Vargitmossens vindkraftsprojekt, Vörå

BILAGA 9: RAPPORT ÖVER BULLER- OCH SKUGGMODELLERING

Oy Kustens Vind Ab

Vargitmossens vindkraftsprojekt

Rapport över buller- och skuggmodellering

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Vargitmossens vindkraftsprojekt

1 BULLER- OCH SKUGGMODELLERINGENS MÅL

Projektägaren till Vargitmossens vindkraftsprojekt Oy Kustens Vind Ab planerar byggande av 9 kraftverk i alternativ 1 (ALT1) och 6 kraftverk i alternativ 2 (ALT2) i Vörå kommuns område. Denna rapport över buller- och skuggmodelleringen har utarbetats utifrån layoutplanerna i MKB-beskrivningsskedet för Vargitmossens vindkraftsprojekt.

De bullerkonsekvenser som vindkraftverken orsakar har bedömts med WindPRO-programmets DECIBEL-modul. Vindkraftverkens skuggeffekter har modellerats med hjälp av WindPRO-programmets SHADOW-modul. Buller- och skuggmodelleringarna har gjorts av Henna-Riikka Rintamäki och kvalitetsgranskningen av Johanna Harju från FCG Finnish Consulting Group Oy.

2 UTGÅNGSUPPGIFTER OCH METODER

2.1 Buller

2.1.1 Bullermodellering ISO 9613-2

De ljudtrycksnivåer som vindkraftverken orsakar har modellerats med WindPRO-programmets Decibel-modul enligt standarden ISO 9613-2. I enlighet med miljöförvaltningens anvisning för modellering av buller från vindkraftverk användes en vindhastighet på 8 m/s mätt på 10 meters höjd, en lufttemperatur på 15 °C, ett lufttryck på 101,325 kPa, en relativ luftfuktighet på 70 procent och en markhårdhet på 0,4. Beräkningen har gjorts 4,0 meter över markytan.

Ljudtrycksnivåerna från Vargitmossens vindkraftverk har i alla projektalternativ modellerats med kraftverksmodellen Siemens Gamesa SG170-6.0 MW som har en navhöjd på 215 meter och en rotordiameter på 170 meter. Kraftverkens totala höjd är således 300 meter och effekten är som mest 6,0 MW.

Utgångsbullernivån för kraftverket Siemens Gamesa SG170-6.0 MW är 106,0 dB(A) och baserar sig på bullerspektrum som uppgetts av kraftverkstillverkaren. En säkerhetsmarginal på 2 dB(A) har lagts till utgångsbullernivån och utgångsbullernivån är således 108,0 dB(A). Noggrannare uppgifter för kraftverken i Vargitmossen presenteras i tabell 1. I bullermodelleringarna för Vargitmossens beaktades de verksamma vindkraftverken i Mörknässkogen, Storbacken och Pensala samt vindkraftverken i Sandbacka, Trollkullen, Storbötet och Norrkangan, som beviljats bygglov. Noggrannare uppgifter om de nämnda kraftverken presenteras i tabellerna 2–10.

Vid granskningen av de sammantagna konsekvenserna för Vargitmossens vindkraftsprojekt beaktades utöver de ovan nämnda kraftverken även kraftverken i Ölands vindkraftsprojekt. Noggrannare uppgifter om Ölands kraftverk presenteras i tabell 11. Dessutom gjordes en bullermodellering för nuläget i omgivningen av Vargitmossens projektområde. I modelleringen beaktades även närliggande verksamma vindkraftsprojekt och vindkraftsprojekt som beviljats bygglov. I modelleringarna beaktades projekt som orsakar sammantagna konsekvenser på fem kilometers avstånd från kraftverken i Vargitmossens ALT1 och för vilka nödvändiga uppgifter för bullermodelleringar fanns tillgängliga.

Beräkningsresultaten från bullermodelleringarna har åskådliggjorts med hjälp av så kallade kartor över medeljudnivåer. På kartorna över medelljudnivåer presenteras kurvor över bullrets medelljudnivå dvs. ekvivalensljudnivå (LAeq) med 5 dB:s mellanrum.

Tabell 1. Modelleringsprogram och ljudeffektsnivåer och ljudeffektsnivåer för kraftverken i Vargitmossens vindkraftsprojekt med kraftverket Siemens Gamesa SG170-6.0 MW samt bullrets särdrag.

UPPGIFTER OM MODELLERINGSPROGRAMMET					
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2	
UPPGIFTER OM VINDKRAFTVERKET					
Vindkraftverkets tillverkare: Siemens Gamesa				Typ: SG 6.0-170	Serienummer: -
Nominell effekt: 6,0 MW		Navhöjd: 215 m		Rotorns diameter: 170 m	Torntyp: stål/hybrid
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret					
Reglering av bladvinkeln		Rotationshastighet		Annat, vad	
Ja	- dB	Ja	- dB	Noise mode-reglering: AM 0 STE	Ja
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå	106 dB
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN					
Standard Acoustic Emission, SG 6.0-170, Rev. 0 2020-05-26.					

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	65,7	200	92	1600	99,3
63	88,5	25	69,7	250	93,5	2000	96,4
125	95,4	31,5	73,7	315	94,1	2500	94
250	98,1	40	77,5	400	93	3150	92,7
500	99,9	50	80,3	500	94,8	4000	90,3
1000	103,8	63	83,1	630	96,8	5000	86,8
2000	101,9	80	85,9	800	98,1	6300	82,9
4000	95,3	100	89,8	1000	99,3	8000	79,2
8000	85	125	90,2	1250	99,5	10000	75,5
108 dB(A)		160	91,7				

Mätning och observationer av bullrets särdrag:							
Smalbandig-het/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 2. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Storbackens vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Vestas				Typ: V150-4.2 MW		Serienummer: -	
Nominell effekt: 4,3 MW		Navhöjd: 145 m		Rotorns diameter: 150 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering:		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå			
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Bullermodellering för Storbackens vindkraftspark – Ramboll, 30.10.2019, Referens: 1510037570-008							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	58	200	91,2	1600	92,6
63	84,2	25	62,7	250	92,6	2000	91,2
125	92,2	31,5	67,2	315	93,8	2500	89,5
250	97,4	40	71,5	400	94,7	3150	87,4
500	99,8	50	75,2	500	95,1	4000	84,8
1000	99,4	63	78,7	630	95,3	5000	82,1
2000	96,1	80	81,9	800	95,2	6300	78,9
4000	90	100	84,7	1000	94,7	8000	75,3
8000	81	125	87,1	1250	93,9	10000	71,7
104,9 dB(A)		160	89,4				

Mätning och observationer av bullrets särdrag:							
Smalbandig-het/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 3. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Sandbacka vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Siemens Gamesa				Typ: SG 6.2-170		Serienummer: -	
Nominell effekt: 6,2 MW		Navhöjd: 115 m		Rotorns diameter: 170 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: AM 0 STE		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		106 dB	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Standard Acoustic Emission, SG 6.0-170, Rev. 0 2020-05-26.							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	63,7	200	90	1600	97,3
63	86,5	25	67,7	250	91,5	2000	94,4
125	93,4	31,5	71,7	315	92,1	2500	92
250	96,1	40	75,5	400	91	3150	90,7
500	97,9	50	78,3	500	92,8	4000	88,3
1000	101,8	63	81,1	630	94,8	5000	84,8
2000	99,9	80	83,9	800	96,1	6300	80,9
4000	93,3	100	87,8	1000	97,3	8000	77,2
8000	83	125	88,2	1250	97,5	10000	73,5
106 dB(A)		160	89,7				

Mätning och observationer av bullrets särdrag:							
Smalbandig-het/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 4. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Storbötet 2 (Vörå) vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Vestas				Typ: V162-7.2		Serienummer: -	
Nominell effekt: 7,2 MW		Navhöjd: 134 m		Rotorns diameter: 162 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: PO7200		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		105,5 dB	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Document nro: DMS no.: 0116–1715_00, 2022-01-07.							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	60,8	200	92,3	1600	92,8
63	86	25	65,3	250	93,6	2000	91,3
125	93,6	31,5	69,6	315	94,7	2500	89,5
250	98,4	40	73,7	400	95,4	3150	87,3
500	100,5	50	77,2	500	95,8	4000	84,6
1000	99,7	63	80,6	630	95,9	5000	81,9
2000	96,2	80	83,7	800	95,6	6300	78,7
4000	89,9	100	86,3	1000	95	8000	75
8000	80,8	125	88,5	1250	94,1	10000	71,3
105,5 dB(A)		160	90,7				

Mätning och observationer av bullrets särdrag:							
Smalbandig-het/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 5. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Storbötet 2 (Nykarleby) vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Vestas				Typ: V172-7.2		Serienummer: -	
Nominell effekt: 7,2 MW		Navhöjd: 164 m		Rotorns diameter: 172 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: PO7200		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		106,9 dB	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Document nro: DMS no.: 0128–4336_00, 2022-06-30.							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	61,7	200	96	1600	92,4
63	90,4	25	66,9	250	96,6	2000	90,4
125	98	31,5	71,8	315	96,8	2500	88,1
250	101,3	40	76,6	400	96,9	3150	85,5
500	101,5	50	81	500	96,7	4000	82,5
1000	99,9	63	84,8	630	96,6	5000	79,1
2000	95,4	80	88,2	800	96,1	6300	75,4
4000	87,9	100	90,9	1000	95,2	8000	71,3
8000	77,2	125	93,2	1250	93,9	10000	66,9
106,9 dB(A)		160	94,8				

Mätning och observationer av bullrets särdrag:							
Smalbandig-het/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 6. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Trollkullens vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Nordex				Typ: N163-5.7		Serienummer: -	
Nominell effekt: 5,7 MW		Navhöjd: 178,5 m		Rotorns diameter: 163 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: Mode 0		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		107,2 dB(A)	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Uppgifterna om bullerutsläpp baserar sig på dokumentet ”Third octave sound power levels Nordex N163/5.X F008_276_A17_EN”. Den ljudeffektsnivå för vindkraftverket som meddelats av tillverkaren motsvarar medelljudnivån, och för att motsvara det övre konfidensintervallet 95 % har +2 dB har lagts till i kraftverkets utgångsvärden vid modelleringen.							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	65,4	200	93,4	1600	97,6
63	90,4	25	69,3	250	94,3	2000	96,4
125	96,6	31,5	74,8	315	97,6	2500	94,4
250	100,3	40	78,4	400	97,2	3150	91,7
500	102,9	50	83,5	500	97,4	4000	87,7
1000	103,6	63	84,8	630	99,4	5000	82,9
2000	101,1	80	87,6	800	98,5	6300	82,7
4000	93,5	100	92,3	1000	99,3	8000	80,8
8000	85,5	125	90,8	1250	98,6	10000	76,6
108,7 dB(A)		160	92,1				

Mätning och observationer av bullrets särdrag:							
Smalbandighet/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 7. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Mörknäs-skogens vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET (VINDKRAFTVERKEN)							
Vindkraftverkets tillverkare: Nordex				Typ: N163		Serienummer: -	
Nominell effekt: 5,7 MW		Navhöjd: 158 m		Rotorns diameter: 163 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering:		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		107,2 +2 dB(A)	

AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN

Uppgifterna om bullerutsläpp baserar sig på dokumentet ”Third octave sound power levels Nordex N163/5.X F008_276_A17_EN”.

Den ljudeffektsnivå för vindkraftverket som meddelats av tillverkaren motsvarar medelljudnivån, och för att motsvara det övre konfidensintervallet har +2 dB har lagts till i kraftverkets utgångsvärden vid modelleringen.

Oktavvis [Hz], L_{WA} [dB]		Per 1/3-oktav [Hz], L_{WA} [dB]					
		20	65,9	200	93,9	1600	98,1
63	90,9	25	69,8	250	94,8	2000	96,9
125	97,1	31,5	75,3	315	98,1	2500	94,9
250	100,8	40	78,9	400	97,7	3150	92,2
500	103,4	50	84,0	500	97,9	4000	88,2
1000	104,1	63	85,3	630	99,9	5000	83,4
2000	101,6	80	88,1	800	99,0	6300	83,2
4000	94,0	100	92,8	1000	99,8	8000	81,3
8000	86,0	125	91,3	1250	99,1	10000	77,1
$L_{WA,tot}$ = 109,2 dB		160	92,6				

Mätning och observationer av bullrets särdrag:							
Smalbandighet/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 8. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Norrkangans vindkraftverk.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Vestas				Typ: V162-5.6		Serienummer: -	
Nominell effekt: 5,6 MW		Navhöjd: 169 m		Rotorns diameter: 162 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering:		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		104 dB	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	60,1	200	91,1	1600	91
63	92,6	25	64,6	250	92,4	2000	89,4
125	97,2	31,5	68,8	315	93,4	2500	87,5
250	99,1	40	72,9	400	94,1	3150	85,1
500	98,1	50	76,4	500	94,4	4000	82,4
1000	94,3	63	79,7	630	94,4	5000	79,5
2000	87,7	80	82,7	800	94	6300	76,2
4000	78,3	100	85,2	1000	93,4	8000	72,5
8000	92,6	125	87,5	1250	92,4	10000	68,7
104 dB(A)		160	89,6				

Mätning och observationer av bullrets särdrag:							
Smalbandighet/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 9. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Pensala vindkraftverk Nordtank.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Nordtank				Typ: 150		Serienummer: -	
Nominell effekt: 0,15 MW		Navhöjd: 38 m		Rotorns diameter: 24,6 m		Torntyp: stål	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad:			
Ja	- dB	Ja	- dB	Noise mode-reglering:		Ja	
~~Nej~~		~~Nej~~		Noise mode, utgångs-		-	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Ramboll 1.4.1989							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20		200		1600	
63	79,4	25		250		2000	
125	86,4	31,5		315		2500	
250	89,8	40		400		3150	
500	92,4	50		500		4000	
1000	92,2	63		630		5000	
2000	89,3	80		800		6300	
4000	84,5	100		1000		8000	
8000	75,0	125		1250		10000	
97,8 dB(A)		160					

Mätning och observationer av bullrets särdrag:							
Smalbandighet/To-nalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	~~Nej~~

Tabell 10. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Pensala vindkraftverk Lagerway L100 – 2,52 MW.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET							
Vindkraftverkets tillverkare: Lagerway				Typ: Lagerway L100		Serienummer: -	
Nominell effekt: 2,52 MW		Navhöjd: 98 m		Rotorns diameter: 100 m		Torntyp: stål	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad:			
Ja	- dB	Ja	- dB	Noise mode-reglering:			
~~Nej~~		~~Nej~~		Noise mode, utgångs-		-	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Uppgifterna om bullerutsläppen baserar sig på tillverkarens dokument ” L100-2.5MW rev, Date 2014-01-27”.							

Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20		200		1600	
63	86,6	25		250		2000	
125	93,6	31,5		315		2500	
250	97,0	40		400		3150	
500	99,6	50		500		4000	
1000	99,4	63		630		5000	
2000	96,5	80		800		6300	
4000	91,7	100		1000		8000	
8000	82,2	125		1250		10000	
98,0 dB(A)		160					

Mätning och observationer av bullrets särdrag:							
Smalbandighet/To-nalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	~~Nej~~

Tabell 11. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Ölands vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET						
Modelleringsprogram och version: WindPRO version 3.6.355				Modelleringsmetod: ISO 9613-2		
UPPGIFTER OM VINDKRAFTVERKEN						
Vindkraftverkets tillverkare: Generic				Typ: RD 200 HH 200		Serienummer: -
Nominell effekt: 7,2 MW		Navhöjd: 200 m		Rotorns diameter: 200 m		Torntyp: stål/hybrid
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret						
Reglering av bladvinkeln		Rotationshastighet		Annat, vad: PO7200-0S		
Ja	dB	Ja	dB	Noise mode-reglering: Mode 0, no STE		Ja
~~Nej~~		~~Nej~~		Noise mode, utgångsljudnivå		110,1 dB(A) + 2 dB (A)
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN						
Third octave noise emission V172-7.2MW 50/60 Hz Document no 0128-4336_00 *En säkerhetsmarginal på 2 dB(A) har lagts till utgångsbullernivån.*						

Oktavvis [Hz], dB(A)		Per 1/3-oktav [Hz], dB(A)					
		12,5	*50,6*	*125,0*	*97,2*	*1250,0*	*99,8*
62,5	*93,5*	*16,0*	*56,7*	*160,0*	*99,2*	*1600,0*	*98,3*
125	*102,2*	*20*	*62,4*	*200,0*	*100,6*	*2000,0*	*96,3*
250	*106,1*	*25*	*68,1*	*250,0*	*101,5*	*2500,0*	*94,0*
500	*107*	*31,5*	*73,5*	*315,0*	*101,9*	*3150,0*	*91,3*
1000	*105,7*	*40*	*78,7*	*400,0*	*102,2*	*4000,0*	*88,2*
2000	*101,3*	*50,0*	*83,5*	*500,0*	*102,2*	*5000,0*	*84,8*
4000	*93,6*	*63,0*	*87,8*	*630,0*	*102,2*	*6300,0*	*81,0*
8000	*82,8*	*80,0*	*91,5*	*800,0*	*101,8*	*8000,0*	*76,7*
112,1 dB(A)		*100,0*	*94,6*	*1000,0*	*101,0*	*10000*	*72,1*

Mätning och observationer av bullrets särdrag:			
Smalbandighet/Tonalitet	Impulsartat buller	Amplitudmodulation	Annat, vad:

~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej	~~Ja~~	Nej

Tabell 12. Använda modelleringsparametrar vid ISO 9613-2-kalkylerna samt objekt som är utsatta för buller.

AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN			
Beräkningshöjd		Beräkningsrutans storlek [m·m]	
ISO 9613-2: 4,0 m		25x25 m	
Relativ fuktighet		Temperatur	
70 %	Annat, vad och varför:	ISO 9613-2: 15 C°	
Terrängmodellens källa och noggrannhet			
Terrängmodellens källa: LMV terrängdatabas		Horisontell resolution: 1,0	Vertikal resolution: 0,5
Beaktande av mark- och vattenytans absorption och reflektion, använda koefficienter			
ISO 9613-2	markområden = 0,4; vattenområden = 0		Obs
Atmosfärens stabilitet vid beräkningen/meteorologisk korrigering			
Neutral, (0): Neutral		Annat, vad och varför:	
Beaktande av väderförhållanden; vindriktningar och hastighet som använts vid beräkningen			
Vindens riktning: 0-360°		Vindhastighet: 8 m/s uppmätt på 10 meters höjd	
Riktning för kraftverkets ljud och dämpning			
Fri rymd: ja		Annat, vad och varför:	

2.1.2 Lågfrekvent buller

Det lågfrekventa bullret beräknades med metoder enligt Miljöministeriets anvisning 2/2014 och med uppskattningar av de ljudeffektsnivåer för kraftverken som erhållits från kraftverkstillverkaren.

Anvisningen 2/2014 erbjuder en metod för beräkning av lågfrekvent buller utanför byggnader. I social- och hälsoministeriets förordning om boendehälsa fastställs åtgärdsbegränsningar för lågfrekvent buller i bostadsrum. Ljudnivån som sprids till insidan av byggnaderna kalkylerades med hjälp av ljudisoleringsresultat från Åbo yrkeshögskolas Anojanssi-projekt (Keränen, Hakala och Hongisto 2017) och resultaten jämfördes med åtgärdsgränserna.

Tabell 13. Närmevärde för ljudnivåskillnad för fasaden till ett finländskt småhus i enlighet med resultaten från Anojanssi-projektet.

f [Hz]	20	25	31.5	40	50	63	80	100	125	160	200
DLσ [dB]	7.6	8.3	9.2	10.3	11.5	13.0	14.8	16.8	18.8	21.1	22.8

Vid beräkningen av lågfrekvent buller beaktades effekten av markytans form enligt anvisningen 4/2014. Resultaten har presenterats i form av en tabell enligt frekvens vid bostads- och fritidsbyggnaderna i projektområdets omgivning.

2.2 Skuggmodellering

Tabell 14. Modelleringsprogram och vindkraftverkens storlek i skuggmodelleringarna för Vargitmossens vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET			
Modelleringsprogram och version: WindPRO version 3.6.355		Modelleringsmetod: ISO 9613-2	
UPPGIFTER OM VINDKRAFTVERKET			
Vindkraftverkets tillverkare: Siemens Gamesa		Typ: SG 6.0-170	Serienummer: -
Nominell effekt: 6,0 MW	Navhöjd: 215 m	Rotorns diameter: 170 m	Torntyp: stål/hybrid

I Vargitmossens projekt har vindkraftverkens skuggeffekter modellerats med kraftverkstypen Siemens Gamesa SG 6.0-170. Kraftverket har en rotordiameter på 170 meter och tornet har en höjd (navhöjd) på 215 meter. Vid modelleringarna har kraftverken således en total höjd på 300 meter.

Skuggmodelleringarna har gjorts för tre olika situationer: för nuläget i närområdet till Vargitmossens projekt och för en situation där man utöver kraftverken i nuläget även beaktade kraftverken i ALT1 eller ALT2 till Vargitmossen samt för en situation där man även beaktade alla andra vindkraftsprojekt som orsakar sammantagna konsekvenser. I modelleringen av nuläget ingick vindkraftsprojekt som är i drift eller som beviljats bygglov i närområdet. Projekt som är i drift är Mörknässkogens, Storbackens och Pensala vindkraftsprojekt och bygglov har beviljats för Sandbacka, Trollkullens, Storbötets och Norrkangans projekt. I modelleringarna av sammantagna konsekvenser ingick utöver dessa även de närliggande vindkraftverken i Öland och Roukus.

I modelleringarna beaktades projekt som orsakar sammantagna konsekvenser på fem kilometers avstånd från kraftverken i Vargitmossens ALT1. De uppgifter för de projekt som orsakar sammantagna konsekvenser som använts vid skuggmodelleringarna presenteras i tabell 15.

Tabell 15. Uppgifter för vindkraftsparker som är i drift, vindkraftsparker som beviljats bygglov och projekt i utvecklingsskedet som orsakar sammantagna konsekvenser och som använts vid skuggmodelleringarna.

Vindkraftspark	Vindkraftverkets tillverkare och typ	Rotorns diameter	Navhöjd	Nominell effekt
Sandbacka	Siemens Gamesa SG 6.2–170	170 m	115 m	6,2 MW
Storbacken	Vestas V150-4.2	150 m	145 m	4,2 MW
Mörknässkogen	Vestas V136-3.45	136 m	166 m	3,45 MW
Trollkullen	Nordex N163/5.X	163 m	178,5 m	5,7 MW
Storbötet 1	Vestas V172-7.2 och Vestas V162-6.2	172 m och 162 m	164 m och 166 m	7,2 MW och 6,2 MW
Storbötet 2	Vestas V162-7.2	162 m	134 m	7,2 MW
Öland	Generic RD 200 7.2 MW	200 m	200 m	7,2 MW
Roukus	Generic RD200 10 MW	200 m	200 m	10 MW
Norrkanga	Vestas V162-5.6	162 m	169 m	5,6 MW
Pensala (Norrpigg Lagerwey)	Lagerwey L100-2.5 MW	100 m	98 m	2,52 MW
Pensala (Norrpigg Nordtank)	Nordtank	24,6 m	38 m	0,15 MW

Skuggeffekterna modellerades med hjälp av WindPRO-programmets Shadow-modul. Vid beräkningen beaktas skuggor som bildas då solen ligger över 3 grader ovanför horisonten. Som skugga räknas en situation där bladet täcker minst 20 procent av solen.

Vid modelleringen av skuggeffekter beaktas den maximala bredden av vingens blad samt bredden av vingens spets på 90 procents avstånd från turbinen. I fråga om Vargitmossens vindkraftverk användes vid skuggmodelleringen en maximal bredd på 4,5 meter för bladet och en bredd på 1,5 meter för bladets spets på 90 procents avstånd.

Vid beräkningen för skuggningsmodellen beaktades projektområdets höjduppgifter, vindkraftverkens lägen, vindkraftverkens navhöjd och rotordiameter samt projektområdets tidszon. Vid modelleringen beaktades solens läge vid horisonten vid olika klockslag och årstider, molnighet per månad (med andra ord hur mycket solen lyser då den står ovanför horisonten) samt den uppskattade driftstiden för vindkraftverken per år.

Som granskningshöjd för skuggningen på gårdsplanen för bostads- eller fritidsbyggnaderna i närheten användes 1,0 meter. Beräkningsområdets storlek var 5,0 x 5,0 meter. Beräkningsfönstren riktades mot kraftverken i s.k. ”greenhouse mode”.

Modelleringen utgick från den så kallade reella situationen (real case). Modelleringen gjordes för två olika beräkningssituationer.

1) Verklig situation där den skyddande effekten från träd inte beaktades (real case, no forest)

2) Verklig situation där den skyddande effekten från träd beaktades (real case, luke forest). Trädens höjd baserar sig på en nationell inventering av skogar (MVMI) som utarbetats baserat på flera olika källor av Naturresursinstitutet (Luke) 2021. I inventeringen användes förutom terrängmätningar från den nationella inventeringen av skogar (VMI) även satellitbilder och andra källor, såsom Lantmäteriverkets numeriska terrängdatabas och höjdmodell.

De genomsnittliga soltimmarna baserar sig på långvariga väderuppgifter som uppmätts vid Umeå väderstation under åren 1988–1993. Som vindriktning och hastighetsfördelning vid beräkningarna användes Nasas MERRA-data (Modern Era Retrospective-analysis for Research and Applications) från närheten av projektområdet.

Resultaten från skuggmodelleringen åskådliggörs med hjälp av en karta. Skuggeffektens omfattning (1, 8 och 20 timmar i året) framgår av kartan. I modelleringen har också effekterna för känsliga objekt i omgivningen runt området för vindkraftsparken räknats ut separat.

2.3 Gräns- och riktvärden

2.3.1 Buller

I Statsrådets förordning (1107/2015) fastställs planeringsvärden för maximalvärdet för medelljudnivåerna dag- och nattetid för vindkraftverk. Om bullret från vindkraftverket innehåller tonala, smalbandiga eller impulsliknande komponenter eller om det är tydligt amplitudmodulerat, bör det enligt anvisningarna läggas till fem decibel till modelleringsresultaten innan de jämförs med riktvärdet. Eftersom riktvärdet redan omfattar de typiska dragen för buller från vindkraftverk, bör de ovan nämnda typiska dragen för ljud vara ovanligt kraftiga för att fem decibels tillägg i ljudstyrkan skulle behöva beaktas i modelleringsresultaten (Miljöförvaltningens anvisning 2/2014).

Tabell 16. Riktvärden för buller från vindkraftverk enligt Statsrådets förordning 27.8.2015).

Konsekvensobjekt	Dagtid (7–22)	Nattetid (22–7)
Fast bebyggelse	45 dB	40 dB
Fritidsbebyggelse	45 dB	40 dB
Vårdanstalter	45 dB	40 dB
Läroanstalter	45 dB	—
Rekreationsområden	45 dB	—
Campingområden	45 dB	40 dB
Nationalparker	40 dB	40 dB

I social- och hälsoministeriets förordning (545/2015) fastställs åtgärdsgränser för lågfrekvent buller. Åtgärdsgränserna berör bostadsrum och de har fastställts som icke-frekvensvägda medelljudnivåer under en timme tersvis. Åtgärdsgränserna berör buller nattetid och under dagen tillåts 5 dB högre värden.

Tabell 17. Åtgärdsgränser för medelljudnivån under en timme för lågfrekvent inomhusbuller i sovutrymmen.

Tersband Hz	20	25	31,5	40	50	63	80	100	125	160	200
Medelljudnivå LZeq,1h, dB	74	64	56	49	44	42	40	38	36	34	32
Medelljudnivå beräknat uti-från föregående med A-väg-ning LAeq,1h, dB	24	19	17	14	14	16	18	19	20	21	21

Dessutom får buller under natten som eventuellt orsakar sömnstörningar och som tydligt skiljer sig från bakgrundsbuller inte överskrida 25 dB som medelljudnivå under en timme LAeq,1h uppmätt i sovutrymmen.

2.3.2 Skuggeffekter

I Finland finns inga allmänna myndighetsbestämmelser om den maximala varaktigheten för skuggning som orsakas av vindkraftverk eller bedömningsgrunder för skuggbildning. I miljöministeriets anvisningar för planering av vindkraftbyggande föreslås att man bör använda andra länders rekommendationer om begränsning av reflexer (Miljöministeriet 2012).

I flera länder har det utfärdats riktvärden eller getts rekommendationer för den godkända mängden av blänkeffekter. Till exempel i Sverige är motsvarande rekommendation åtta timmar per år och 30 minuter per dag.

Vid bedömningen granskades konsekvenserna i ett område där skuggor eller blinkeffekter i en verklig situation enligt modelleringen (”real case”) förekommer under minst 8 timmar per år.

3 BULLER- OCH SKUGGNINGSMODELLERINGARNAS RESULTAT

3.1 Buller

3.1.1 Beräkningsresultat för buller ISO 9613-2 i nuläget

Enligt bullermodelleringen av nuläget för Vargitmossens projektområdet överskrids bullernivån på 40 dB(A) vid beräkningspunkt Bostadsbyggnad C (Bild 1 och Tabell 18). Bostadsbyggnaden i fråga ligger i närheten av vindkraftverk som är i drift i Pensala, på deras södra sida. I modelleringen av nuläget beaktades vindkraftsprojekt som är i drift och under uppbyggnad i närheten av Vargitmossen. Se noggrannare uppgifter om beräkningsresultaten i bilaga 1.

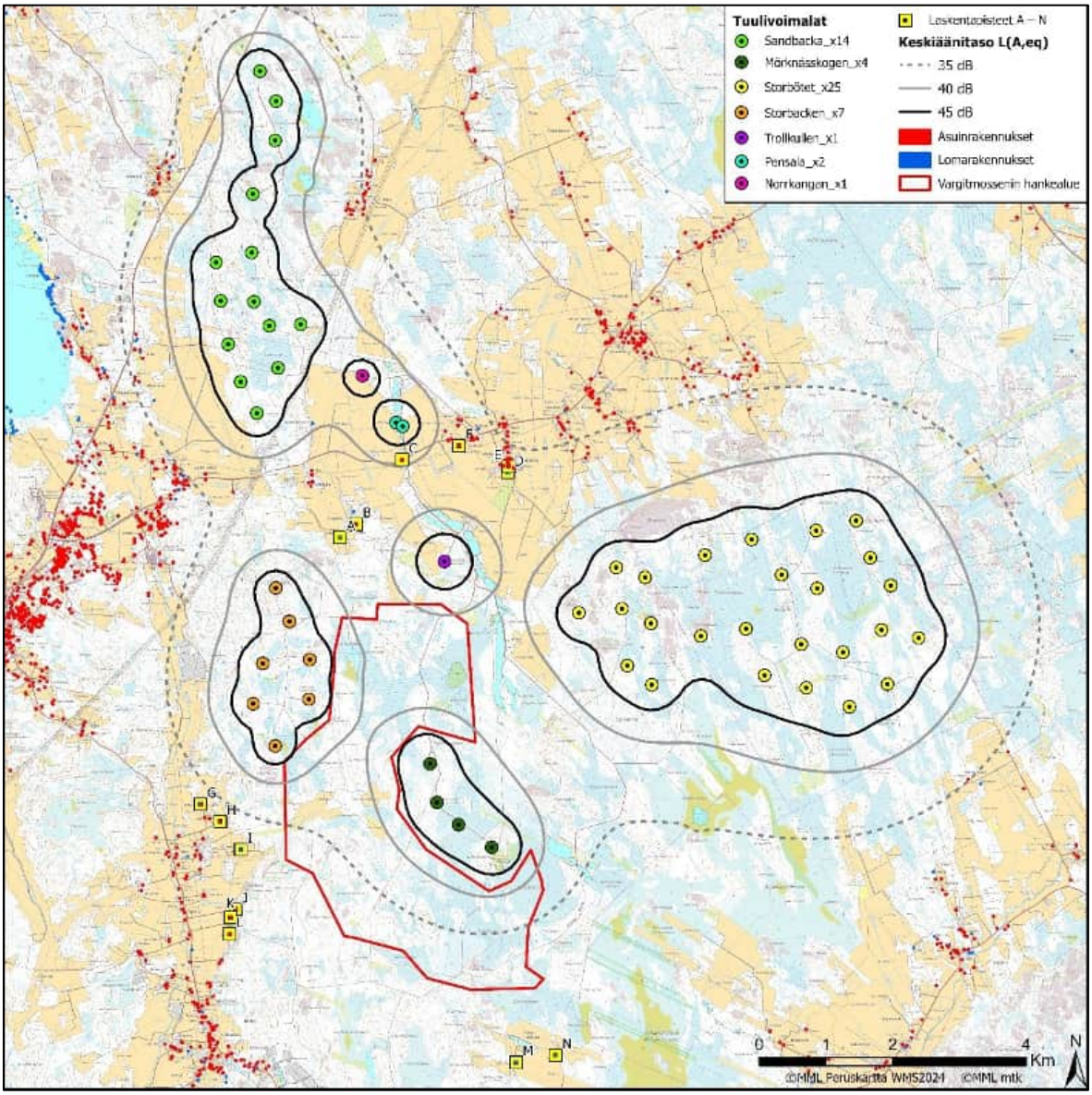


Bild 1. Bullermodelleringens resultat i nuläget.

Tabell 18. Kalkylerade bullernivåer i nuläget i omgivningen av Vargitmossens vindkraftsprojekt.

	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Bullernivå dB(A)
Bostadsbyggnad A (England)	273465	7028646	17,5	4,0	37,2
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	4,0	37,0
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	4,0	40,9
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	4,0	35,4
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	4,0	35,2
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	4,0	36,8
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	4,0	33,6
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	4,0	33,6
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	4,0	32,7
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	4,0	29,8
Bostadsbyggnad K (Nyback)	271822	7022950	20	4,0	29,3
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	4,0	28,7
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	4,0	27,7
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	4,0	27,7

3.1.2 Beräkningsresultat för buller ISO 9613-2 med kraftverket SG170–6.0 MW (106.0 dB + 2.0 dB)

Projektalternativ ALT1

Enligt bullermodelleringen för projektalternativ 1 (ALT1) överskrids bullernivån på 40 dB(A) vid beräkningspunkt Bostadsbyggnad C (Bild 2 och Tabell 19). I modelleringen beaktades utöver kraftverken i Vargitmossens projektalternativ 1 (ALT1) även vindkraftverk som beviljats bygglov och som är i drift i närheten. Se noggrannare beräkningsresultat i bilaga 2.

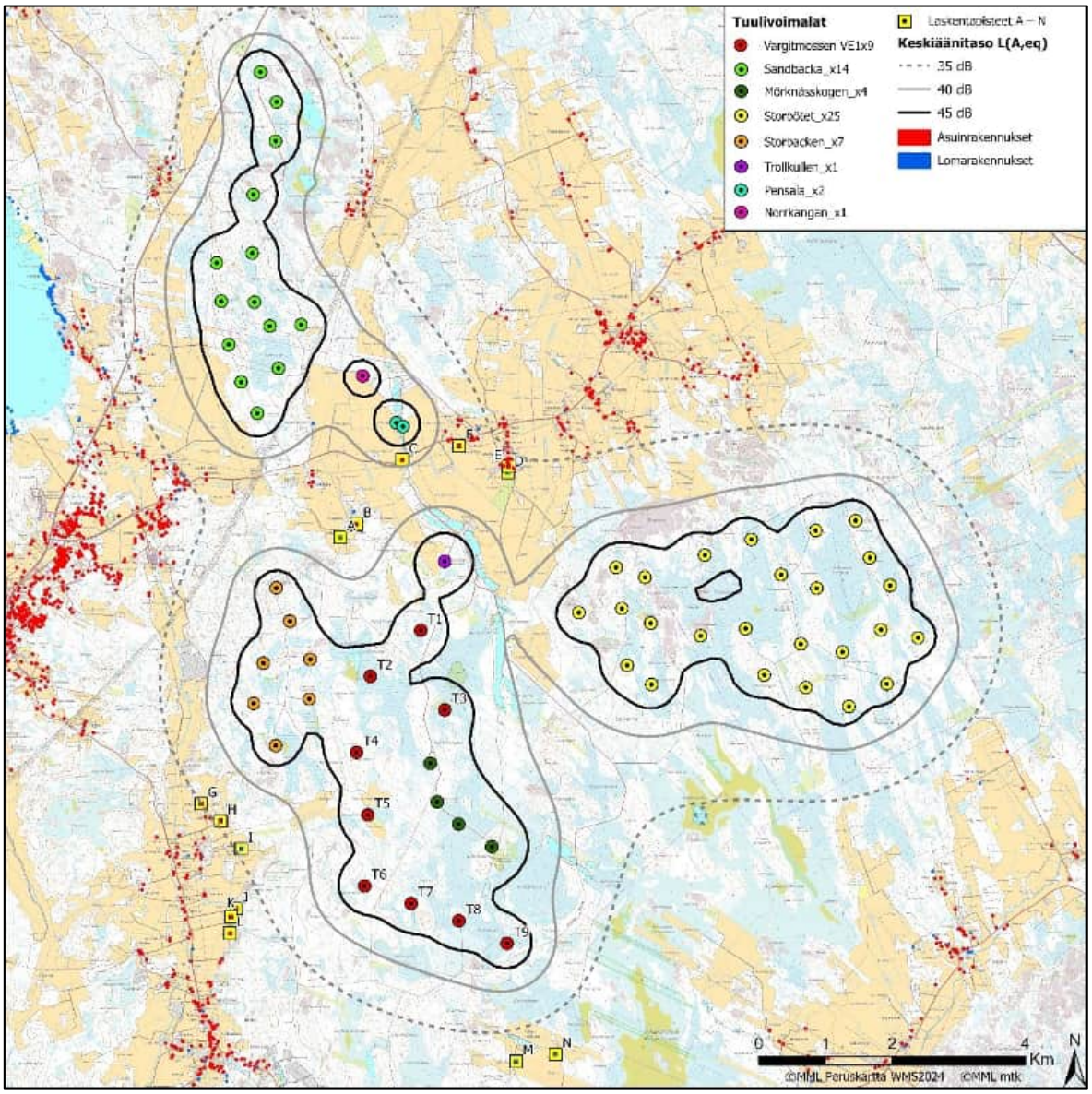


Bild 2. Bullermodelleringens resultat i projektalternativ 1 (ALT1).

Tabell 19. Kalkylerade bullernivåer i omgivningen av Vargitmossens vindkraftspark i projektalternativ 1 (ALT1).

	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Bullernivå dB(A)
Bostadsbyggnad A (England)	273465	7028646	17,5	4,0	38,0
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	4,0	37,8
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	4,0	41,0
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	4,0	35,8
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	4,0	35,6
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	4,0	37,1
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	4,0	35,0
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	4,0	35,4
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	4,0	35,4
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	4,0	33,2
Bostadsbyggnad K (Nyback)	271822	7022950	20	4,0	32,7
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	4,0	32,2
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	4,0	32,3
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	4,0	31,9

Projektalternativ ALT2

Enligt bullermodelleringen för projektalternativ 2 (ALT2) överskrids bullernivån på 40 dB(A) vid beräkningspunkt Bostadsbyggnad C (Bild 3 och Tabell 20). I modelleringen beaktades utöver kraftverken i Vargitmossens projektalternativ 2 (ALT2) även vindkraftverk som beviljats bygglov och som är i drift i närheten. Se noggrannare beräkningsresultat i bilaga 3.

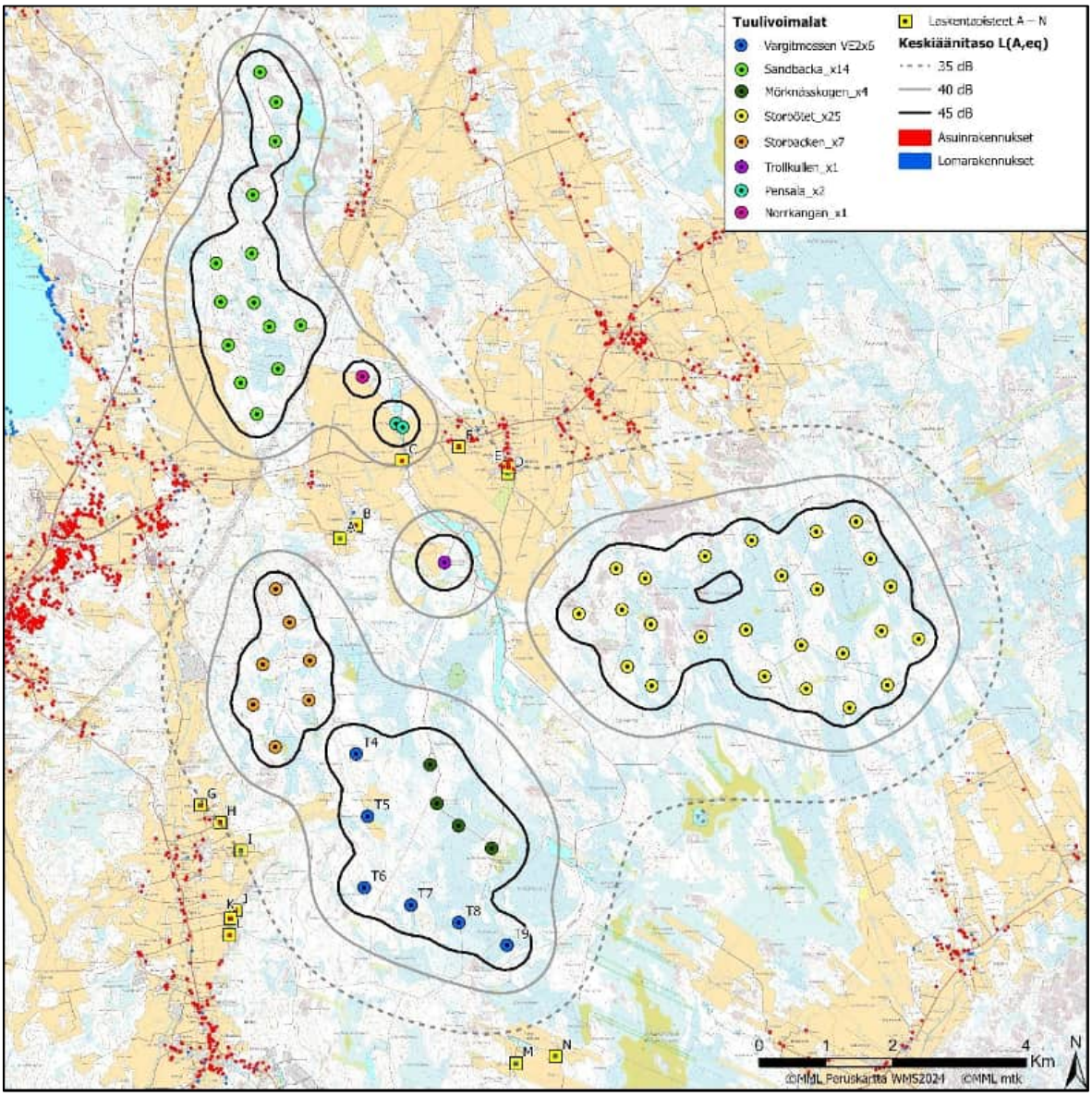


Bild 3. Bullermodelleringens resultat i projektalternativ 2 (ALT2).

Tabell 20. Kalkylerade bullernivåer i omgivningen av Vargitmossens vindkraftspark i projektalternativ 2 (ALT2).

	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Bullernivå dB(A)
Bostadsbyggnad A (England)	273465	7028646	17,5	4,0	37,3
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	4,0	37,1
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	4,0	40,9
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	4,0	35,5
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	4,0	35,3
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	4,0	36,9
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	4,0	34,7
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	4,0	35,1
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	4,0	35,1
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	4,0	33,0
Bostadsbyggnad K (Nyback)	271822	7022950	20	4,0	32,5
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	4,0	31,9
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	4,0	32,2
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	4,0	31,8

3.1.3 Lågfrekvent buller

De kalkylerade resultaten av de låga ljud som produceras av vindkraftverk, det vill säga lågfrekvent ljud, har jämförts med åtgärdsgränserna som utfärdats i Social- och hälsovårdsministeriets förordning om boendehälsa (545/2015). Dessa är maximala värden som fastställts för buller nattetid i sovutrymmen. Åtgärdsgränsen har även jämförts med ljudnivån utanför de undersökta byggnaderna.

De kalkylerade resultaten för utrymmen inomhus har fåtts genom att beakta närmevärdet för ytterhöljet till finländska småhus (84 % percentil, Anojanssi 2019). Som en osäkerhetsfaktor vid bedömningen kan emellertid ses att det finns stora individuella skillnader i byggnadernas ljudisolering vid låga frekvenser, och ljudnivån inomhus påverkas väsentligt även av rummets mått och inredning.

Nuläge

I modelleringen av lågfrekvent buller i nuläget beaktades vindkraftsprojekt som är i drift och som beviljats bygglov i närheten av Vargitmossen. I nuläget överskrider det lågfrekventa bullret inte Social- och hälsovårdsministeriets riktvärde för boendehälsa vid beräkningspunkterna A–N. Vindkraftsprojekt som beaktats i modelleringen av nuläget är Storbackens, Mörknässkogens och Pensala vindkraftverk som är i drift samt Sandbacka, Trollkullens, Storbötets och Norrkangans vindkraftverk som beviljats bygglov. Se noggrannare uppgifter för de beaktade vindkraftverken i tabellerna 2–10.

I tabell 21 presenteras beräkningsresultat för lågfrekvent buller i närheten av Vargitmossens vindkraftsprojekt i närheten. I tabellen framkommer i vilken mån åtgärdsgränsen har underskridits (negativt värde) eller överskridits (positivt värde). I byggnadernas inomhusutrymmen ligger bullret som högst 3,7 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad C). Se noggrannare beräkningsresultat i bilaga 4.

Tabell 21. Beräkningsresultat för lågfrekvent buller i nuläget.

Byggnad	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
Bostadsbyggnad A (England)	7,2	100	-6,1	50
Bostadsbyggnad B (Renlund)	7,4	100	-5,8	50
Bostadsbyggnad C (Jeppovägen 586)	9,2	100	-3,7	50
Fritidsbyggnad D (Kvarnbacka)	7,0	100	-6,3	50
Bostadsbyggnad E (Gullback)	6,8	100	-6,4	50
Bostadsbyggnad F (Jeppovägen 675)	7,2	100	-5,8	50
Fritidsbyggnad G (Kullastået 64b)	3,8	100	-9,4	50
Bostadsbyggnad H (Kullastået 85)	4,0	100	-9,1	50
Fritidsbyggnad I (Kyhrastået, Bobacken)	3,9	100	-9,1	50
Bostadsbyggnad J (Hagabacktået 71)	2,5	100	-10,4	50
Bostadsbyggnad K (Nyback)	2,2	100	-10,6	50
Bostadsbyggnad L (Kimo Skogsbilväg 55)	1,9	100	-10,9	50
Fritidsbyggnad M (Fårmossen)	1,9	100	-10,9	50
Fritidsbyggnad N (Brändå)	2,0	100	-10,9	50

Projektalternativ ALT1 och ALT2

Det lågfrekventa buller som orsakas av Vargitmossens vindkraftsprojekt överskrider inte Social- och hälsovårdsministeriets riktvärde för boendehälsa vid beräkningspunkterna A–N i någotdera projektalternativet (ALT1 och ALT2). I modelleringarna beaktades även närliggande vindkraftverk som är i drift och som beviljats bygglov. Se noggrannare uppgifter för de beaktade vindkraftverken i tabellerna 1–10.

I tabell 22 och 23 presenteras beräkningsresultaten av lågfrekvent buller i projektalternativen 1 (ALT1) och 2 (ALT2). I tabellerna framkommer i vilken mån åtgärdsgränsen har underskridits (negativt värde) eller överskridits (positivt värde). I byggnadernas inomhusutrymmen ligger bullret som högst 3,3 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad C i alternativ 1 (ALT1)). Se noggrannare beräkningsresultat i bilagorna 5 och 6.

Tabell 22. Beräkningsresultat för lågfrekvent buller i projektalternativ 1 (ALT1).

Byggnad	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
Bostadsbyggnad A (England)	8,3	100	-5,1	50
Bostadsbyggnad B (Renlund)	8,4	100	-5,0	50
Bostadsbyggnad C (Jeppovägen 586)	9,5	100	-3,3	50
Fritidsbyggnad D (Kvarnbacka)	7,5	100	-5,8	50
Bostadsbyggnad E (Gullback)	7,4	100	-5,9	50
Bostadsbyggnad F (Jeppovägen 675)	7,7	100	-5,4	50
Fritidsbyggnad G (Kullastået 64b)	5,8	100	-7,5	50
Bostadsbyggnad H (Kullastået 85)	6,2	100	-7,1	50
Fritidsbyggnad I (Kyhrastået, Bobacken)	6,5	100	-6,8	50
Bostadsbyggnad J (Hagabacktået 71)	5,3	100	-7,9	50

Bostadsbyggnad K (Nyback)	5,0	100	-8,2	50
Bostadsbyggnad L (Kimo Skogsbilväg 55)	4,7	100	-8,5	50
Fritidsbyggnad M (Fårmossen)	4,8	100	-8,4	50
Fritidsbyggnad N (Brändå)	4,6	100	-8,6	50

Tabell 23. Beräkningsresultat för lågfrekvent buller i projektalternativ 2 (ALT2).

Byggnad	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
Bostadsbyggnad A (England)	7,5	100	-5,8	50
Bostadsbyggnad B (Renlund)	7,7	100	-5,6	50
Bostadsbyggnad C (Jeppovägen 586)	9,3	100	-3,6	50
Fritidsbyggnad D (Kvarnbacka)	7,2	100	-6,1	50
Bostadsbyggnad E (Gullback)	7,0	100	-6,2	50
Bostadsbyggnad F (Jeppovägen 675)	7,4	100	-5,7	50
Fritidsbyggnad G (Kullastået 64b)	5,3	100	-7,9	50
Bostadsbyggnad H (Kullastået 85)	5,8	100	-7,5	50
Fritidsbyggnad I (Kyhrastået, Bobacken)	6,2	100	-7,1	50
Bostadsbyggnad J (Hagabacktået 71)	5,0	100	-8,2	50
Bostadsbyggnad K (Nyback)	4,7	100	-8,5	50
Bostadsbyggnad L (Kimo Skogsbilväg 55)	4,4	100	-8,8	50
Fritidsbyggnad M (Fårmossen)	4,6	100	-8,6	50
Fritidsbyggnad N (Brändå)	4,4	100	-8,8	50

3.2 Skuggeffekter

3.2.1 Skuggning ”Real Case, No forest”

Nuläge

I närheten av Vargitmossens planerade vindkraftspark finns flera vindkraftsparker som är i drift eller under uppbyggnad. För de skuggeffekter som orsakas av dessa vindkraftsparker gjordes en modellering som kan anses beskriva nuläget för skuggeffekterna när den skyddande effekten från träd inte har beaktats. De skuggeffekter som vindkraftsparkerna orsakar har presenterats på bilden nedan (Bild 4) och skuggtimmarna i nuläget vid Vargitmossens beräkningspunkter A–N presenteras i tabell 24. Se uppgifter för de beaktade vindkraftsprojekten i kapitel 2.2. Mer detaljerade beräkningsresultat för modelleringen av skuggningen i nuläget finns i bilaga 7.

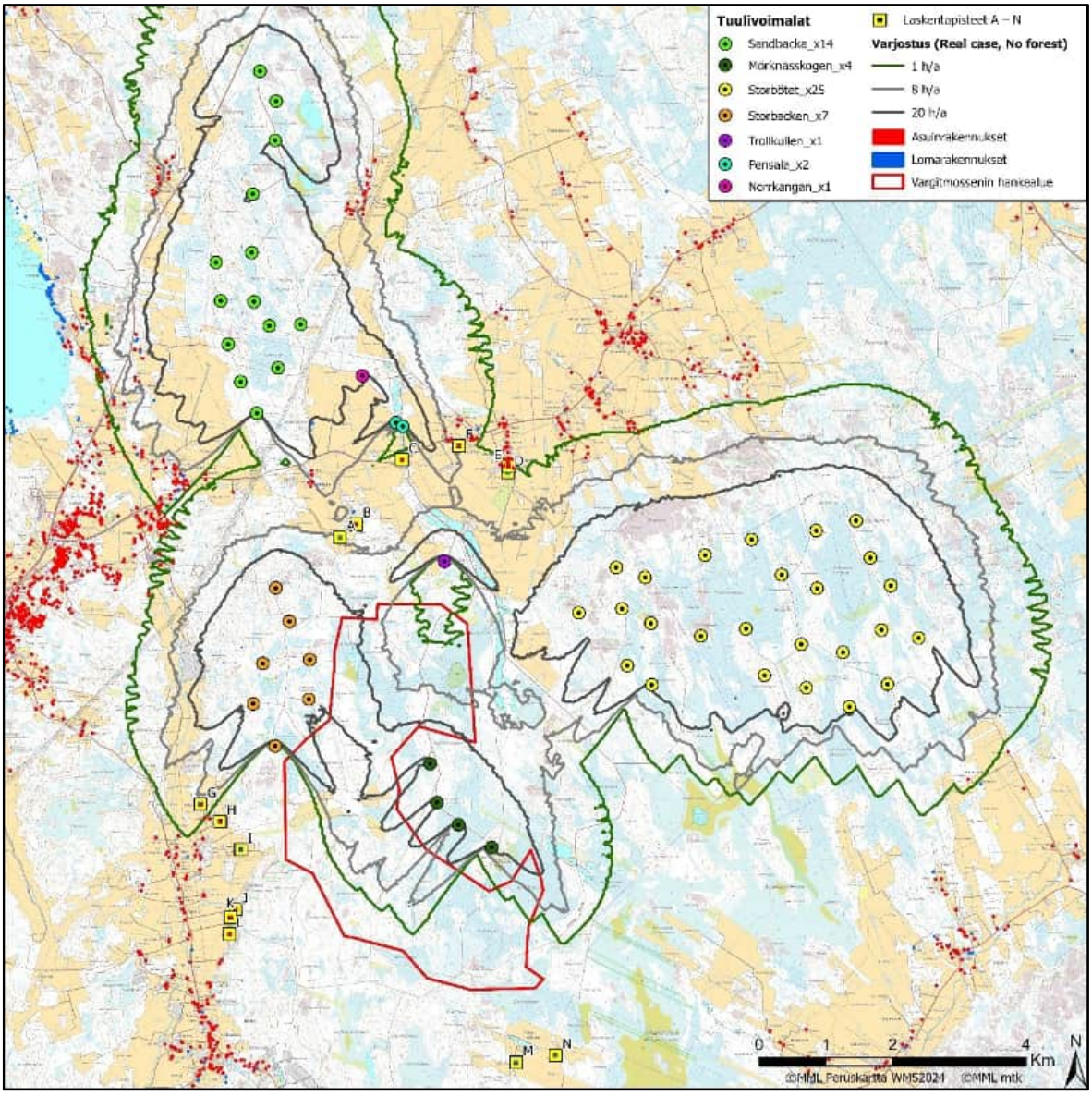


Bild 4. Skuggmodelleringens resultat i nuläget när den skyddande effekten från träd inte har beaktats.

Tabell 24. Skuggmodelleringens resultat i nuläget när den skyddande effekten från träd inte har beaktats "real case, no forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräknings-höjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:20
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:36
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:06
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:12
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	6:34
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	0:00
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Projektalternativ ALT1

I projektalternativ 1 (ALT1) är skuggeffekterna på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna över 8 h/a vid beräkningspunkterna Bostadsbyggnad A (11 h, 11 min./år) och Bostadsbyggnad F (8 h, 13 min./år), när den skyddande effekten från träd inte har beaktats. I modelleringen beaktades utöver kraftverken i Vargitmossens vindkraftverk även vindkraftverk som beviljats bygglov och som är i drift i närheten. (Bild 5, Tabell 25) Se noggrannare beräkningsresultat i bilaga 8.

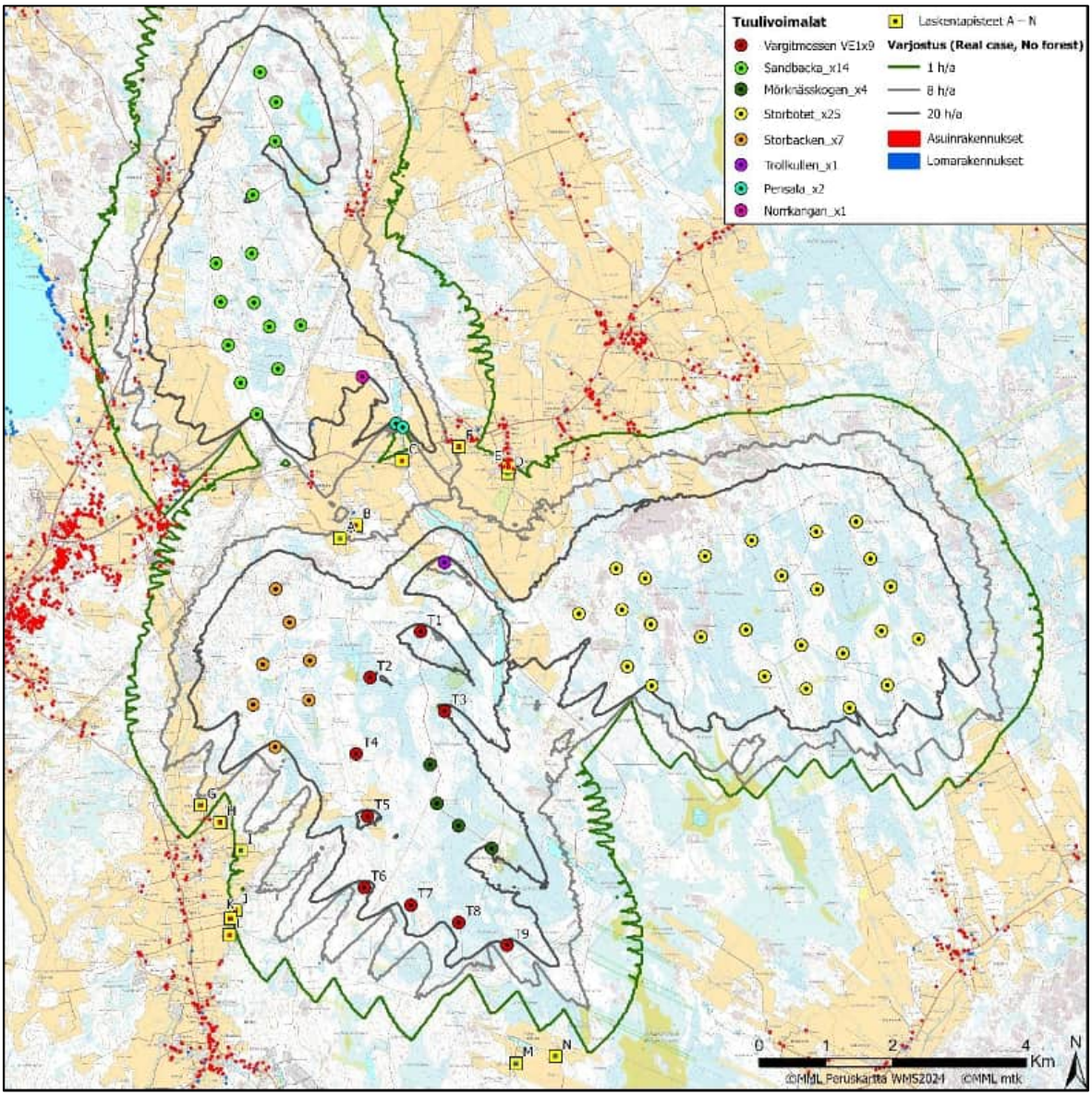


Bild 5. Skuggmodelleringens resultat när den skyddande effekten från träd inte beaktas i projektalternativ 1 (ALT 1).

Tabell 25. Skuggmodelleringens resultat för ALT1 när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	11:11
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	7:27
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:13
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	6:35
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	1:38
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Projektalternativ ALT2

I projektalternativ 2 (ALT2) är skuggeffekterna på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna över 8 h/a vid beräkningspunkterna Bostadsbyggnad A (9 h, 21 min./år) och Bostadsbyggnad F (8 h, 13 min./år), när den skyddande effekten från träd inte har beaktats. I modelleringen beaktades utöver kraftverken i Vargitmossens vindkraftverk även vindkraftverk som beviljats bygglov och som är i drift i närheten. (Bild 6, Tabell 26) Se noggrannare beräkningsresultat i bilaga 9.

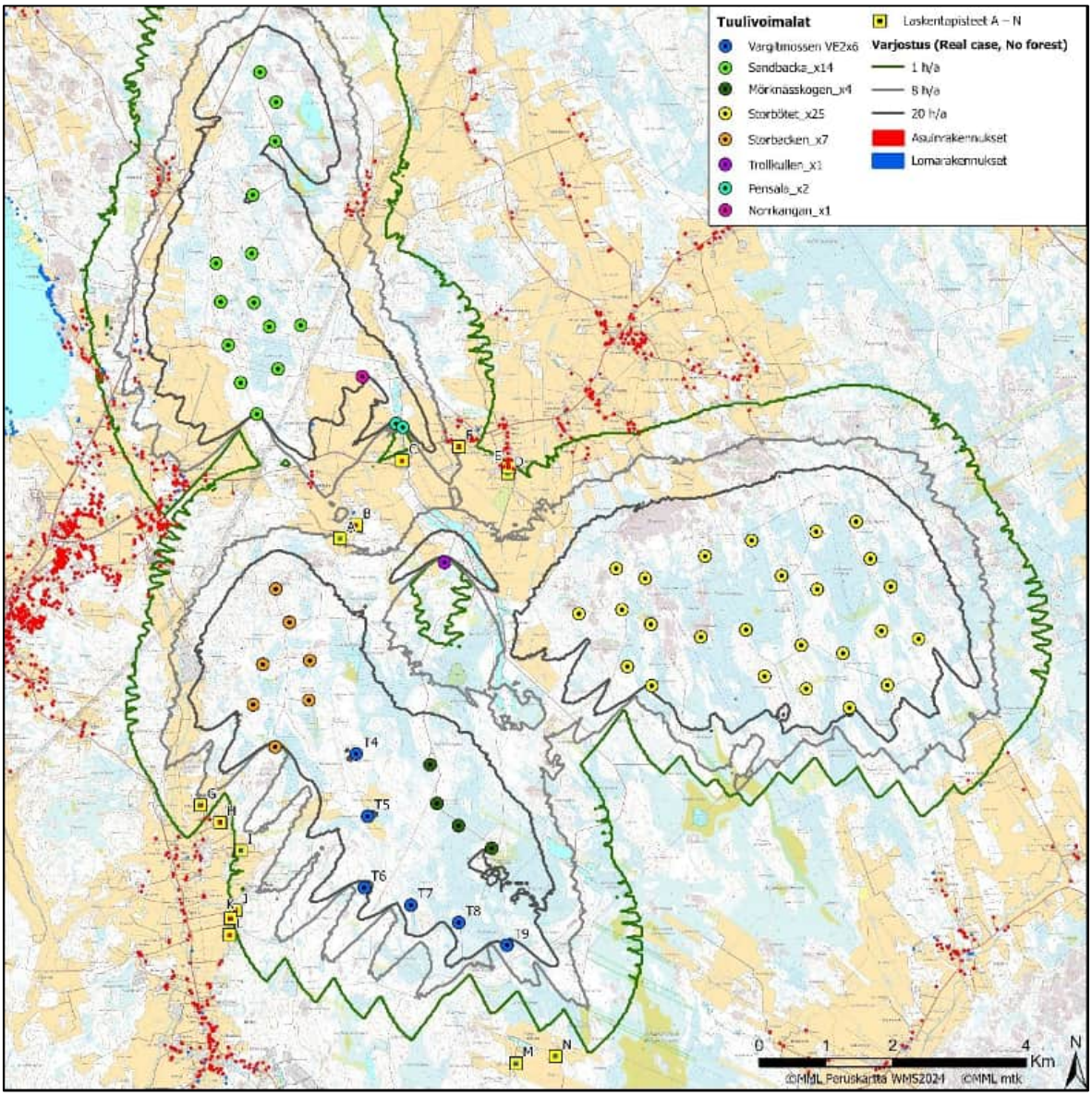


Bild 6. Skuggmodelleringens resultat när den skyddande effekten från träd inte beaktas i projektalternativ 2 (ALT 2).

Tabell 26. Skuggmodelleringens resultat för ALT2 när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:21
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:36
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:06
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:13
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	6:35
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	1:38
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

3.2.2 Skuggning "Real Case, Luke forest"

I modelleringen "Real Case, No Forest" beaktas inte den skymmande effekt som uppstår genom träden. Av denna orsak gjordes även skuggmodelleringar där träden beaktas (Real Case, Luke Forest).

Nuläge

Enligt skuggmodelleringen för nuläget där träden beaktas i närheten av Vargitmossens projekt är skuggeffekterna på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna över 8 h/a vid beräkningspunkterna Bostadsbyggnad A (9 h, 20 min./år) och Bostadsbyggnad F (8 h, 12 min./år), (Bild 7, Tabell 27). Se noggrannare beräkningsresultat i bilaga 10.

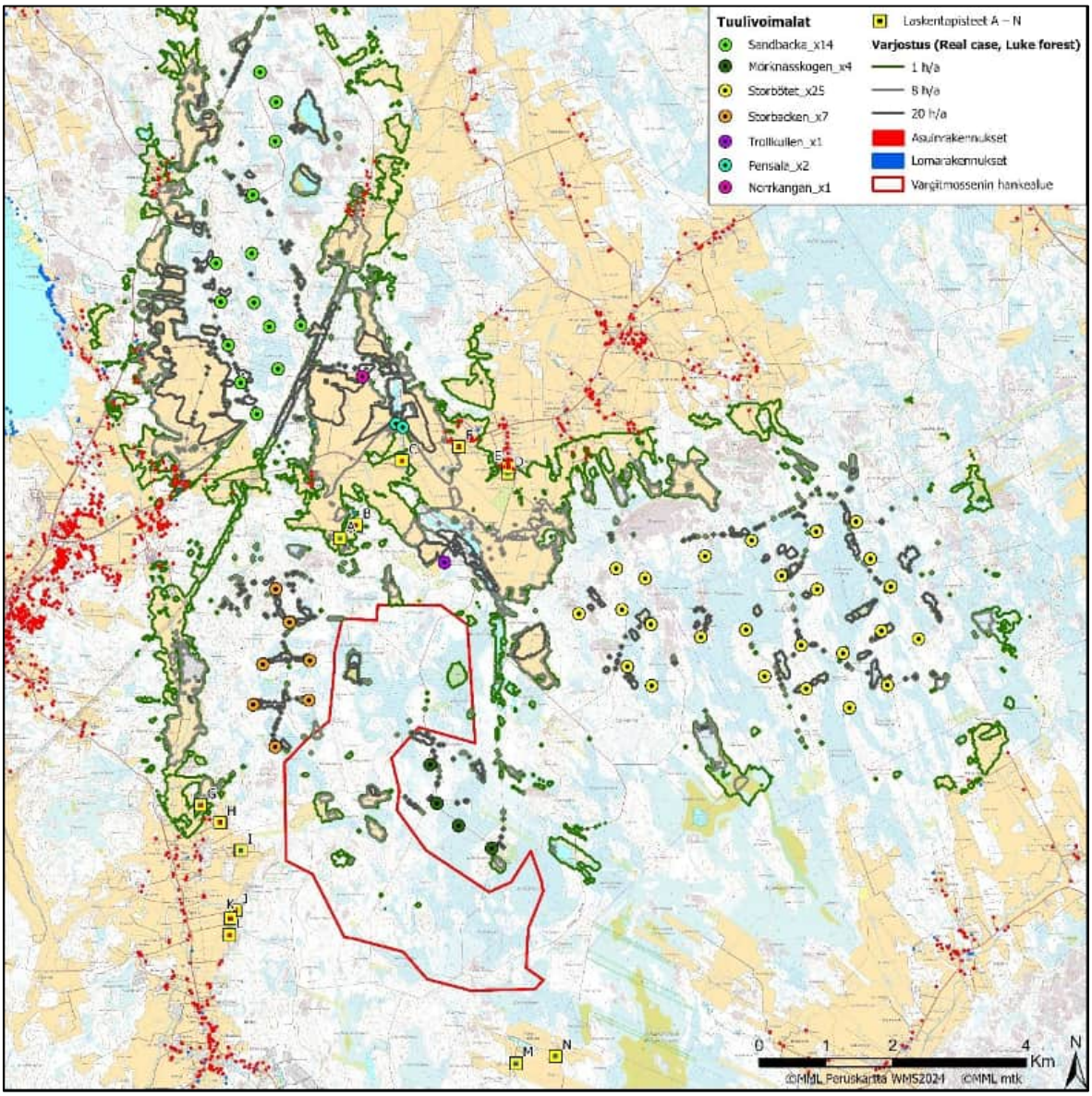


Bild 7. Skuggmodelleringens resultat när den skyddande effekten från träd har beaktats.

Tabell 27. Skuggmodelleringens resultat i nuläget när den skyddande effekten från träd har beaktats "real case, luke forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:20
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:36
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:06
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:12
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	0:00
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	0:00
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Enligt skuggmodelleringen för projektalternativ 1 (ALT1) där träden beaktas i närheten av Vargitmossens projekt är skuggeffekterna på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna över 8 h/a vid beräkningspunkterna Bostadsbyggnad A (11 h, 11 min./år) och Bostadsbyggnad F (8 h, 13 min./år), (Bild 8, Tabell 28). Se noggrannare beräkningsresultat i bilaga 11.

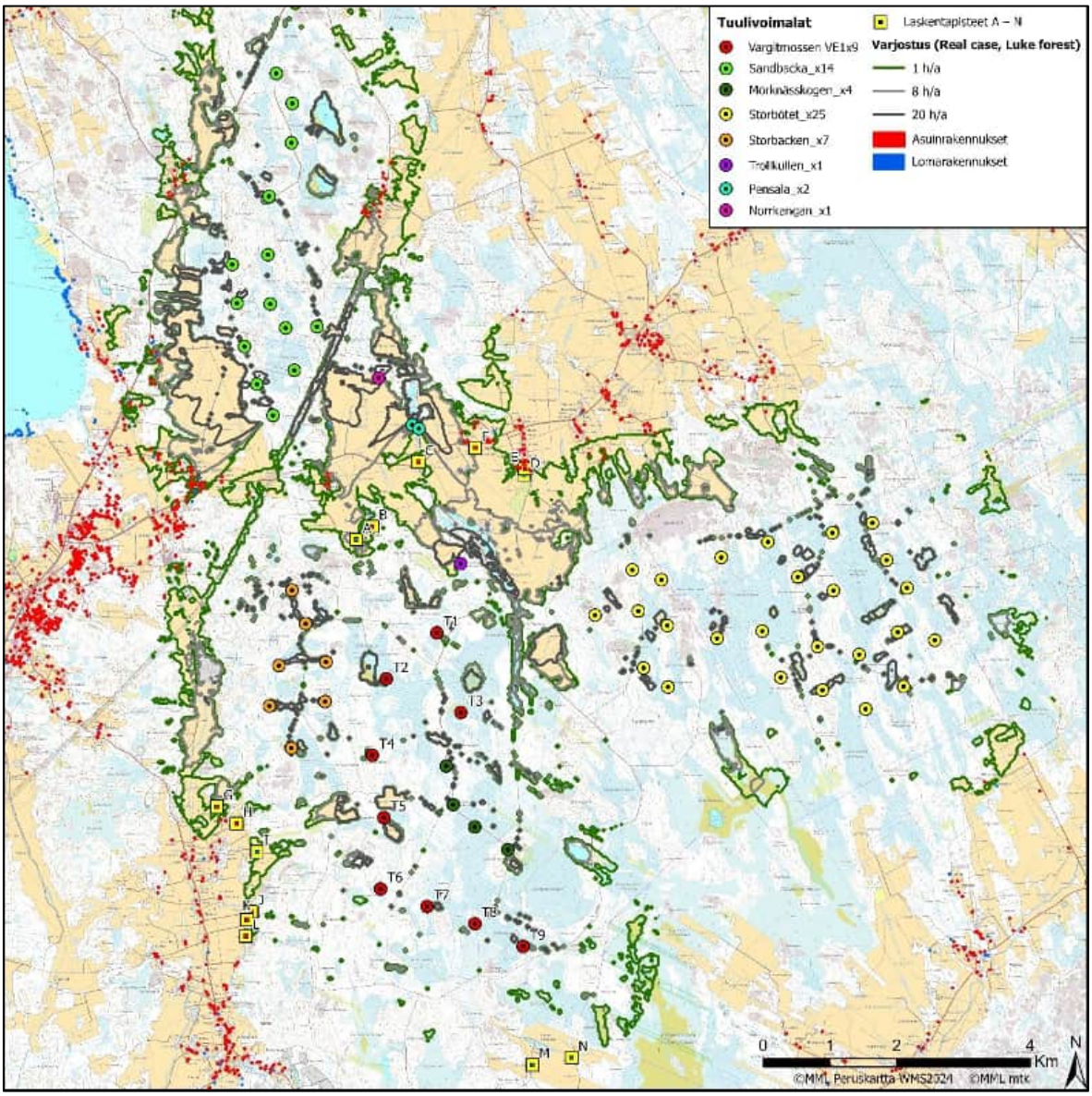


Bild 8. Skuggmodelleringens resultat när den skyddande effekten från träd har beaktats i projektalternativ 1 (ALT 1).

Tabell 28. Skuggmodelleringens resultat i ALT1 när den skyddande effekten från träd har beaktats "real case, luke forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	11:11
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	7:27
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:13
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	0:00
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Enligt skuggmodelleringen för projektalternativ 2 (ALT2) där träden beaktas i närheten av Vargitmossens projekt är skuggeffekterna på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna över 8 h/a vid beräkningspunkterna Bostadsbyggnad A (9 h, 21 min9./år) och Bostadsbyggnad F (8 h, 13 min./år), (Bild 9, Tabell 2). Se noggrannare beräkningsresultat i bilaga 12.

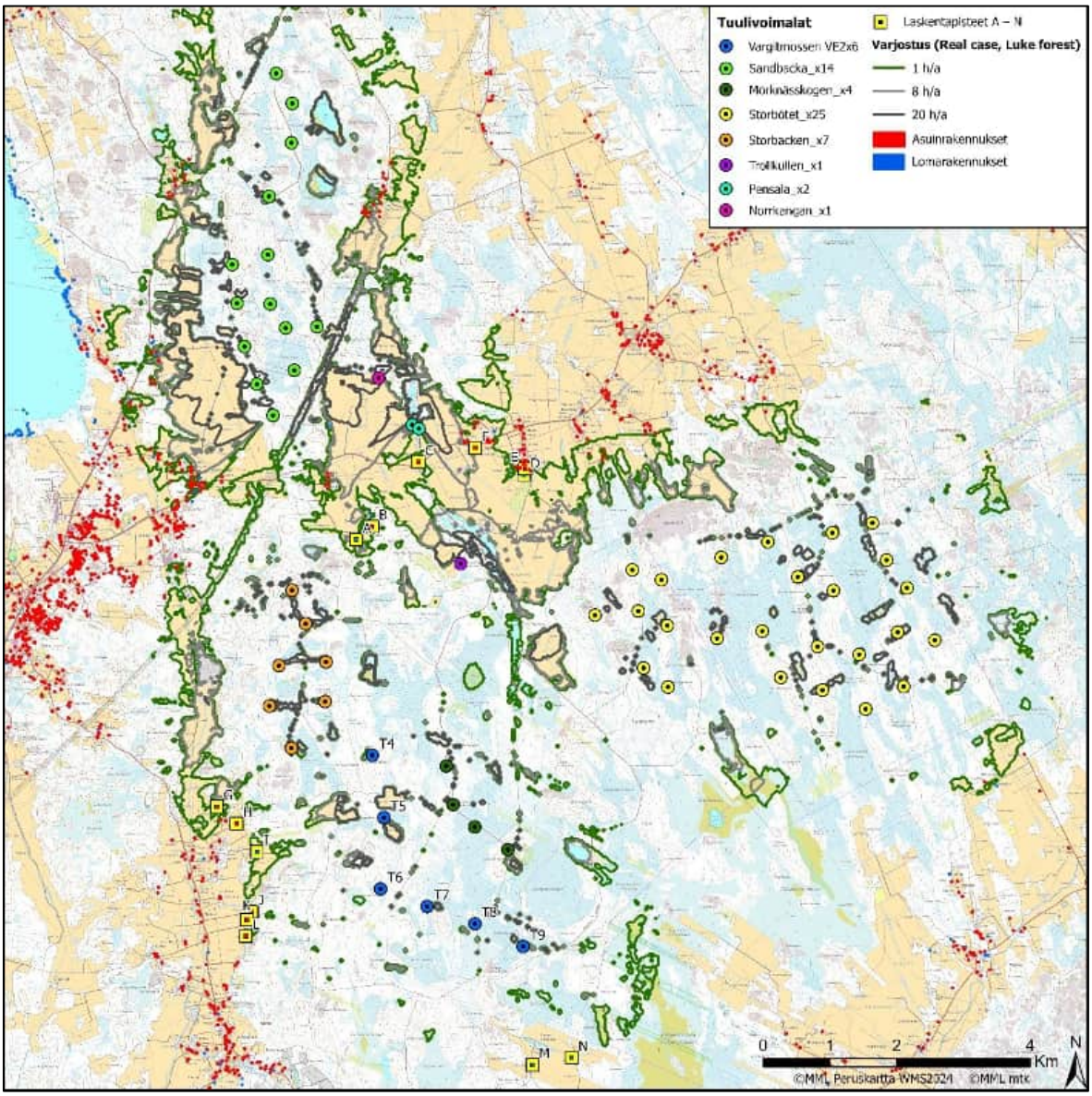


Bild 9. Skuggmodelleringens resultat när den skyddande effekten från träd har beaktats i projektalternativ 2 (ALT 2).

Tabell 29. Skuggmodelleringens resultat i ALT2 när den skyddande effekten från träd har beaktats ”real case, luke forest”.

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:21
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:36
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:06
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	1:59
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:13
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	0:00
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

4 RESULTAT AV MODELLERINGEN AV SAMMANTAGNA BULLER- OCH SKUGGEFFEKTER

4.1 Buller

4.1.1 Beräkningsresultat för sammantaget buller ISO 9613-2

Enligt modelleringen av sammantaget buller för projektalternativ 1 (ALT1) överskrids bullernivån på 40 dB(A) vid beräkningspunkt Bostadsbyggnad C (41,1 dB(A)), (Bild 10, Tabell 30). I modelleringen beaktades utöver kraftverken i Vargitmossens vindkraftverk även vindkraftverk som beviljats bygglov och som är i drift i närheten samt kraftverken i Ölands vindkraftsprojekt. Se noggrannare beräkningsresultat i bilaga 13.

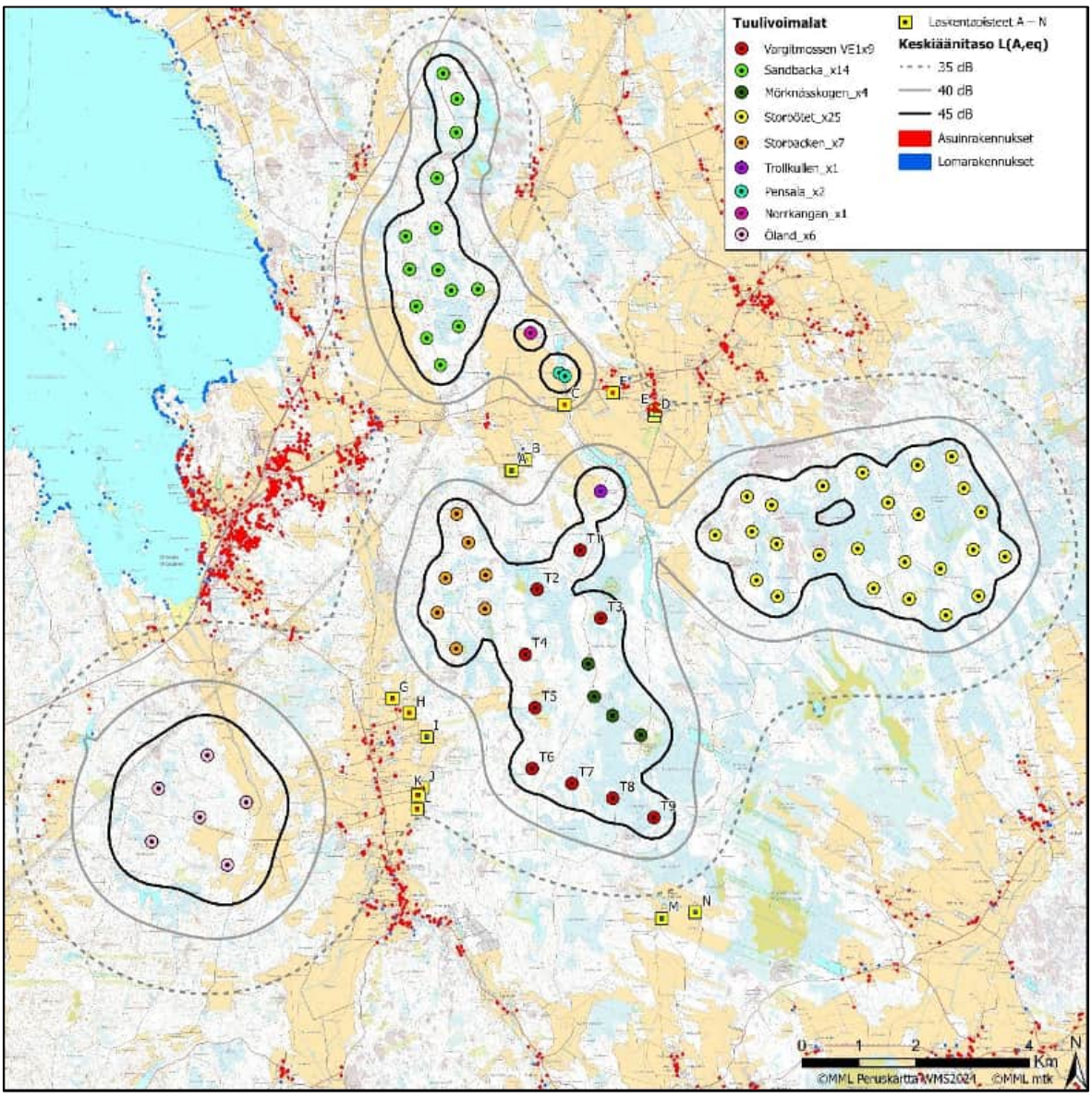


Bild 10. Resultat av modelleringen av sammantaget buller i projektalternativ 1 (ALT1).

Tabell 30. Kalkylerade nivåer av sammantaget buller i omgivningen av Vargitmossens vindkraftspark i projekt-alternativ 1 (ALT1).

	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Bullernivå dB(A)
Bostadsbyggnad A (England)	273465	7028646	17,5	4,0	38,1
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	4,0	37,9
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	4,0	41,1
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	4,0	35,9
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	4,0	35,7
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	4,0	37,2
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	4,0	36,7
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	4,0	36,8
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	4,0	36,7
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	4,0	35,6
Bostadsbyggnad K (Nyback)	271822	7022950	20	4,0	35,4
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	4,0	35,2
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	4,0	32,7
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	4,0	32,3

Enligt modelleringen av sammantaget buller för projektalternativ 2 (ALT2) överskrids bullernivån på 40 dB(A) vid beräkningspunkt Bostadsbyggnad C (41,0 dB(A)), (Bild 11, Tabell 31). I modelleringen beaktades utöver kraftverken i Vargitmossens vindkraftverk även vindkraftverk som beviljats bygglov och som är i drift i närheten samt kraftverken i Ölands vindkraftsprojekt. Se noggrannare beräknings-resultat i bilaga 14.

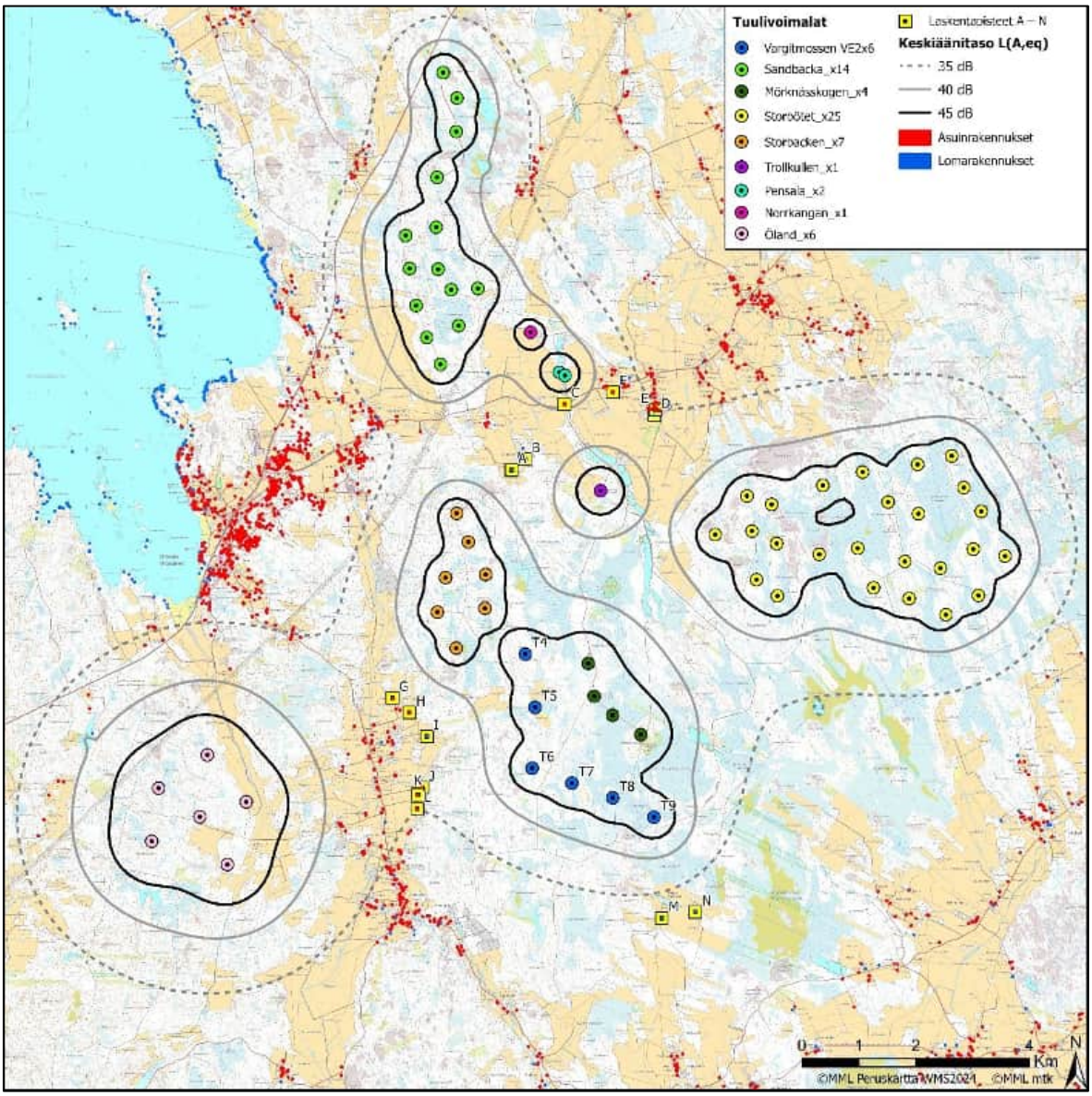


Bild 11. Resultat av modelleringen av sammantaget buller i projektalternativ 2 (ALT2).

Tabell 31. Kalkylerade nivåer av sammantaget buller i omgivningen av Vargitmossens vindkraftspark i projekt-alternativ 2 (ALT2).

	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-ningshöjd (m)	Bullernivå dB(A)
Bostadsbyggnad A (England)	273465	7028646	17,5	4,0	37,4
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	4,0	37,2
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	4,0	41,0
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	4,0	35,6
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	4,0	35,3
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	4,0	37,0
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	4,0	36,5
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	4,0	36,6
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	4,0	36,5
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	4,0	35,4
Bostadsbyggnad K (Nyback)	271822	7022950	20	4,0	35,3
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	4,0	35,1
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	4,0	32,6
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	4,0	32,2

4.1.2 Lågfrekventa bullernivåer (sammantagna konsekvenser)

I Vargitmossens projektalternativ 1 (ALT1) eller 2 (ALT2) överskrids det sammantagna lågfrekventa bullret inte Social- och hälsovårdsministeriets riktvärde för boendehälsa inomhus vid beräknings-punkterna.

I tabell 32 och 33 presenteras beräkningsresultaten av lågfrekvent buller i projektalternativen 1 (ALT1) och 2 (ALT2). I tabellerna framkommer i vilken mån åtgärdsgränsen har underskridits (negativt värde) eller överskridits (positivt värde). I byggnadernas inomhusutrymmen ligger bullret som högst 3,3 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad C). Mer detaljerade beräknings-resultat för sammantaget lågfrekvent buller presenteras i bilagorna 15 och 16.

Tabell 32. Beräkningsresultat för sammantaget lågfrekvent buller i projektalternativ 1 (ALT1).

Byggnad	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
Bostadsbyggnad A (England)	8,5	100	-4,9	50
Bostadsbyggnad B (Renlund)	8,5	100	-4,8	50
Bostadsbyggnad C (Jeppovägen 586)	9,7	100	-3,3	50
Fritidsbyggnad D (Kvarnbacka)	7,6	100	-5,6	50
Bostadsbyggnad E (Gullback)	7,5	100	-5,8	50
Bostadsbyggnad F (Jeppovägen 675)	7,8	100	-5,3	50
Fritidsbyggnad G (Kullastået 64b)	7,5	100	-6,3	50
Bostadsbyggnad H (Kullastået 85)	7,7	100	-6,0	50
Fritidsbyggnad I (Kyhrastået, Bobacken)	7,9	100	-5,9	50
Bostadsbyggnad J (Hagabacktået 71)	7,2	100	-6,6	50
Bostadsbyggnad K (Nyback)	7,1	100	-6,7	50
Bostadsbyggnad L (Kimo Skogsbilväg 55)	6,9	100	-6,9	50
Fritidsbyggnad M (Fårmossen)	5,2	100	-8,1	50
Fritidsbyggnad N (Brändå)	5,0	100	-8,3	50

Tabell 33. Beräkningsresultat för sammantaget lågfrekvent buller i projektalternativ 2 (ALT2).

Byggnad	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
Bostadsbyggnad A (England)	7,8	100	-5,6	50
Bostadsbyggnad B (Renlund)	7,9	100	-5,4	50
Bostadsbyggnad C (Jeppovägen 586)	9,4	100	-3,5	50
Fritidsbyggnad D (Kvarnbacka)	7,3	100	-6,0	50
Bostadsbyggnad E (Gullback)	7,1	100	-6,1	50
Bostadsbyggnad F (Jeppovägen 675)	7,5	100	-5,5	50
Fritidsbyggnad G (Kullastået 64b)	7,3	100	-6,6	50
Bostadsbyggnad H (Kullastået 85)	7,5	100	-6,3	50
Fritidsbyggnad I (Kyhrastået, Bobacken)	7,6	100	-6,1	50
Bostadsbyggnad J (Hagabacktået 71)	7,0	100	-6,8	50
Bostadsbyggnad K (Nyback)	6,9	100	-6,9	50
Bostadsbyggnad L (Kimo Skogsbilväg 55)	6,8	100	-7,1	50
Fritidsbyggnad M (Fårmossen)	5,1	100	-8,3	50
Fritidsbyggnad N (Brändå)	4,8	100	-8,5	50

4.2 Skuggeffekter

4.2.1 Sammantagna skuggeffekter, ”Real Case, No Forest”

Enligt modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) överskrider skuggeffekterna 8 h/a vid beräkningspunkterna A (11 h, 13 min./år) och Fritidsbyggnad F (8 h, 14 min./år), när den skyddande effekten från träd inte har beaktats. (Bild 12, Tabell 34) Se noggrannare beräkningsresultat i bilaga 17.

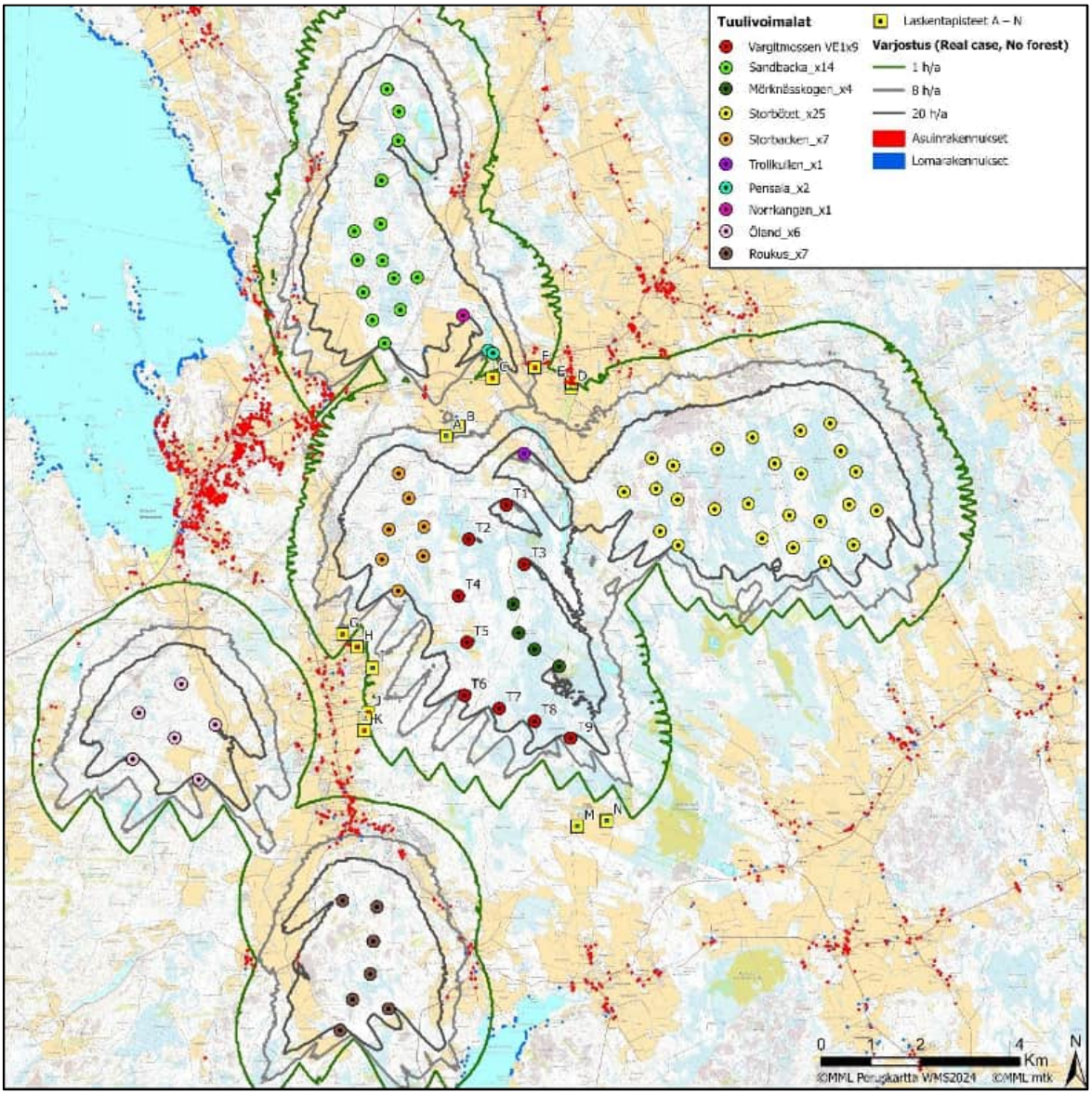


Bild 12. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) när den skyddande effekten från träd inte har beaktats.

Tabell 34. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräkningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	11:13
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	7:28
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	2:00
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:14
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	6:36
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	1:39
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Enligt modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) överskrider skuggeffekterna 8 h/a vid beräkningspunkterna A (9 h, 22 min./år) och Fritidsbyggnad F (8 h, 14 min./år), när den skyddande effekten från träd inte har beaktats (Bild 13, Tabell 35). Se noggrannare beräkningsresultat i bilaga 18.

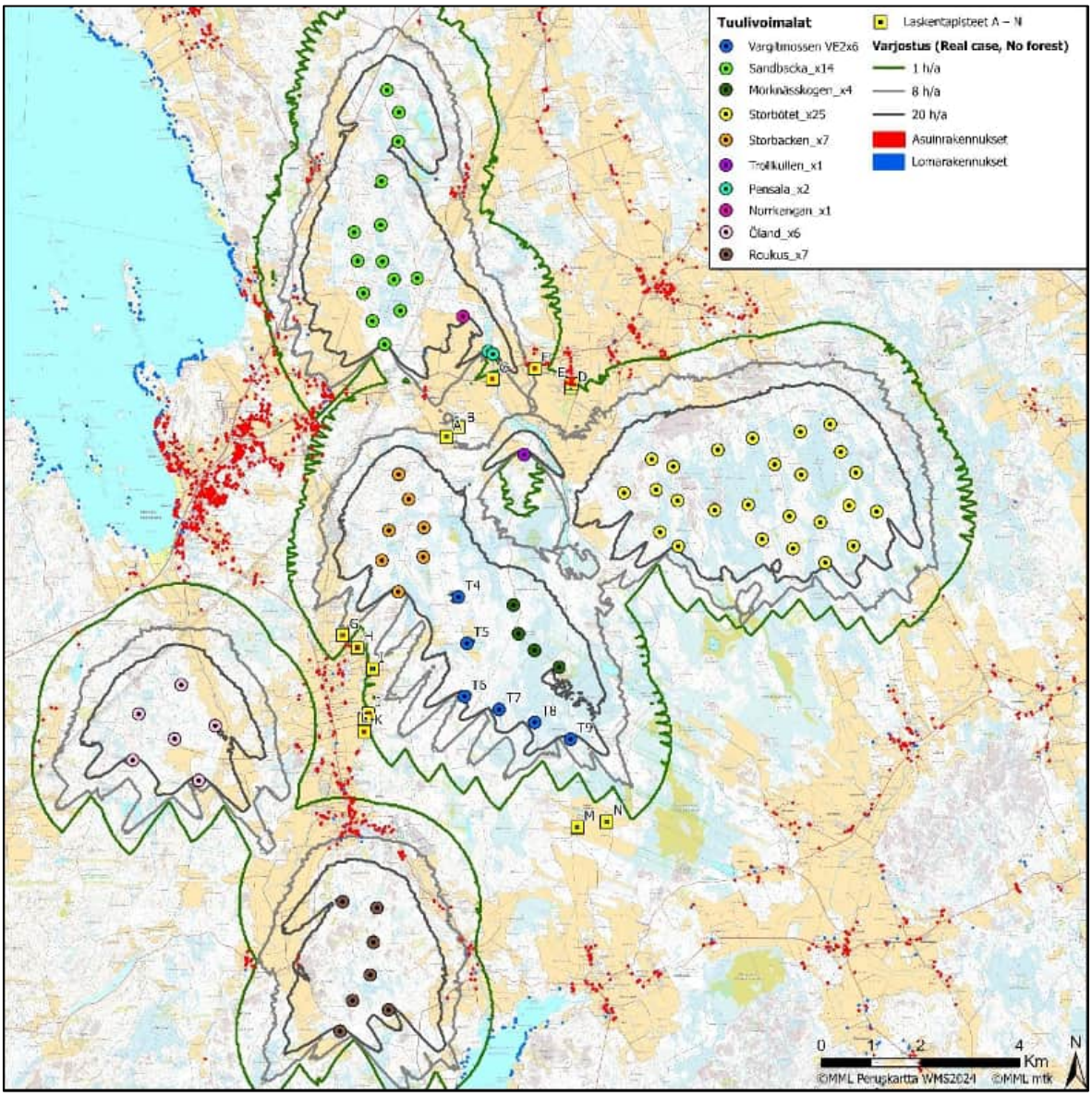


Bild 13. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) när den skyddande effekten från träd inte har beaktats.

Tabell 35. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräkningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:22
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:37
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	2:00
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:14
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	6:36
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	1:38
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

4.2.2 Sammantagna skuggeffekter, "Real Case, Luke Forest"

Enligt modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) överskrider skuggeffekterna 8 h/a vid beräkningspunkterna A (11 h, 13 min./år) och Bostadsbyggnad F (8 h, 14 min./år), när den skyddande effekten från träd har beaktats (Bild 14, Tabell 36). Se noggrannare beräkningsresultat i bilaga 19.

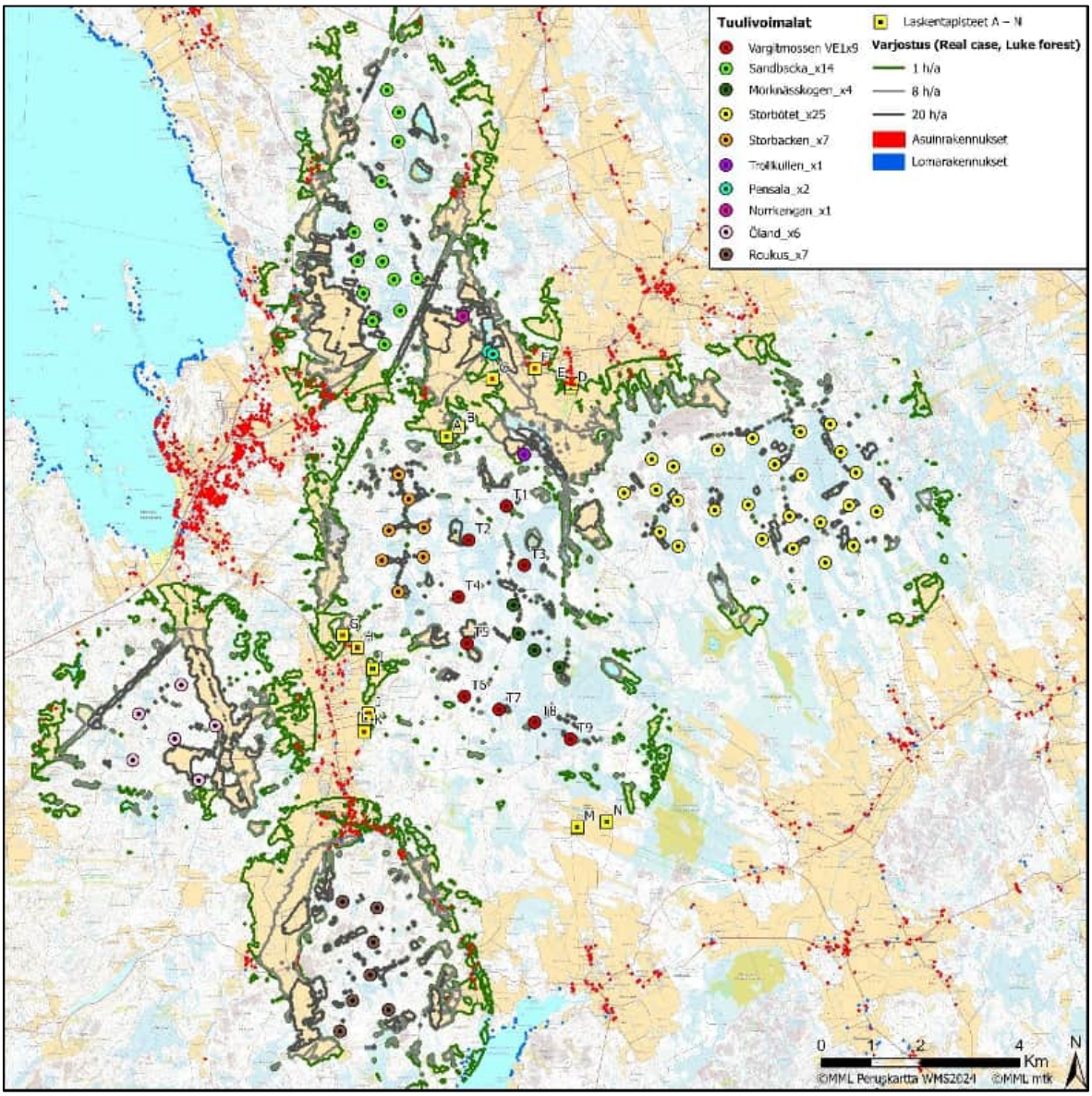


Bild 14. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) när den skyddande effekten från träd har beaktats.

Tabell 36. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 1 (ALT1) när den skyddande effekten från träd har beaktats "Real Case, Luke Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräkningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	11:13
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	7:28
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	2:00
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:14
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	0:00
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

Enligt modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) överskrider skuggeffekterna 8 h/a vid beräkningspunkterna A (9 h, 22 min./år) och Bostadsbyggnad F (8 h, 14 min./år), när den skyddande effekten från träd har beaktats (Bild 15, Tabell 37). Se noggrannare beräkningsresultat i bilaga 20.

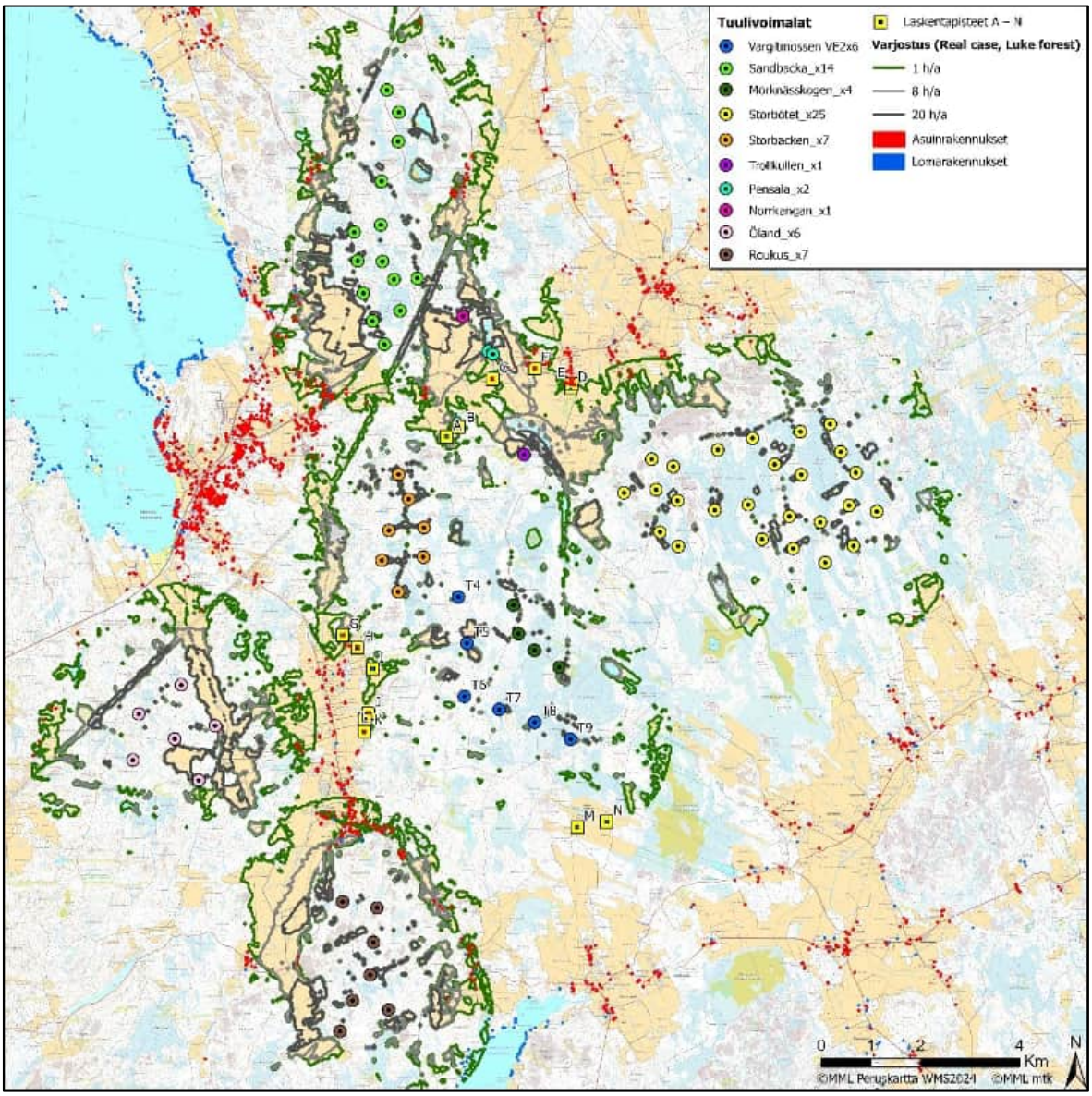


Bild 15. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) när den skyddande effekten från träd har beaktats.

Tabell 37. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 2 (ALT2) när den skyddande effekten från träd har beaktats "Real Case, Luke Forest".

Byggnad	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräkningshöjd (m)	Skuggning h/a
Bostadsbyggnad A (England)	273465	7028646	17,5	5,0 x 5,0	9:22
Bostadsbyggnad B (Renlund)	273705	7028841	18,8	5,0 x 5,0	5:37
Bostadsbyggnad C (Jeppovägen 586)	274394	7029806	16,6	5,0 x 5,0	2:07
Fritidsbyggnad D (Kvarnbacka)	275975	7029617	22,5	5,0 x 5,0	2:13
Bostadsbyggnad E (Gullback)	275990	7029707	22,5	5,0 x 5,0	2:00
Bostadsbyggnad F (Jeppovägen 675)	275245	7030019	18,6	5,0 x 5,0	8:14
Fritidsbyggnad G (Kullastået 64b)	271374	7024647	17,5	5,0 x 5,0	0:00
Bostadsbyggnad H (Kullastået 85)	271670	7024391	18	5,0 x 5,0	0:00
Fritidsbyggnad I (Kyhrastået, Bobacken)	271978	7023969	22,5	5,0 x 5,0	3:08
Bostadsbyggnad J (Hagabacktået 71)	271898	7023073	24	5,0 x 5,0	0:00
Bostadsbyggnad K (Nyback)	271822	7022950	20	5,0 x 5,0	0:00
Bostadsbyggnad L (Kimo Skogsbilväg 55)	271811	7022704	20,6	5,0 x 5,0	0:00
Fritidsbyggnad M (Fårmossen)	276103	7020778	45,8	5,0 x 5,0	0:00
Fritidsbyggnad N (Brändå)	276693	7020888	47,5	5,0 x 5,0	0:00

FCG Finnish Consulting Group Oy

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Utarbetad av

Johanna Harju, ing. YH
Granskad av

BILAGOR

Bilaga 1. Vargitmossens vindkraftsprojekt - Resultat från spridningsmodellering för buller ISO 9613-2 i nuläget, MM 2/2014

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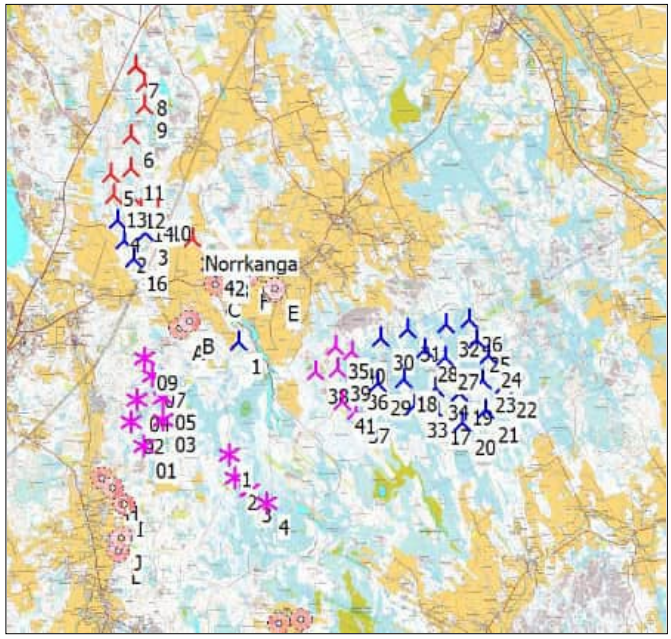
Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen nykytilanne_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Noise sensitive area

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
02	272 153	7 026 165	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
03	272 991	7 026 229	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
04	272 290	7 026 759	26,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
05	273 002	7 026 818	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
07	272 700	7 027 390	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
09	272 494	7 027 846	25,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5700 163.0 !O...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	108,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5700 163.0 !O...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
10	272 876	7 031 835	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
11	272 142	7 032 911	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
12	272 176	7 032 174	25,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
13	271 677	7 032 186	20,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
14	272 407	7 031 814	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
16	272 217	7 030 505	17,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
17	280 336	7 026 417	51,4	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
18	279 422	7 027 294	47,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
19	280 918	7 026 942	43,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
2	271 975	7 030 974	19,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5700 163.0 !O...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
20	280 996	7 026 139	45,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
21	281 600	7 026 467	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
22	282 102	7 027 147	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
23	281 524	7 027 270	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
24	281 681	7 027 926	43,3	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
25	281 366	7 028 337	44,7	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
26	281 165	7 028 894	38,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
27	280 535	7 027 893	42,5	VESTAS V172-7.2 7200 172.0 !O! ...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
28	279 986	7 028 096	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
29	278 725	7 027 182	49,9	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5700 163.0 !O...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
3	272 536	7 031 182	18,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
30	278 813	7 028 386	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
31	279 541	7 028 621	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
32	280 544	7 028 746	40,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
33	279 701	7 026 603	52,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
34	280 279	7 027 063	50,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
35	277 608	7 028 174	38,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5700 163.0 !O...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
4	271 789	7 031 536	17,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
40	278 041	7 028 049	43,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
42	274 303	7 030 363	16,9	LAGERWEY L100-2.5MW 2520 10...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	USER	Level 0 - - Standard mode - 01-2014	8,0	105,0
43	274 404	7 030 306	17,5	NORDTANK 150 24.6 !O! hub: 38...	No	NORDTANK	-150	150	24,6	38,0	USER	nordtank	8,0	97,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
6	272 158	7 033 787	24,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
8	272 507	7 035 178	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
9	272 494	7 034 589	30,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V162-5.6 560...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	USER	V162 - 5.6 MW Mode 0 STE - 4-2019	8,0	104,0

Calculation Results

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Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen nykytilanne_2024

Sound level

Noise sensitive area No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]	Distance to noise demand [m]	Demands fulfilled ? Noise
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	4,0	40,0	37,2	575	Yes
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	4,0	40,0	37,0	653	Yes
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	4,0	40,0	40,9	-81	No
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	4,0	40,0	35,4	868	Yes
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	4,0	40,0	35,2	952	Yes
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	4,0	40,0	36,8	375	Yes
G	Lomarakennus G (Kullasteet 64b)	271 374	7 024 647	17,5	4,0	40,0	33,6	815	Yes
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	4,0	40,0	33,6	812	Yes
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	4,0	40,0	32,7	1 061	Yes
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	4,0	40,0	29,8	1 942	Yes
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	4,0	40,0	29,3	2 080	Yes
L	Asuinrakennus L (Kimo Skogsbilvdg 55)	271 811	7 022 704	20,6	4,0	40,0	28,7	2 320	Yes
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	4,0	40,0	27,7	2 371	Yes
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	4,0	40,0	27,7	2 393	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
01	3262	3524	4679	5371	5449	5265	1418	1401	1642	2528	2665	2906	5973	6265
02	2805	3092	4274	5148	5220	4938	1705	1837	2202	3101	3230	3476	6676	6957
03	2462	2706	3841	4513	4590	4407	2260	2262	2475	3338	3479	3715	6273	6495
04	2221	2515	3701	4661	4728	4397	2301	2447	2806	3706	3836	4081	7089	7335
05	1885	2140	3295	4081	4154	3906	2711	2767	3026	3903	4042	4280	6786	6981
07	1470	1764	2950	3959	4022	3657	3044	3169	3494	4389	4524	4767	7432	7626
09	1257	1566	2729	3904	3959	3503	3387	3550	3909	4808	4939	5184	7932	8122
1	1603	1433	1647	1634	1717	1746	5152	5138	5281	6076	6220	6438	7580	7578
1	3601	3708	4534	4496	4587	4755	3446	3218	3078	3618	3753	3919	4699	4799
10	3241	3105	2532	3809	3770	2984	7338	7536	7912	8811	8942	9187	11512	11587
11	4463	4357	3833	5051	5005	4240	8294	8528	8938	9835	9960	10206	12756	12848
12	3754	3665	3243	4577	4540	3748	7564	7795	8202	9100	9226	9471	12047	12149
13	3963	3910	3610	5005	4972	4173	7540	7790	8217	9110	9232	9477	12229	12354
14	3338	3242	2823	4188	4155	3357	7236	7455	7852	8751	8878	9124	11632	11730
16	2238	2231	2285	3860	3855	3065	5915	6135	6537	7435	7561	7807	10469	10602
17	7220	7056	6837	5406	5448	6233	9130	8895	8704	9072	9188	9294	7047	6618
18	6106	5919	5617	4154	4193	4985	8467	8273	8148	8623	8749	8883	7309	6959
19	7642	7455	7121	5617	5648	6450	9810	9588	9416	9810	9928	10040	7818	7379
2	2762	2745	2685	4222	4208	3405	6351	6586	7001	7897	8021	8266	10994	11129
2	4237	4347	5165	5058	5150	5359	3550	3266	3028	3420	3545	3679	4060	4169
20	7933	7771	7548	6105	6144	6934	9731	9483	9270	9596	9707	9801	7254	6785
21	8418	8240	7938	6444	6475	7276	10381	10139	9936	10274	10385	10482	7907	7426
22	8762	8561	8149	6603	6623	7430	11009	10784	10605	10982	11098	11203	8745	8268
23	8172	7971	7563	6022	6044	6851	10477	10261	10095	10496	10614	10727	8453	8000
24	8243	8024	7521	5948	5960	6764	10810	10611	10473	10915	11037	11161	9062	8622
25	7903	7673	7121	5538	5545	6345	10645	10463	10349	10828	10953	11086	9206	8789
26	7700	7456	6828	5237	5236	6023	10666	10503	10418	10938	11067	11211	9560	9165
27	7107	6892	6428	4872	4891	5698	9713	9527	9409	9886	10012	10145	8378	7985
28	6541	6321	5844	4287	4306	5113	9271	9099	9004	9516	9645	9788	8280	7920
29	5457	5284	5061	3671	3720	4487	7771	7583	7469	7964	8092	8233	6916	6610
3	4676	4770	5536	5316	5407	5674	3933	3626	3339	3628	3742	3851	3652	3723
3	2699	2615	2311	3777	3754	2947	6633	6842	7230	8129	8258	8503	10992	11095
30	5352	5125	4639	3092	3115	3922	8321	8180	8134	8716	8851	9013	8072	7788
31	6073	5837	5279	3700	3711	4515	9077	8931	8874	9440	9573	9729	8559	8236
32	7076	6836	6237	4649	4652	5447	10039	9880	9803	10336	10466	10614	9117	8746
33	6559	6396	6195	4790	4836	5612	8549	8326	8155	8560	8680	8796	6843	6455
34	6992	6806	6489	5002	5036	5835	9221	9009	8854	9278	9399	9519	7542	7137
35	4168	3957	3603	2178	2228	2996	7158	7037	7023	7653	7791	7966	7543	7339
36	4832	4659	4463	3123	3179	3924	7262	7092	7006	7545	7677	7829	6867	6610
37	5163	5037	5030	3839	3906	4597	6993	6781	6633	7087	7212	7344	6015	5735
38	3777	3617	3531	2387	2461	3112	6356	6217	6182	6794	6931	7102	6778	6610
39	4325	4147	3947	2638	2699	3427	6934	6785	6731	7315	7450	7614	6979	6763
4	5177	5253	5957	5610	5700	6030	4441	4118	3792	3983	4087	4168	3245	3251
4	3338	3305	3125	4602	4579	3772	6897	7142	7565	8459	8581	8826	11584	11716

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen nykytilanne_2024

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
40	4613	4405	4046	2592	2636	3418	7480	7342	7304	7902	8038	8204	7521	7283
41	4725	4594	4584	3419	3488	4165	6724	6530	6412	6911	7040	7183	6161	5919
42	1910	1634	564	1830	1809	1002	6418	6523	6800	7673	7813	8049	9747	9766
43	1906	1622	499	1715	1695	889	6414	6512	6781	7650	7791	8027	9673	9687
5	4515	4446	4061	5380	5340	4554	8115	8368	8797	9690	9811	10056	12794	12911
6	5301	5179	4563	5650	5594	4869	9167	9403	9814	10711	10836	11081	13586	13665
7	7079	6933	6194	7058	6990	6347	11009	11245	11654	12552	12678	12923	15328	15381
8	6598	6446	5690	6550	6482	5838	10585	10813	11215	12113	12240	12486	14834	14882
9	6018	5871	5143	6066	6001	5331	9998	10225	10626	11525	11652	11897	14267	14322
Norrkanga	2417	2202	1374	2606	2571	1777	6832	6977	7297	8186	8324	8565	10515	10555

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Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen nykytilanne_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	14.8.2024 12.33

DMS no.: 0079-5298_01

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	169,0	8,0	104,0	No	85,1	92,6	97,2	99,1	98,1	94,3	87,7	78,3

WTG: Siemens Gamesa SG 6.2-170 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	14.8.2024 13.02

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	115,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

WTG: NORDEX N163/5.7 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	14.8.2024 13.19

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	178,5	8,0	108,7	No	90,4	96,6	100,3	102,9	103,6	101,1	93,5	85,5

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Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen nykytilanne_2024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	16.9.2024 15.25

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	166,0	8,0	104,8	No	85,1	92,7	97,6	99,8	99,1	95,6	89,4	80,4

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	23.8.2024 9.52

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	164,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: VESTAS V162-7.2 7200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	15.8.2024 12.12

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	134,0	8,0	105,5	No	86,0	93,6	98,4	100,5	99,7	96,2	89,9	80,8

WTG: LAGERWEY L100-2.5MW 2520 100.0 !O!
Noise: Level 0 - - Standard mode - 01-2014

Source	Source/Date	Creator	Edited
L100-2.5MW rev 27-1-2014	27.1.2014	USER	15.8.2024 12.41

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	98,0	8,0	105,0	No	86,6	93,6	97,0	99,6	99,4	96,5	91,7	82,2

WTG: NORDTANK 150 24.6 !O!
Noise: nordtank

Source	Source/Date	Creator	Edited
Rambøll (Memo)	1.4.1989	USER	15.8.2024 12.44

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	38,0	8,0	97,8	No	79,4	86,4	89,8	92,4	92,2	89,3	84,5	75,0

WTG: VESTAS V150-4.2 4200 150.0 !O!
Noise: Level 00 - Measured - Mode PO1 - 03-2018

Source	Source/Date	Creator	Edited
Manufacturer	15.3.2018	USER	15.8.2024 12.30

Document n. 0067-4767 V06.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	145,0	8,0	104,9	No	84,2	92,3	97,4	99,8	99,4	96,1	90,1	81,0

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Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen nykytilanne_2024

WTG: NORDEX N163/5.X 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	16.9.2024 9.24

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	158,0	8,0	109,2	No	90,9	97,1	100,8	103,4	104,1	101,6	94,0	86,0

Noise sensitive area: A Asuinrakennus A (England)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: B Asuinrakennus B (Renlund)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: C Asuinrakennus C (Jepuantie 586)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: D Lomarakennus D (Kvarnbacka)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: E Asuinrakennus E (Gullback)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: F Asuinrakennus F (Jepuantie 675)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: G Lomarakennus G (Kullasteet 64b)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen nykytilanne_2024

Noise sensitive area: H Asuinrakennus H (Kullastået 85)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: I Lomarakennus I (Kyhrastået, Bobacken)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: J Asuinrakennus J (Hagabacktået 71)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: K Asuinrakennus K (Nyback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: L Asuinrakennus L (Kimo Skogsbilvdg 55)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: M Lomarakennus M (Fårmossen)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: N Lomarakennus N (Brändå)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

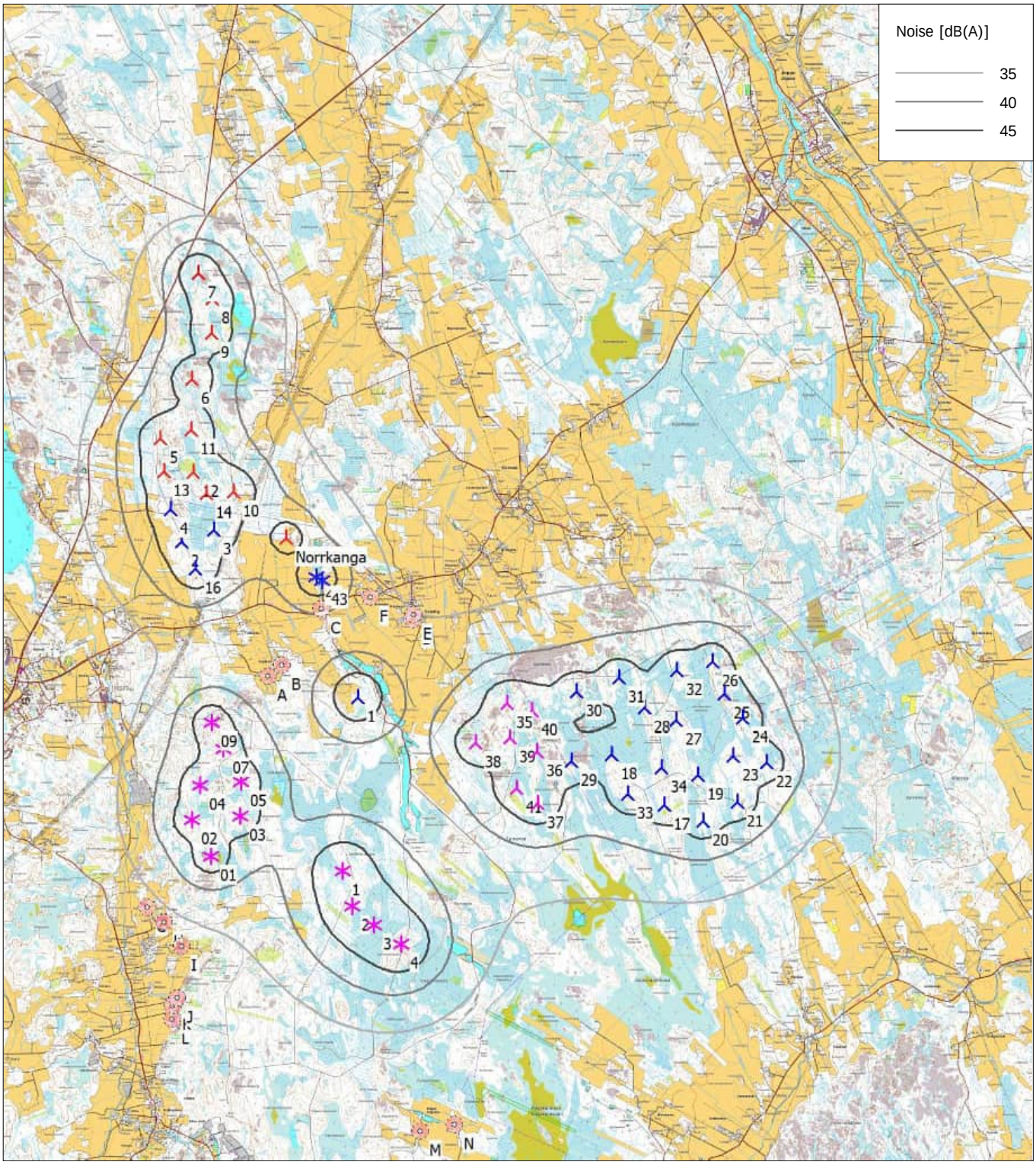
Noise demand: 40,0 dB(A)
No distance demand

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Calculated:
16.9.2024 16.05/3.6.377

DECIBEL - Map 8,0 m/s

Calculation: Vargitmossen nykytilanne_2024



Map: Peruskarttarasteri , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 855 North: 7 029 452

New WTG Existing WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s

Height above sea level from active line object

Bilaga 2. Vargitmossens vindkraftsprojekt - Resultat från spridningsmodellering för buller ISO 9613-2, MM 2/2014 (ALT1)

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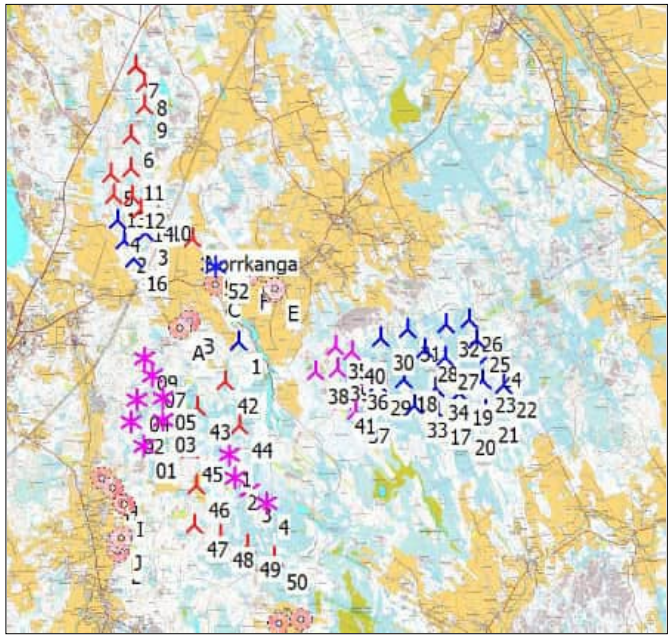
Calculated:
16.9.2024 15.37/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Noise sensitive area

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
02	272 153	7 026 165	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
03	272 991	7 026 229	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
04	272 290	7 026 759	26,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
05	273 002	7 026 818	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
07	272 700	7 027 390	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
09	272 494	7 027 846	25,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5700 163.0 !O! ...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	108,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
10	272 876	7 031 835	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
11	272 142	7 032 911	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
12	272 176	7 032 174	25,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
13	271 677	7 032 186	20,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
14	272 407	7 031 814	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
16	272 217	7 030 505	17,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
17	280 336	7 026 417	51,4	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
18	279 422	7 027 294	47,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
19	280 918	7 026 942	43,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
2	271 975	7 030 974	19,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
20	280 996	7 026 139	45,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
21	281 600	7 026 467	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
22	282 102	7 027 147	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
23	281 524	7 027 270	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
24	281 681	7 027 926	43,3	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
25	281 366	7 028 337	44,7	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
26	281 165	7 028 894	38,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
27	280 535	7 027 893	42,5	VESTAS V172-7.2 7200 172.0 !O! ...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
28	279 986	7 028 096	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
29	278 725	7 027 182	49,9	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
3	272 536	7 031 182	18,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
30	278 813	7 028 386	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
31	279 541	7 028 621	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
32	280 544	7 028 746	40,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
33	279 701	7 026 603	52,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
34	280 279	7 027 063	50,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
35	277 608	7 028 174	38,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
40	278 041	7 028 049	43,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
43	273 914	7 026 560	28,6	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
44	275 031	7 026 054	29,7	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
45	273 706	7 025 416	34,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
46	273 877	7 024 480	30,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
47	273 828	7 023 413	40,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
48	274 526	7 023 150	36,3	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
49	275 242	7 022 891	37,9	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
50	275 965	7 022 551	42,3	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
51	274 303	7 030 363	16,9	LAGERWEY L100-2.5MW 2520 10...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	USER	Level 0 - - Standard mode - 01-2014	8,0	105,0
52	274 404	7 030 306	17,5	NORDTANK 150 24.6 !O! hub: 38...	No	NORDTANK	-150	150	24,6	38,0	USER	nordtank	8,0	97,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
8	272 507	7 035 178	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
9	272 494	7 034 589	30,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V162-5.6 560...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	USER	V162 - 5.6 MW Mode 0 STE - 4-2019	8,0	104,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	4,0	40,0	38,0	497	Yes
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	4,0	40,0	37,8	545	Yes
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	4,0	40,0	41,0	-96	No
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	4,0	40,0	35,8	825	Yes
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	4,0	40,0	35,6	909	Yes
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	4,0	40,0	37,1	361	Yes
G	Lomarakennus G (Kullasteet 64b)	271 374	7 024 647	17,5	4,0	40,0	35,0	747	Yes
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	4,0	40,0	35,4	728	Yes
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	4,0	40,0	35,4	933	Yes
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	4,0	40,0	33,2	1 174	Yes
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	4,0	40,0	32,7	1 279	Yes
L	Asuinrakennus L (Kimo Skogsbilvdg 55)	271 811	7 022 704	20,6	4,0	40,0	32,2	1 366	Yes
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	4,0	40,0	32,3	1 065	Yes
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	4,0	40,0	31,9	1 116	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
01	3262	3524	4679	5371	5449	5265	1418	1401	1642	2528	2665	2906	5973	6265
02	2805	3092	4274	5148	5220	4938	1705	1837	2202	3101	3230	3476	6676	6957
03	2462	2706	3841	4513	4590	4407	2260	2262	2475	3338	3479	3715	6273	6495
04	2221	2515	3701	4661	4728	4397	2301	2447	2806	3706	3836	4081	7089	7335
05	1885	2140	3295	4081	4154	3906	2711	2767	3026	3903	4042	4280	6786	6981
07	1470	1764	2950	3959	4022	3657	3044	3169	3494	4389	4524	4767	7432	7626
09	1257	1566	2729	3904	3959	3503	3387	3550	3909	4808	4939	5184	7932	8122
1	1603	1433	1647	1634	1717	1746	5152	5138	5281	6076	6220	6438	7580	7578
1	3601	3708	4534	4496	4587	4755	3446	3218	3078	3618	3753	3919	4699	4799
10	3241	3105	2532	3809	3770	2984	7338	7536	7912	8811	8942	9187	11512	11587
11	4463	4357	3833	5051	5005	4240	8294	8528	8938	9835	9960	10206	12756	12848
12	3754	3665	3243	4577	4540	3748	7564	7795	8202	9100	9226	9471	12047	12149
13	3963	3910	3610	5005	4972	4173	7540	7790	8217	9110	9232	9477	12229	12354
14	3338	3242	2823	4188	4155	3357	7236	7455	7852	8751	8878	9124	11632	11730
16	2238	2231	2285	3860	3855	3065	5915	6135	6537	7435	7561	7807	10469	10602
17	7220	7056	6837	5406	5448	6233	9130	8895	8704	9072	9188	9294	7047	6618
18	6106	5919	5617	4154	4193	4985	8467	8273	8148	8623	8749	8883	7309	6959
19	7642	7455	7121	5617	5648	6450	9810	9588	9416	9810	9928	10040	7818	7379
2	2762	2745	2685	4222	4208	3405	6351	6586	7001	7897	8021	8266	10994	11129
2	4237	4347	5165	5058	5150	5359	3550	3266	3028	3420	3545	3679	4060	4169
20	7933	7771	7548	6105	6144	6934	9731	9483	9270	9596	9707	9801	7254	6785
21	8418	8240	7938	6444	6475	7276	10381	10139	9936	10274	10385	10482	7907	7426
22	8762	8561	8149	6603	6623	7430	11009	10784	10605	10982	11098	11203	8745	8268
23	8172	7971	7563	6022	6044	6851	10477	10261	10095	10496	10614	10727	8453	8000
24	8243	8024	7521	5948	5960	6764	10810	10611	10473	10915	11037	11161	9062	8622
25	7903	7673	7121	5538	5545	6345	10645	10463	10349	10828	10953	11086	9206	8789
26	7700	7456	6828	5237	5236	6023	10666	10503	10418	10938	11067	11211	9560	9165
27	7107	6892	6428	4872	4891	5698	9713	9527	9409	9886	10012	10145	8378	7985
28	6541	6321	5844	4287	4306	5113	9271	9099	9004	9516	9645	9788	8280	7920
29	5457	5284	5061	3671	3720	4487	7771	7583	7469	7964	8092	8233	6916	6610
3	2699	2615	2311	3777	3754	2947	6633	6842	7230	8129	8258	8503	10992	11095
3	4676	4770	5536	5316	5407	5674	3933	3626	3339	3628	3742	3851	3652	3723

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

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WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
30	5352	5125	4639	3092	3115	3922	8321	8180	8134	8716	8851	9013	8072	7788
31	6073	5837	5279	3700	3711	4515	9077	8931	8874	9440	9573	9729	8559	8236
32	7076	6836	6237	4649	4652	5447	10039	9880	9803	10336	10466	10614	9117	8746
33	6559	6396	6195	4790	4836	5612	8549	8326	8155	8560	8680	8796	6843	6455
34	6992	6806	6489	5002	5036	5835	9221	9009	8854	9278	9399	9519	7542	7137
35	4168	3957	3603	2178	2228	2996	7158	7037	7023	7653	7791	7966	7543	7339
36	4832	4659	4463	3123	3179	3924	7262	7092	7006	7545	7677	7829	6867	6610
37	5163	5037	5030	3839	3906	4597	6993	6781	6633	7087	7212	7344	6015	5735
38	3777	3617	3531	2387	2461	3112	6356	6217	6182	6794	6931	7102	6778	6610
39	4325	4147	3947	2638	2699	3427	6934	6785	6731	7315	7450	7614	6979	6763
4	3338	3305	3125	4602	4579	3772	6897	7142	7565	8459	8581	8826	11584	11716
4	5177	5253	5957	5610	5700	6030	4441	4118	3792	3983	4087	4168	3245	3251
40	4613	4405	4046	2592	2636	3418	7480	7342	7304	7902	8038	8204	7521	7283
41	4725	4594	4584	3419	3488	4165	6724	6530	6412	6911	7040	7183	6161	5919
42	1845	1862	2572	2703	2789	2828	4197	4141	4241	5010	5154	5366	6623	6670
43	2133	2289	3280	3685	3768	3704	3177	3119	3233	4026	4170	4390	6179	6313
44	3027	3084	3804	3684	3775	3968	3916	3748	3695	4323	4462	4644	5381	5424
45	3237	3423	4442	4772	4859	4850	2454	2278	2252	2958	3102	3307	5218	5422
46	4184	4362	5348	5546	5635	5702	2507	2208	1965	2427	2560	2723	4317	4562
47	5243	5426	6415	6562	6652	6752	2745	2368	1931	1959	2057	2137	3479	3817
48	5594	5746	6654	6624	6715	6902	3487	3112	2675	2628	2709	2750	2847	3131
49	6020	6142	6963	6762	6854	7124	4245	3872	3435	3347	3418	3434	2280	2472
5	4515	4446	4061	5380	5340	4554	8115	8368	8797	9690	9811	10056	12794	12911
50	6584	6680	7419	7062	7153	7498	5044	4670	4229	4098	4159	4155	1777	1814
51	1910	1634	564	1830	1809	1002	6418	6523	6800	7673	7813	8049	9747	9766
52	1906	1622	499	1715	1695	889	6414	6512	6781	7650	7791	8027	9673	9687
6	5301	5179	4563	5650	5594	4869	9167	9403	9814	10711	10836	11081	13586	13665
7	7079	6933	6194	7058	6990	6347	11009	11245	11654	12552	12678	12923	15328	15381
8	6598	6446	5690	6550	6482	5838	10585	10813	11215	12113	12240	12486	14834	14882
9	6018	5871	5143	6066	6001	5331	9998	10225	10626	11525	11652	11897	14267	14322
Norrkanga	2417	2202	1374	2606	2571	1777	6832	6977	7297	8186	8324	8565	10515	10555

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Calculated:
16.9.2024 15.37/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	14.8.2024 12.33

DMS no.: 0079-5298_01

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	169,0	8,0	104,0	No	85,1	92,6	97,2	99,1	98,1	94,3	87,7	78,3

WTG: Siemens Gamesa SG 6.2-170 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	14.8.2024 13.02

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	115,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

WTG: NORDEX N163/5.7 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	14.8.2024 13.19

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	178,5	8,0	108,7	No	90,4	96,6	100,3	102,9	103,6	101,1	93,5	85,5

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Calculated:
16.9.2024 15.37/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	16.9.2024 15.25

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	166,0	8,0	104,8	No	85,1	92,7	97,6	99,8	99,1	95,6	89,4	80,4

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	23.8.2024 9.52

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	164,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: VESTAS V162-7.2 7200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	15.8.2024 12.12

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	134,0	8,0	105,5	No	86,0	93,6	98,4	100,5	99,7	96,2	89,9	80,8

WTG: Siemens Gamesa SG 6.0-170 6000 170.0 !O!
Noise: (AM 0, 6.0MW) - 106dB(A) + 2dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	19.8.2024 13.43

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: LAGERWEY L100-2.5MW 2520 100.0 !O!
Noise: Level 0 - - Standard mode - 01-2014

Source	Source/Date	Creator	Edited
L100-2.5MW rev 27-1-2014	27.1.2014	USER	15.8.2024 12.41

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	98,0	8,0	105,0	No	86,6	93,6	97,0	99,6	99,4	96,5	91,7	82,2

WTG: NORDTANK 150 24.6 !O!
Noise: nordtank

Source	Source/Date	Creator	Edited
Rambøll	1.4.1989	USER	15.8.2024 12.44

(Memo)

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	38,0	8,0	97,8	No	79,4	86,4	89,8	92,4	92,2	89,3	84,5	75,0

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Calculated:
16.9.2024 15.37/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

WTG: VESTAS V150-4.2 4200 150.0 !O!
Noise: Level 00 - Measured - Mode PO1 - 03-2018

Source	Source/Date	Creator	Edited
Manufacturer	15.3.2018	USER	15.8.2024 12.30

Document n. 0067-4767 V06.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	145,0	8,0	104,9	No	84,2	92,3	97,4	99,8	99,4	96,1	90,1	81,0

WTG: NORDEX N163/5.X 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	16.9.2024 9.24

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	158,0	8,0	109,2	No	90,9	97,1	100,8	103,4	104,1	101,6	94,0	86,0

Noise sensitive area: A Asuinrakennus A (England)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: B Asuinrakennus B (Renlund)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: C Asuinrakennus C (Jepuantie 586)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: D Lomarakennus D (Kvarnbacka)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: E Asuinrakennus E (Gullback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: F Asuinrakennus F (Jepuantie 675)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: G Lomarakennus G (Kullasteet 64b)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: H Asuinrakennus H (Kullastået 85)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: I Lomarakennus I (Kyhrastået, Bobacken)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: J Asuinrakennus J (Hagabacktået 71)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: K Asuinrakennus K (Nyback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: L Asuinrakennus L (Kimo Skogsbilvdg 55)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: M Lomarakennus M (Fårmossen)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: N Lomarakennus N (Brändå)

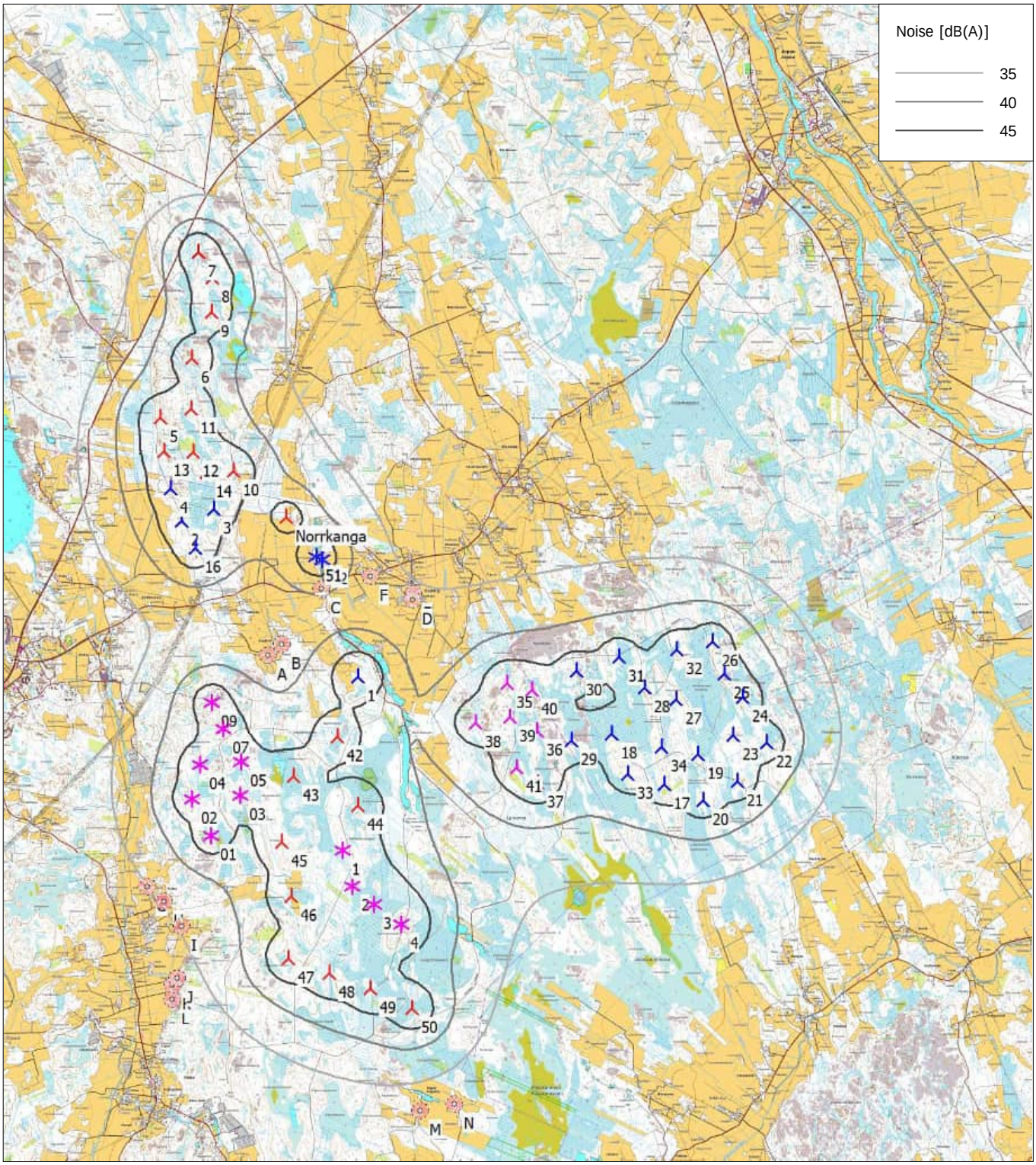
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

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DECIBEL - Map 8,0 m/s

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_rak.luvalliset yhteisvaikutukset_2024



Map: Peruskarttarasteri , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 855 North: 7 029 089

New WTG Existing WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

Bilaga 3. Vargitmossens vindkraftsprojekt - Resultat från spridningsmodellering för buller ISO 9613-2, MM 2/2014 (ALT2)

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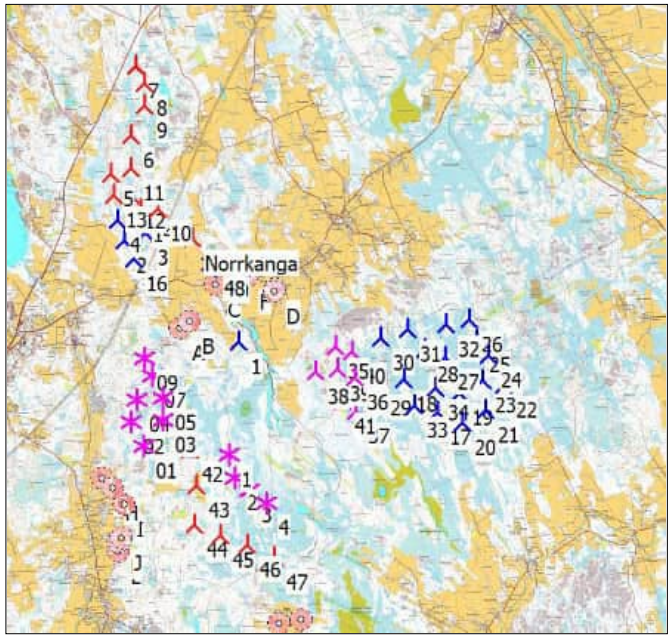
Calculated:
16.9.2024 15.59/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Noise sensitive area

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
02	272 153	7 026 165	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
03	272 991	7 026 229	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
04	272 290	7 026 759	26,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
05	273 002	7 026 818	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
07	272 700	7 027 390	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
09	272 494	7 027 846	25,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5700 163.0 !O! ...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	108,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
10	272 876	7 031 835	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
11	272 142	7 032 911	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
12	272 176	7 032 174	25,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
13	271 677	7 032 186	20,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
14	272 407	7 031 814	22,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
16	272 217	7 030 505	17,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
17	280 336	7 026 417	51,4	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
18	279 422	7 027 294	47,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
19	280 918	7 026 942	43,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
2	271 975	7 030 974	19,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
20	280 996	7 026 139	45,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
21	281 600	7 026 467	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
22	282 102	7 027 147	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
23	281 524	7 027 270	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
24	281 681	7 027 926	43,3	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
25	281 366	7 028 337	44,7	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
26	281 165	7 028 894	38,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
27	280 535	7 027 893	42,5	VESTAS V172-7.2 7200 172.0 !O! ...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
28	279 986	7 028 096	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
29	278 725	7 027 182	49,9	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
3	272 536	7 031 182	18,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
30	278 813	7 028 386	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
31	279 541	7 028 621	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
32	280 544	7 028 746	40,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
33	279 701	7 026 603	52,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
34	280 279	7 027 063	50,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
35	277 608	7 028 174	38,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5700 163.0 !O! ...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
4	271 789	7 031 536	17,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
40	278 041	7 028 049	43,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
43	273 877	7 024 480	30,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
44	273 828	7 023 413	40,0	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
45	274 526	7 023 150	36,3	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
46	275 242	7 022 891	37,9	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
47	275 965	7 022 551	42,3	Siemens Gamesa SG 6.0-170 600...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
48	274 303	7 030 363	16,9	LAGERWEY L100-2.5MW 2520 10...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	USER	Level 0 - - Standard mode - 01-2014	8,0	105,0
49	274 404	7 030 306	17,5	NORDTANK 150 24.6 !O! hub: 38...	No	NORDTANK	-150	150	24,6	38,0	USER	nordtank	8,0	97,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0

To be continued on next page...

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Calculated:
16.9.2024 15.59/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
6	272 158	7 033 787	24,9	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
8	272 507	7 035 178	27,5	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
9	272 494	7 034 589	30,0	Siemens Gamesa SG 6.2-170 620...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V162-5.6 560...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	USER	V162 - 5.6 MW Mode 0 STE - 4-2019	8,0	104,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	4,0	40,0	37,3	564	Yes
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	4,0	40,0	37,1	639	Yes
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	4,0	40,0	40,9	-82	No
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	4,0	40,0	35,5	862	Yes
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	4,0	40,0	35,3	946	Yes
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	4,0	40,0	36,9	369	Yes
G	Lomarakennus G (Kullasteet 64b)	271 374	7 024 647	17,5	4,0	40,0	34,7	764	Yes
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	4,0	40,0	35,1	746	Yes
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	4,0	40,0	35,1	958	Yes
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	4,0	40,0	33,0	1 183	Yes
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	4,0	40,0	32,5	1 288	Yes
L	Asuinrakennus L (Kimo Skogsbilvdg 55)	271 811	7 022 704	20,6	4,0	40,0	31,9	1 374	Yes
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	4,0	40,0	32,2	1 067	Yes
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	4,0	40,0	31,8	1 118	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
01	3262	3524	4679	5371	5449	5265	1418	1401	1642	2528	2665	2906	5973	6265
02	2805	3092	4274	5148	5220	4938	1705	1837	2202	3101	3230	3476	6676	6957
03	2462	2706	3841	4513	4590	4407	2260	2262	2475	3338	3479	3715	6273	6495
04	2221	2515	3701	4661	4728	4397	2301	2447	2806	3706	3836	4081	7089	7335
05	1885	2140	3295	4081	4154	3906	2711	2767	3026	3903	4042	4280	6786	6981
07	1470	1764	2950	3959	4022	3657	3044	3169	3494	4389	4524	4767	7432	7626
09	1257	1566	2729	3904	3959	3503	3387	3550	3909	4808	4939	5184	7932	8122
1	1603	1433	1647	1634	1717	1746	5152	5138	5281	6076	6220	6438	7580	7578
1	3601	3708	4534	4496	4587	4755	3446	3218	3078	3618	3753	3919	4699	4799
10	3241	3105	2532	3809	3770	2984	7338	7536	7912	8811	8942	9187	11512	11587
11	4463	4357	3833	5051	5005	4240	8294	8528	8938	9835	9960	10206	12756	12848
12	3754	3665	3243	4577	4540	3748	7564	7795	8202	9100	9226	9471	12047	12149
13	3963	3910	3610	5005	4972	4173	7540	7790	8217	9110	9232	9477	12229	12354
14	3338	3242	2823	4188	4155	3357	7236	7455	7852	8751	8878	9124	11632	11730
16	2238	2231	2285	3860	3855	3065	5915	6135	6537	7435	7561	7807	10469	10602
17	7220	7056	6837	5406	5448	6233	9130	8895	8704	9072	9188	9294	7047	6618
18	6106	5919	5617	4154	4193	4985	8467	8273	8148	8623	8749	8883	7309	6959
19	7642	7455	7121	5617	5648	6450	9810	9588	9416	9810	9928	10040	7818	7379
2	2762	2745	2685	4222	4208	3405	6351	6586	7001	7897	8021	8266	10994	11129
2	4237	4347	5165	5058	5150	5359	3550	3266	3028	3420	3545	3679	4060	4169
20	7933	7771	7548	6105	6144	6934	9731	9483	9270	9596	9707	9801	7254	6785
21	8418	8240	7938	6444	6475	7276	10381	10139	9936	10274	10385	10482	7907	7426
22	8762	8561	8149	6603	6623	7430	11009	10784	10605	10982	11098	11203	8745	8268
23	8172	7971	7563	6022	6044	6851	10477	10261	10095	10496	10614	10727	8453	8000
24	8243	8024	7521	5948	5960	6764	10810	10611	10473	10915	11037	11161	9062	8622
25	7903	7673	7121	5538	5545	6345	10645	10463	10349	10828	10953	11086	9206	8789
26	7700	7456	6828	5237	5236	6023	10666	10503	10418	10938	11067	11211	9560	9165
27	7107	6892	6428	4872	4891	5698	9713	9527	9409	9886	10012	10145	8378	7985
28	6541	6321	5844	4287	4306	5113	9271	9099	9004	9516	9645	9788	8280	7920
29	5457	5284	5061	3671	3720	4487	7771	7583	7469	7964	8092	8233	6916	6610
3	2699	2615	2311	3777	3754	2947	6633	6842	7230	8129	8258	8503	10992	11095
3	4676	4770	5536	5316	5407	5674	3933	3626	3339	3628	3742	3851	3652	3723
30	5352	5125	4639	3092	3115	3922	8321	8180	8134	8716	8851	9013	8072	7788
31	6073	5837	5279	3700	3711	4515	9077	8931	8874	9440	9573	9729	8559	8236

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
32	7076	6836	6237	4649	4652	5447	10039	9880	9803	10336	10466	10614	9117	8746
33	6559	6396	6195	4790	4836	5612	8549	8326	8155	8560	8680	8796	6843	6455
34	6992	6806	6489	5002	5036	5835	9221	9009	8854	9278	9399	9519	7542	7137
35	4168	3957	3603	2178	2228	2996	7158	7037	7023	7653	7791	7966	7543	7339
36	4832	4659	4463	3123	3179	3924	7262	7092	7006	7545	7677	7829	6867	6610
37	5163	5037	5030	3839	3906	4597	6993	6781	6633	7087	7212	7344	6015	5735
38	3777	3617	3531	2387	2461	3112	6356	6217	6182	6794	6931	7102	6778	6610
39	4325	4147	3947	2638	2699	3427	6934	6785	6731	7315	7450	7614	6979	6763
4	5177	5253	5957	5610	5700	6030	4441	4118	3792	3983	4087	4168	3245	3251
4	3338	3305	3125	4602	4579	3772	6897	7142	7565	8459	8581	8826	11584	11716
40	4613	4405	4046	2592	2636	3418	7480	7342	7304	7902	8038	8204	7521	7283
41	4725	4594	4584	3419	3488	4165	6724	6530	6412	6911	7040	7183	6161	5919
42	3237	3423	4442	4772	4859	4850	2454	2278	2252	2958	3102	3307	5218	5422
43	4184	4362	5348	5546	5635	5702	2507	2208	1965	2427	2560	2723	4317	4562
44	5243	5426	6415	6562	6652	6752	2745	2368	1931	1959	2057	2137	3479	3817
45	5594	5746	6654	6624	6715	6902	3487	3112	2675	2628	2709	2750	2847	3131
46	6020	6142	6963	6762	6854	7124	4245	3872	3435	3347	3418	3434	2280	2472
47	6584	6680	7419	7062	7153	7498	5044	4670	4229	4098	4159	4155	1777	1814
48	1910	1634	564	1830	1809	1002	6418	6523	6800	7673	7813	8049	9747	9766
49	1906	1622	499	1715	1695	889	6414	6512	6781	7650	7791	8027	9673	9687
5	4515	4446	4061	5380	5340	4554	8115	8368	8797	9690	9811	10056	12794	12911
6	5301	5179	4563	5650	5594	4869	9167	9403	9814	10711	10836	11081	13586	13665
7	7079	6933	6194	7058	6990	6347	11009	11245	11654	12552	12678	12923	15328	15381
8	6598	6446	5690	6550	6482	5838	10585	10813	11215	12113	12240	12486	14834	14882
9	6018	5871	5143	6066	6001	5331	9998	10225	10626	11525	11652	11897	14267	14322
Norrkanga	2417	2202	1374	2606	2571	1777	6832	6977	7297	8186	8324	8565	10515	10555

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Calculated:
16.9.2024 15.59/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	14.8.2024 12.33

DMS no.: 0079-5298_01

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	169,0	8,0	104,0	No	85,1	92,6	97,2	99,1	98,1	94,3	87,7	78,3

WTG: Siemens Gamesa SG 6.2-170 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	14.8.2024 13.02

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	115,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

WTG: NORDEX N163/5.7 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	14.8.2024 13.19

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	178,5	8,0	108,7	No	90,4	96,6	100,3	102,9	103,6	101,1	93,5	85,5

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	16.9.2024 15.25

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	166,0	8,0	104,8	No	85,1	92,7	97,6	99,8	99,1	95,6	89,4	80,4

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	23.8.2024 9.52

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	164,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: VESTAS V162-7.2 7200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	15.8.2024 12.12

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	134,0	8,0	105,5	No	86,0	93,6	98,4	100,5	99,7	96,2	89,9	80,8

WTG: Siemens Gamesa SG 6.0-170 6000 170.0 !O!
Noise: (AM 0, 6.0MW) - 106dB(A) + 2dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	19.8.2024 13.43

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: LAGERWEY L100-2.5MW 2520 100.0 !O!
Noise: Level 0 - - Standard mode - 01-2014

Source	Source/Date	Creator	Edited
L100-2.5MW rev 27-1-2014	27.1.2014	USER	15.8.2024 12.41

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	98,0	8,0	105,0	No	86,6	93,6	97,0	99,6	99,4	96,5	91,7	82,2

WTG: NORDTANK 150 24.6 !O!
Noise: nordtank

Source	Source/Date	Creator	Edited
Rambøll	1.4.1989	USER	15.8.2024 12.44

(Memo)

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	38,0	8,0	97,8	No	79,4	86,4	89,8	92,4	92,2	89,3	84,5	75,0

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Calculated:
16.9.2024 15.59/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

WTG: VESTAS V150-4.2 4200 150.0 !O!
Noise: Level 00 - Measured - Mode PO1 - 03-2018

Source	Source/Date	Creator	Edited
Manufacturer	15.3.2018	USER	15.8.2024 12.30

Document n. 0067-4767 V06.

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	145,0	8,0	104,9	No	84,2	92,3	97,4	99,8	99,4	96,1	90,1	81,0

WTG: NORDEX N163/5.X 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	16.9.2024 9.24

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	158,0	8,0	109,2	No	90,9	97,1	100,8	103,4	104,1	101,6	94,0	86,0

Noise sensitive area: A Asuinrakennus A (England)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: B Asuinrakennus B (Renlund)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: C Asuinrakennus C (Jepuantie 586)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: D Lomarakennus D (Kvarnbacka)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: E Asuinrakennus E (Gullback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: F Asuinrakennus F (Jepuantie 675)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: G Lomarakennus G (Kullasteet 64b)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: H Asuinrakennus H (Kullastået 85)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: I Lomarakennus I (Kyhrastået, Bobacken)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: J Asuinrakennus J (Hagabacktået 71)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: K Asuinrakennus K (Nyback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: L Asuinrakennus L (Kimo Skogsbilvdg 55)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: M Lomarakennus M (Fårmossen)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: N Lomarakennus N (Brändå)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

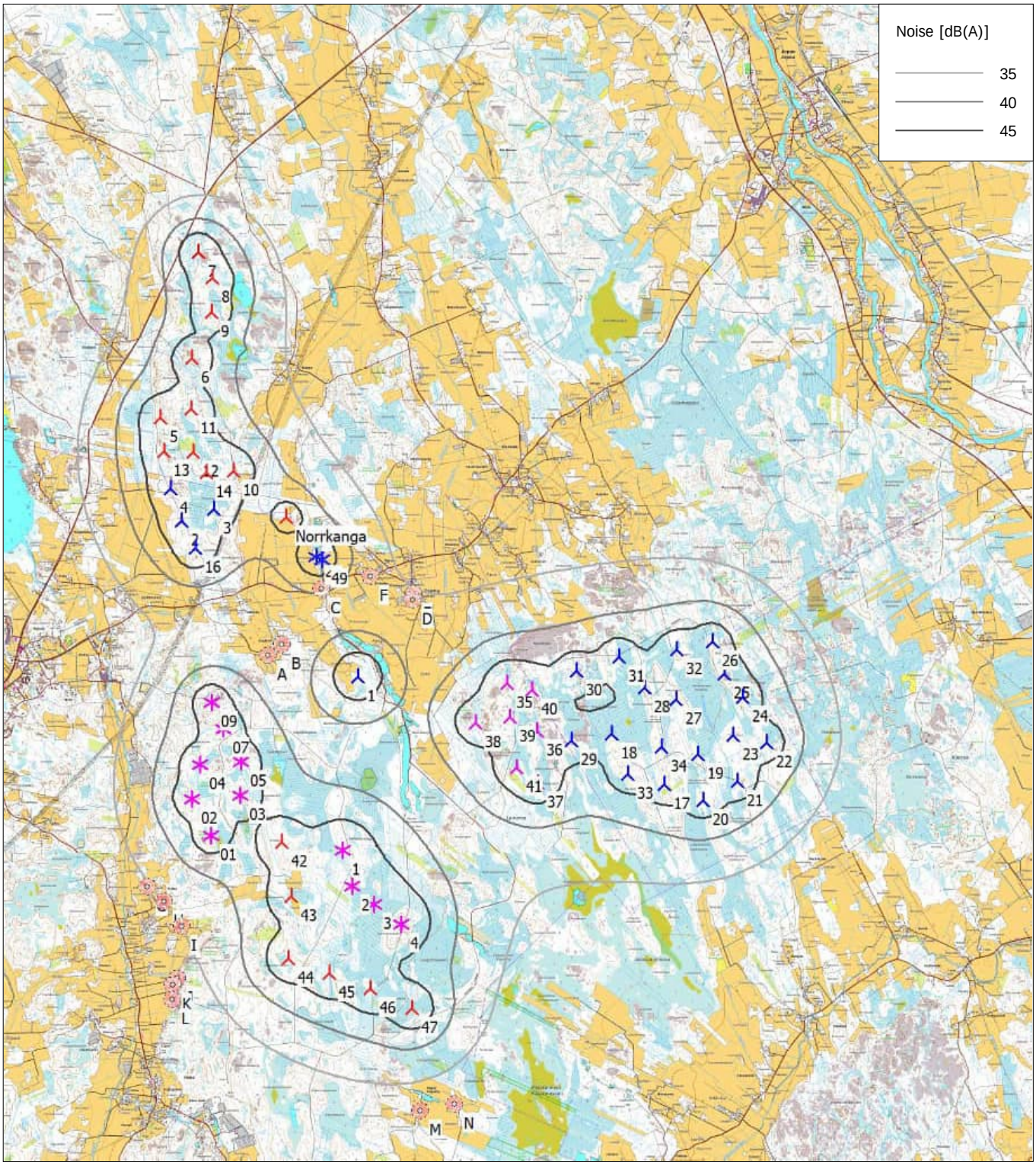
Noise demand: 40,0 dB(A)
No distance demand

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Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:
16.9.2024 15.59/3.6.377

DECIBEL - Map 8,0 m/s

Calculation: Vargitmossen VE2_SG170-6.0MW (108dB)x6xHH215_rak.luvalliset yhteisvaikutukset_2024

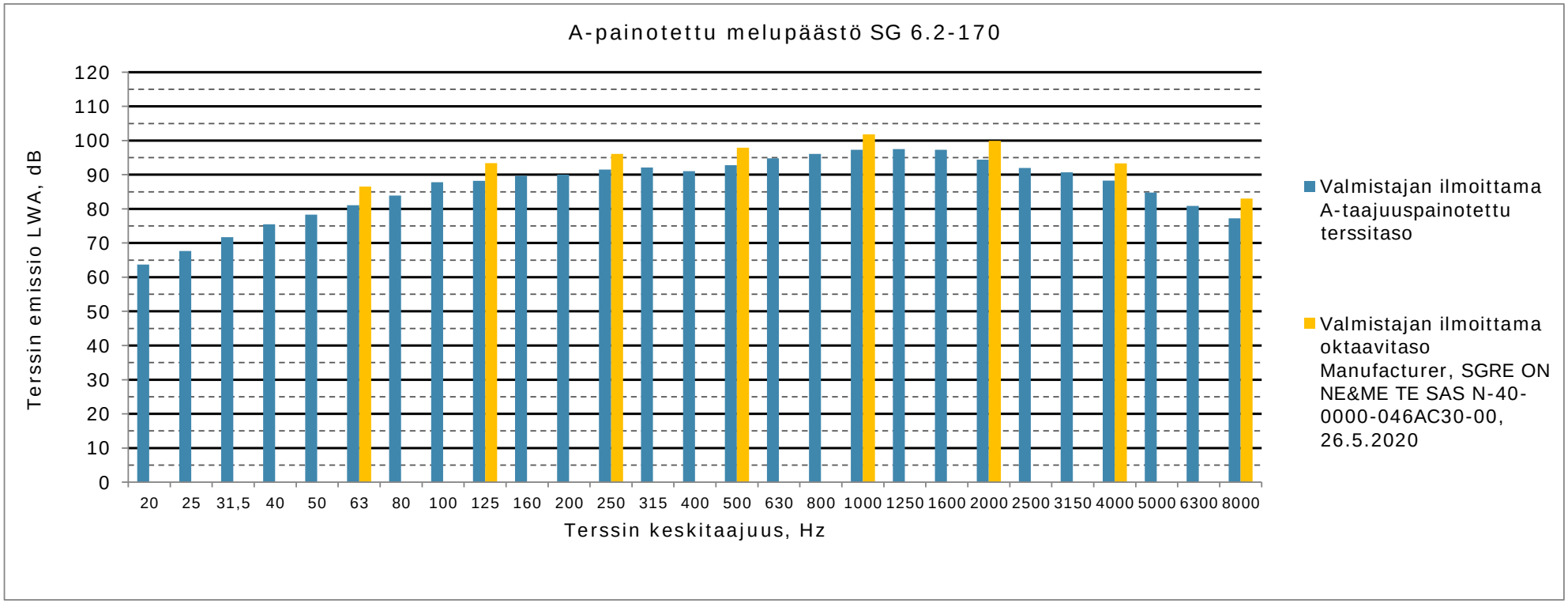


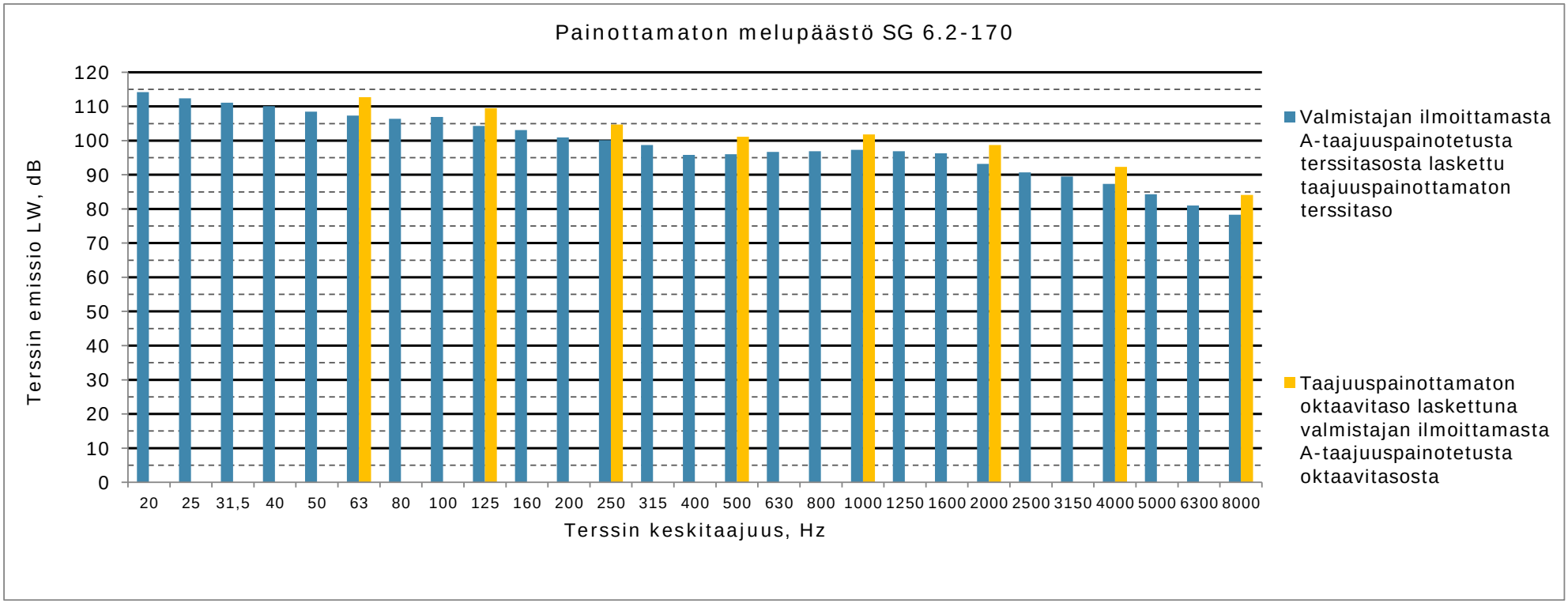
Map: Peruskarttarasteri , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 855 North: 7 029 089

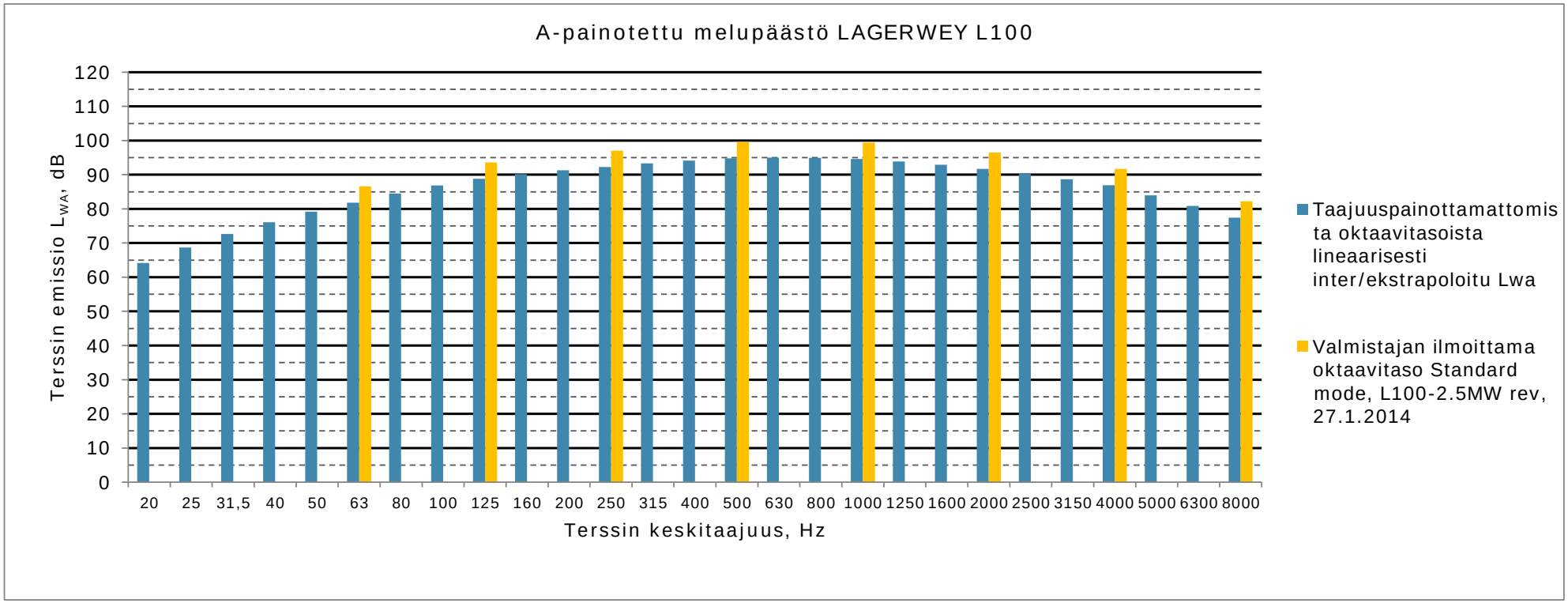
New WTG Existing WTG Noise sensitive area

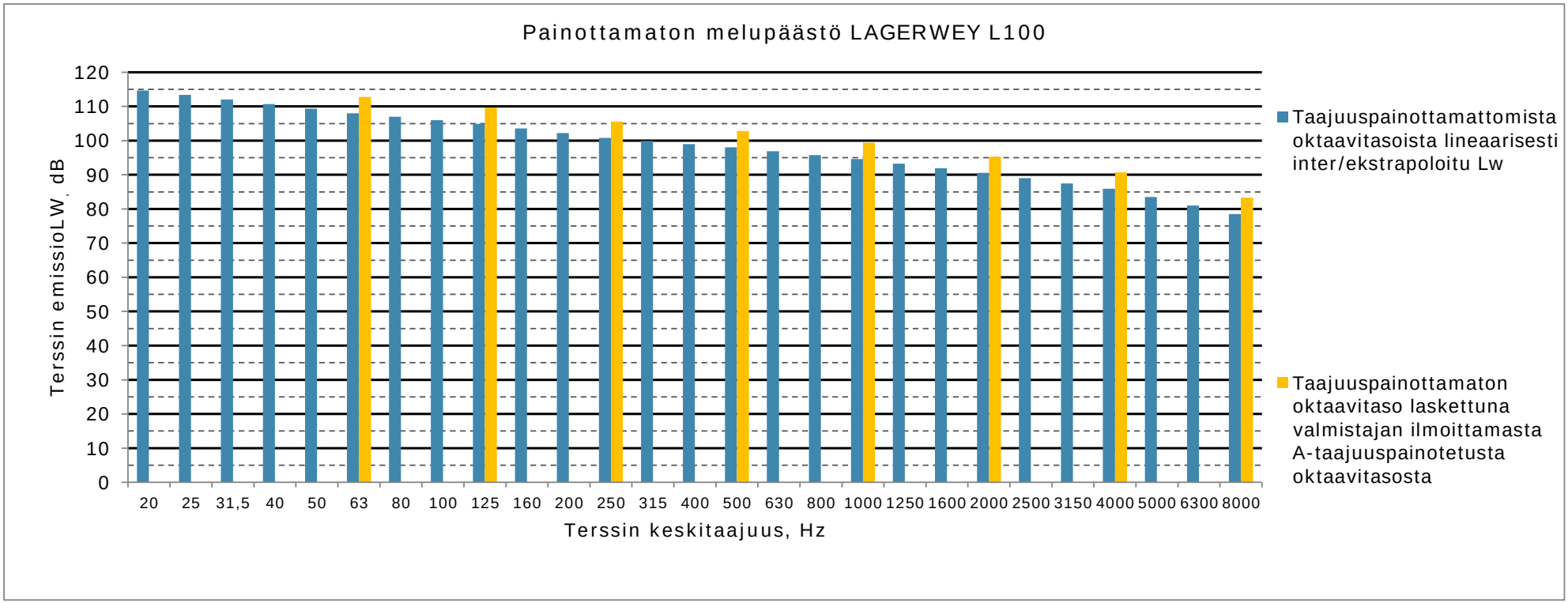
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

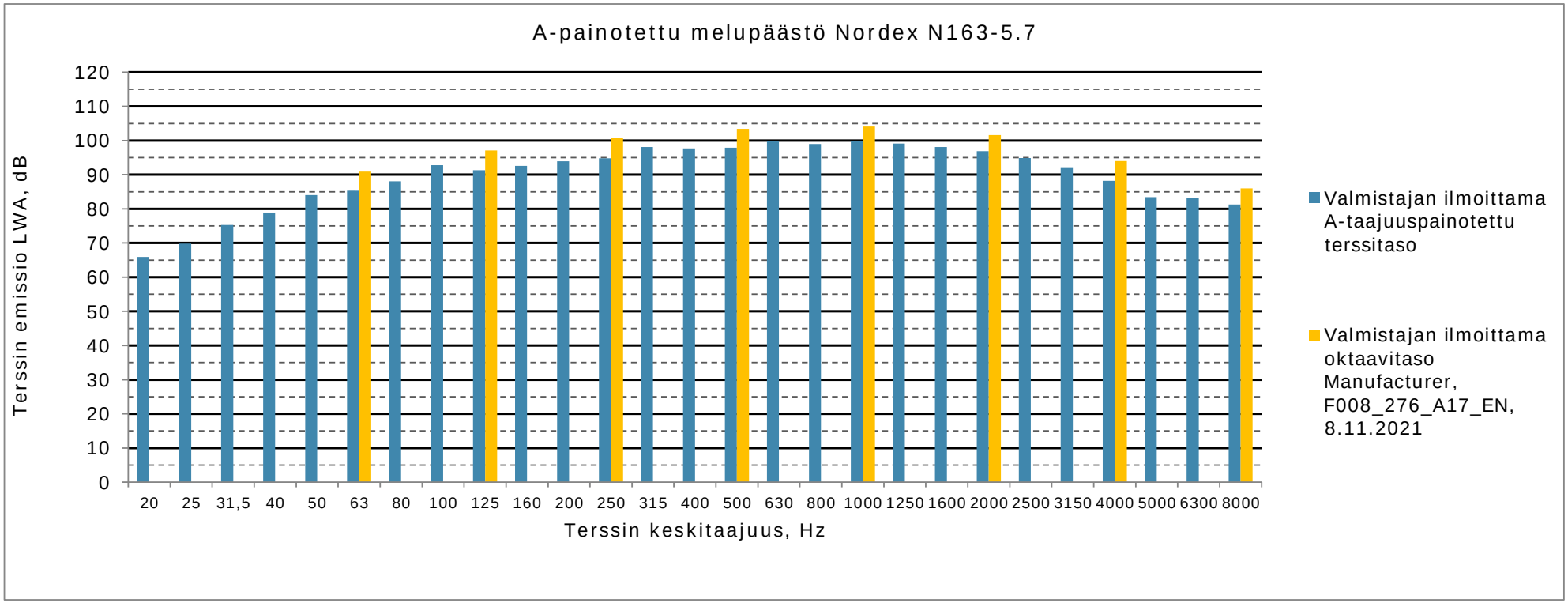
Bilaga 4. Vargitmossens vindkraftsprojekt – byggnadsspecifika värden för lågfrekvent buller i nuläget

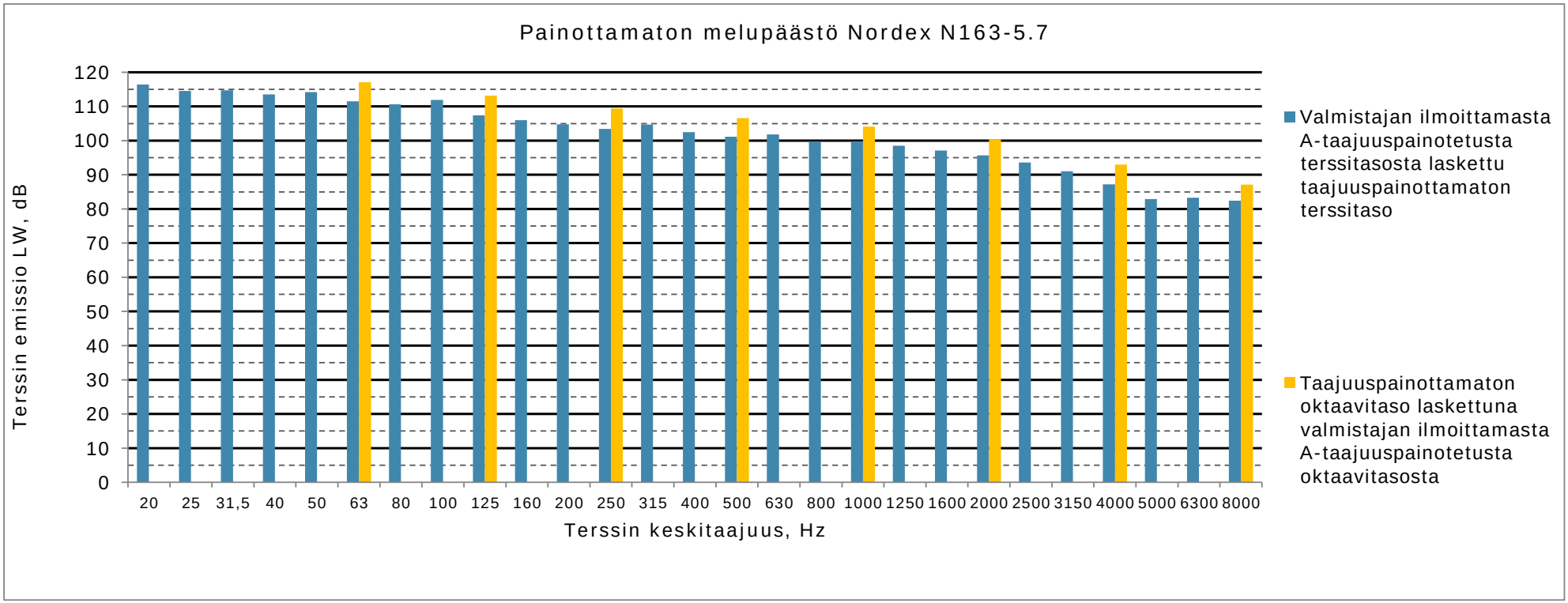

A-painotettu melupäästö SG 6.2-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

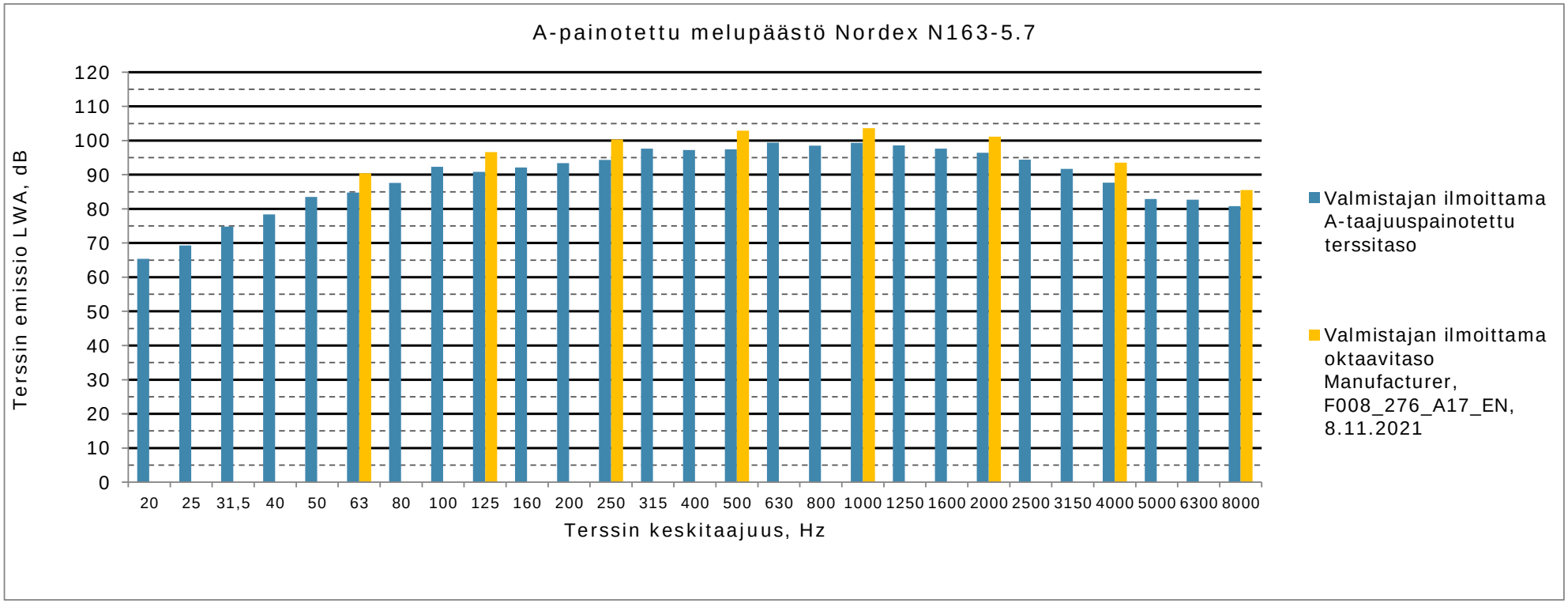

Painottamaton melupäästö SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

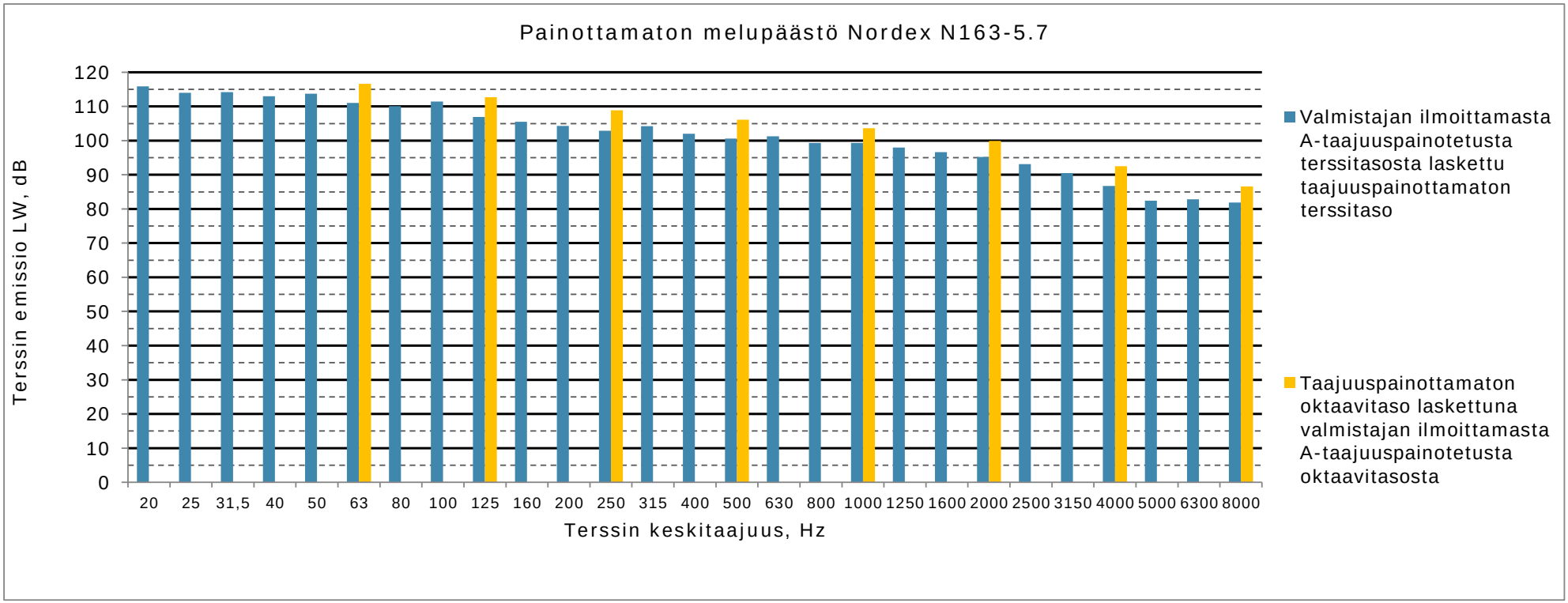

A-painotettu melupäästö LAGERWEY L100
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Standard mode, L100-2.5MW rev, 27.1.2014

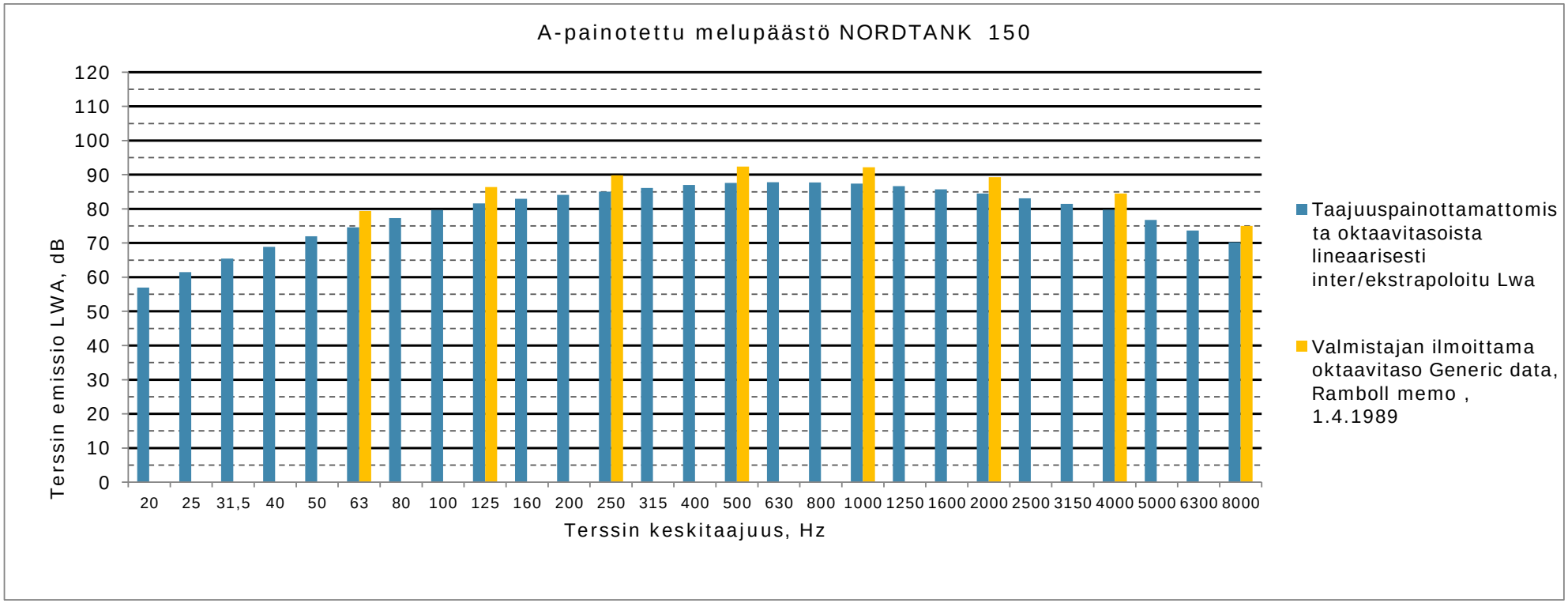

Painottamaton melupäästö LAGERWEY L100
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

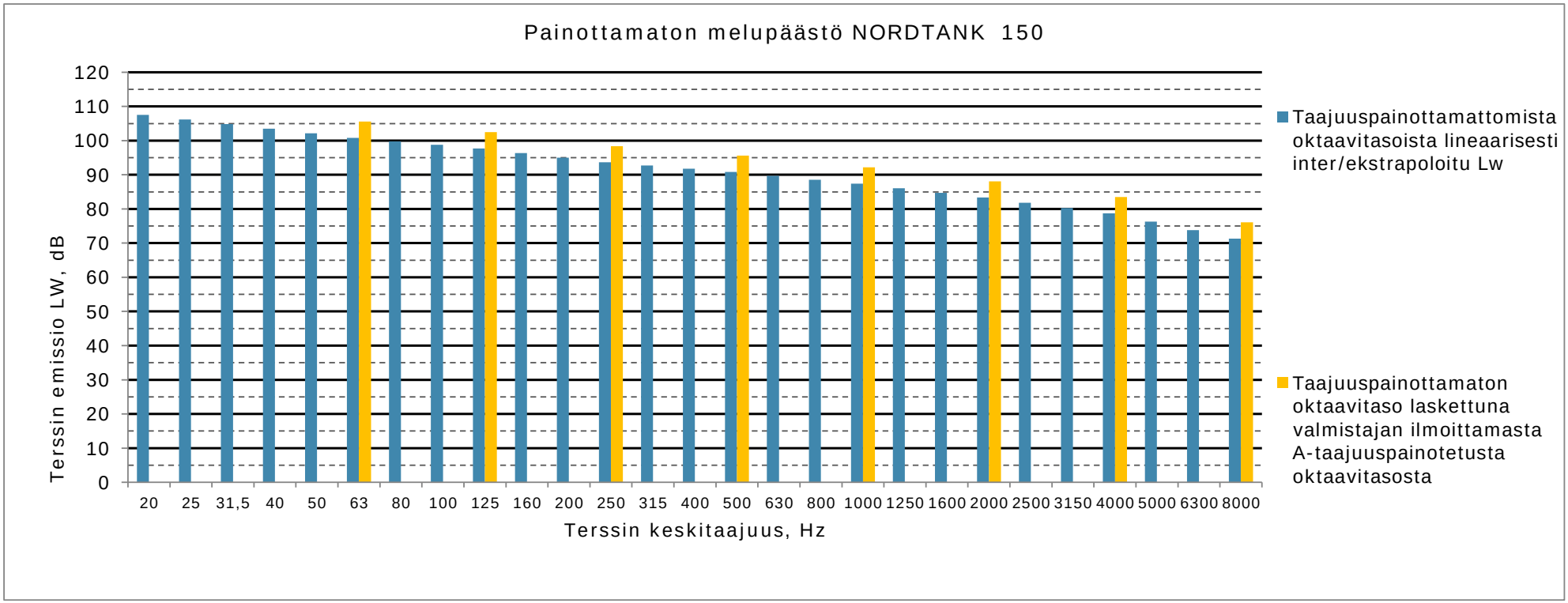

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

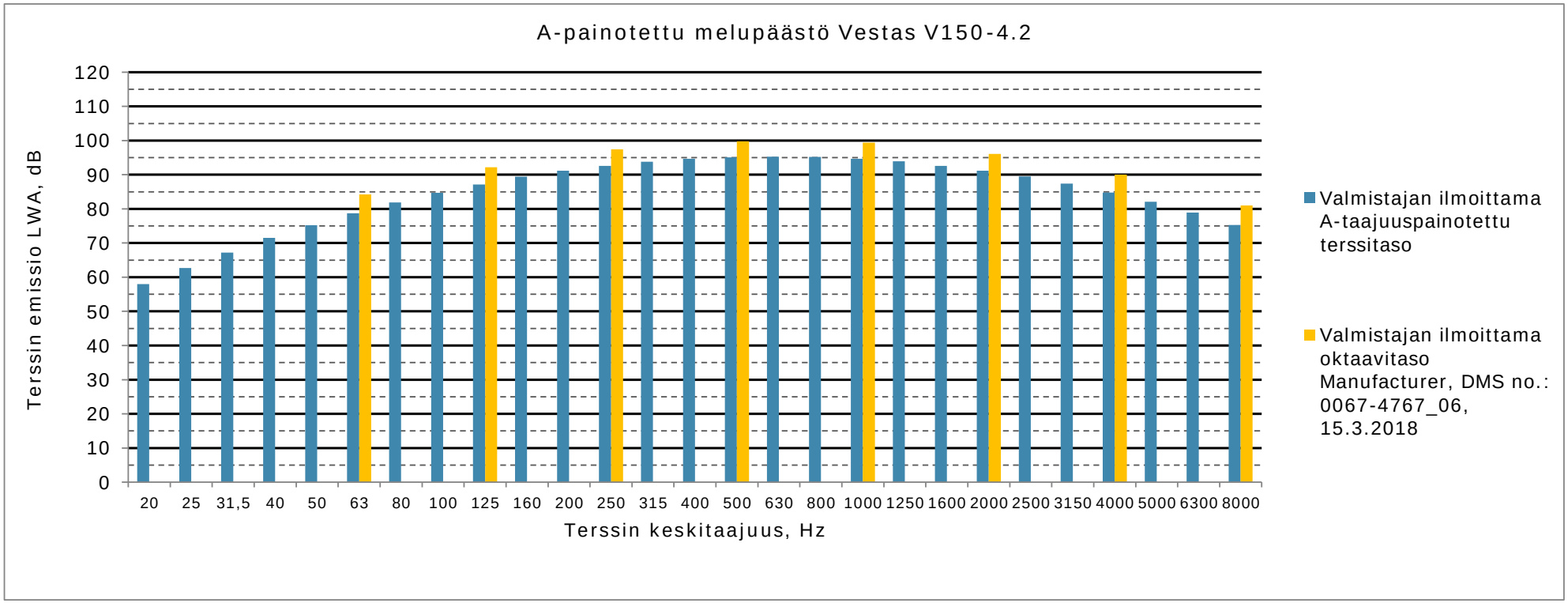

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

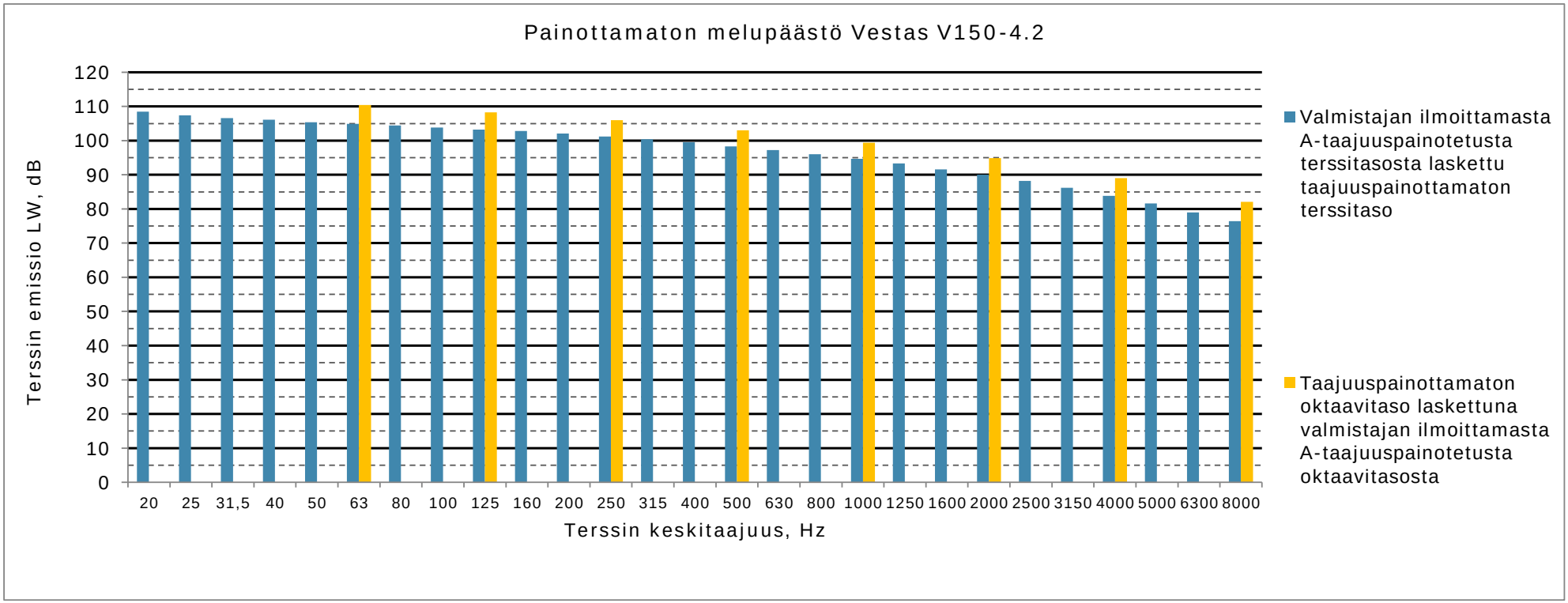

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

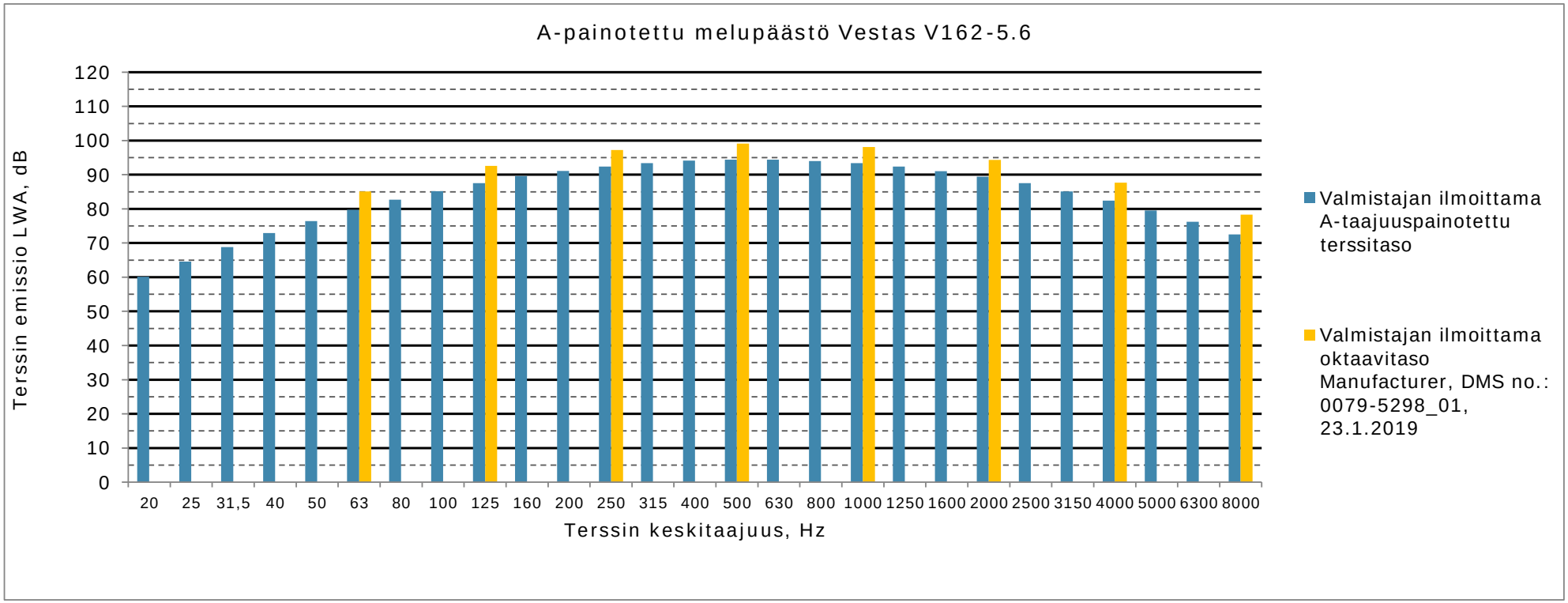

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

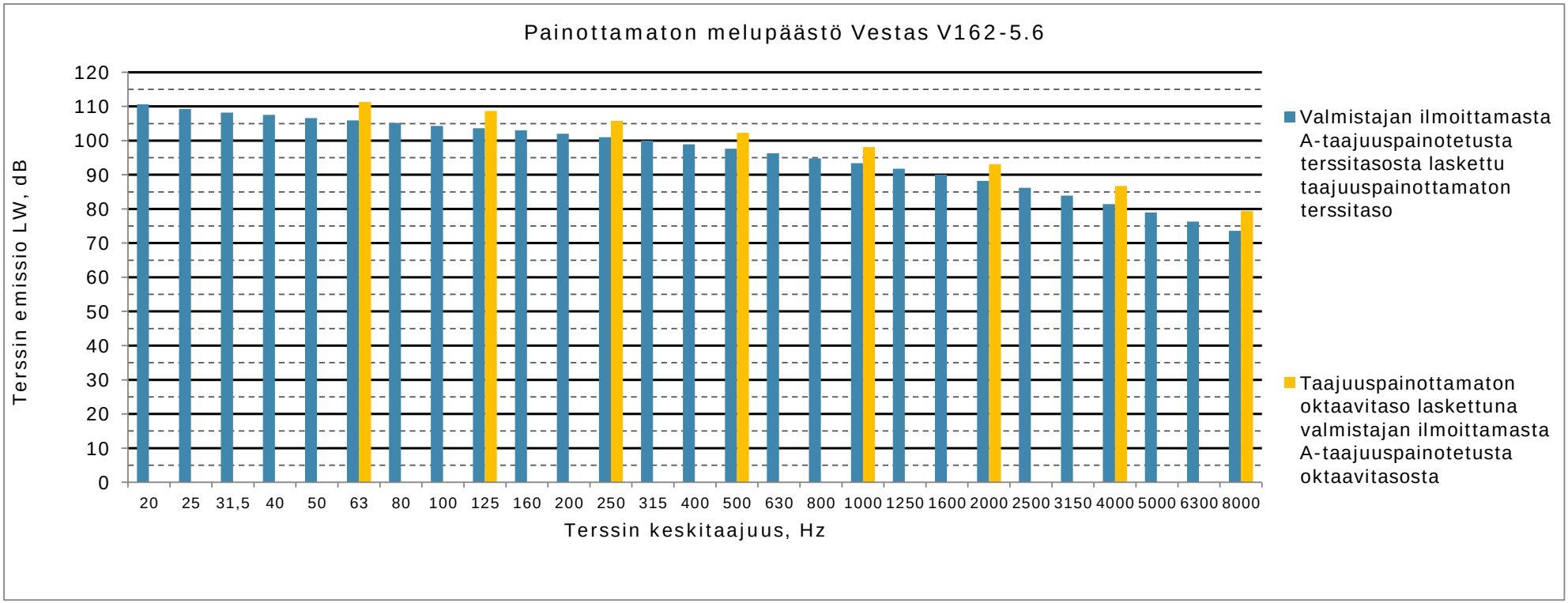

A-painotettu melupäästö NORDTANK 150
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Generic data, Ramboll memo , 1.4.1989

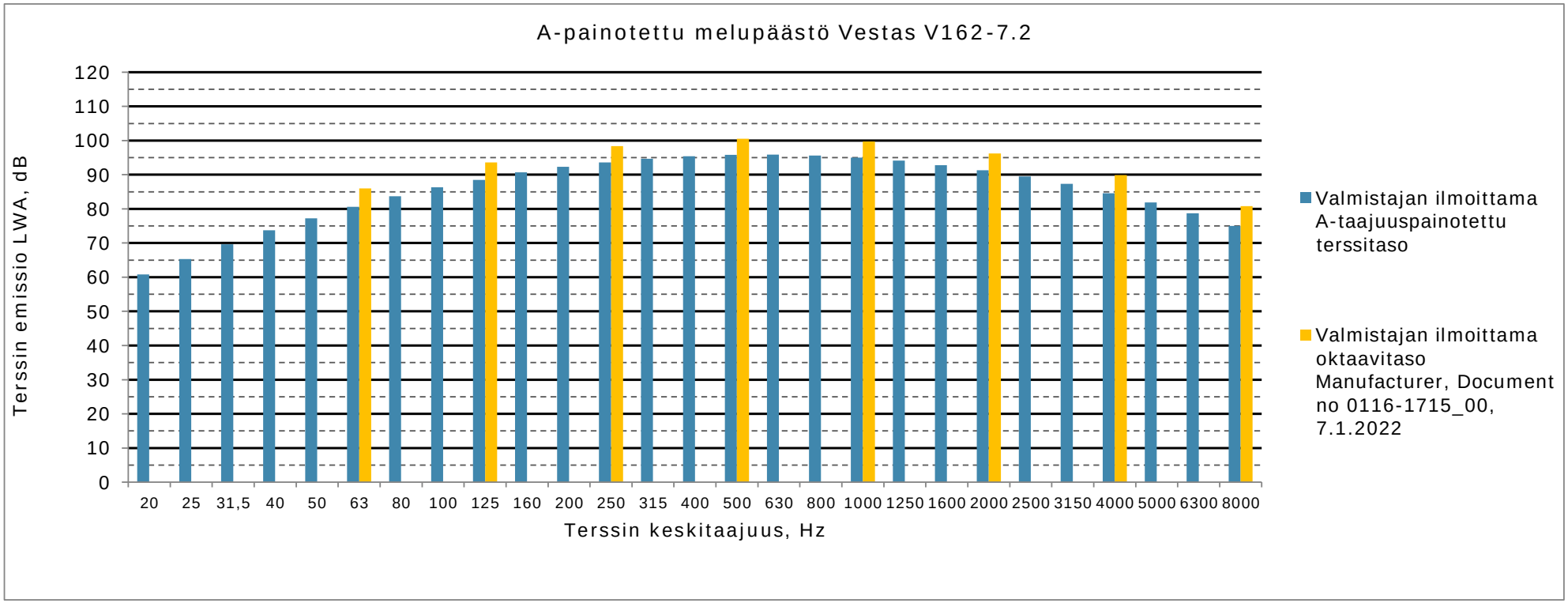

Painottamaton melupäästö NORDTANK 150
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

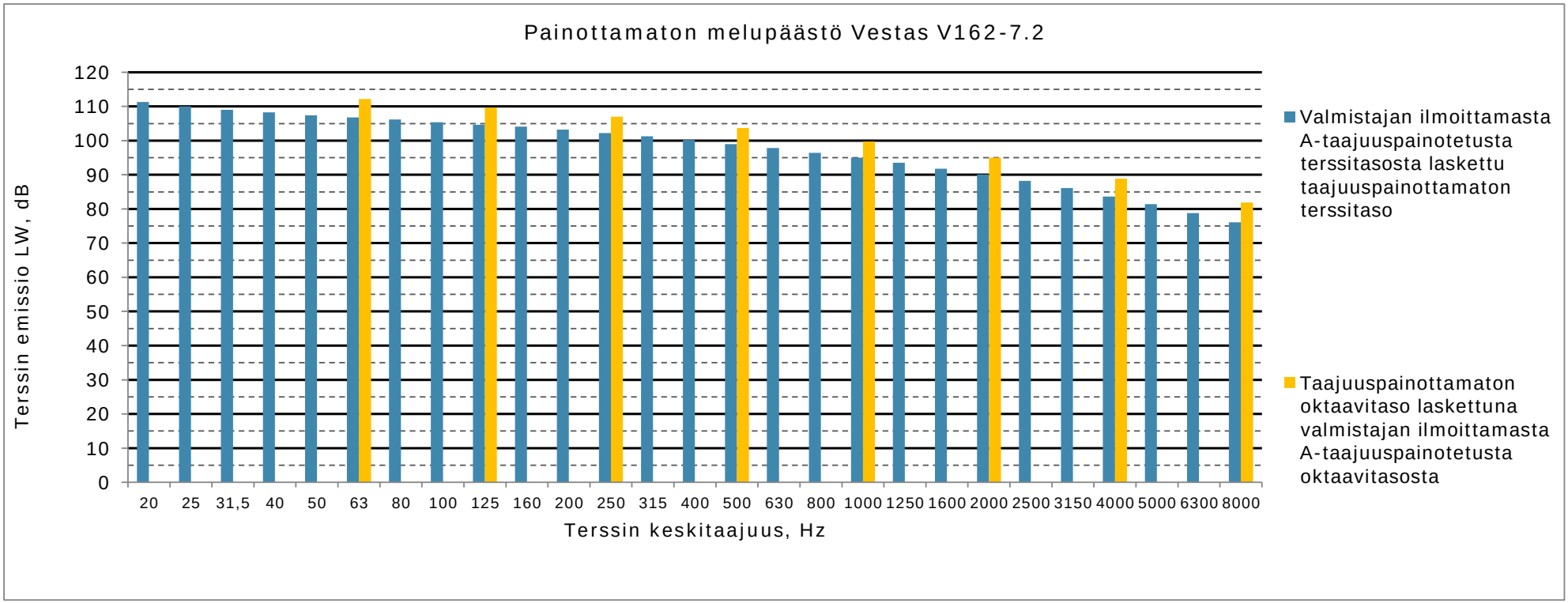

A-painotettu melupäästö Vestas V150-4.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0067-4767_06, 15.3.2018

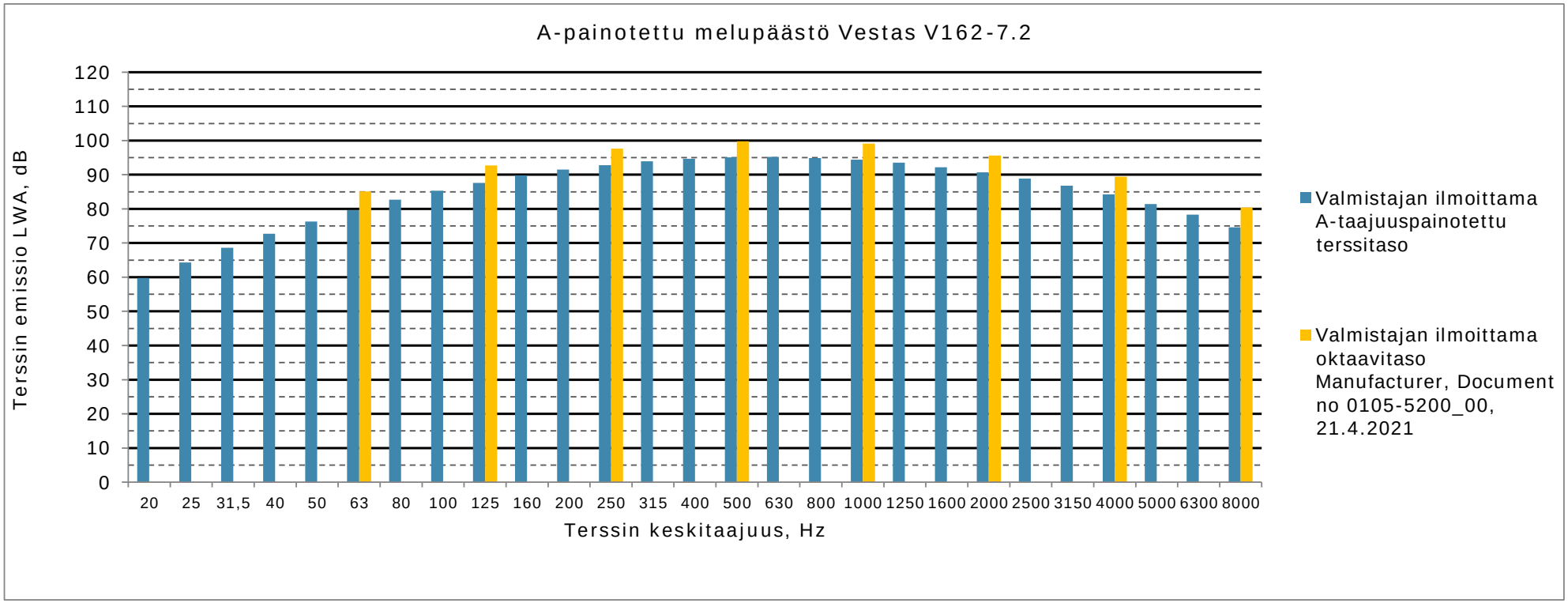

Painottamaton melupäästö Vestas V150-4.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

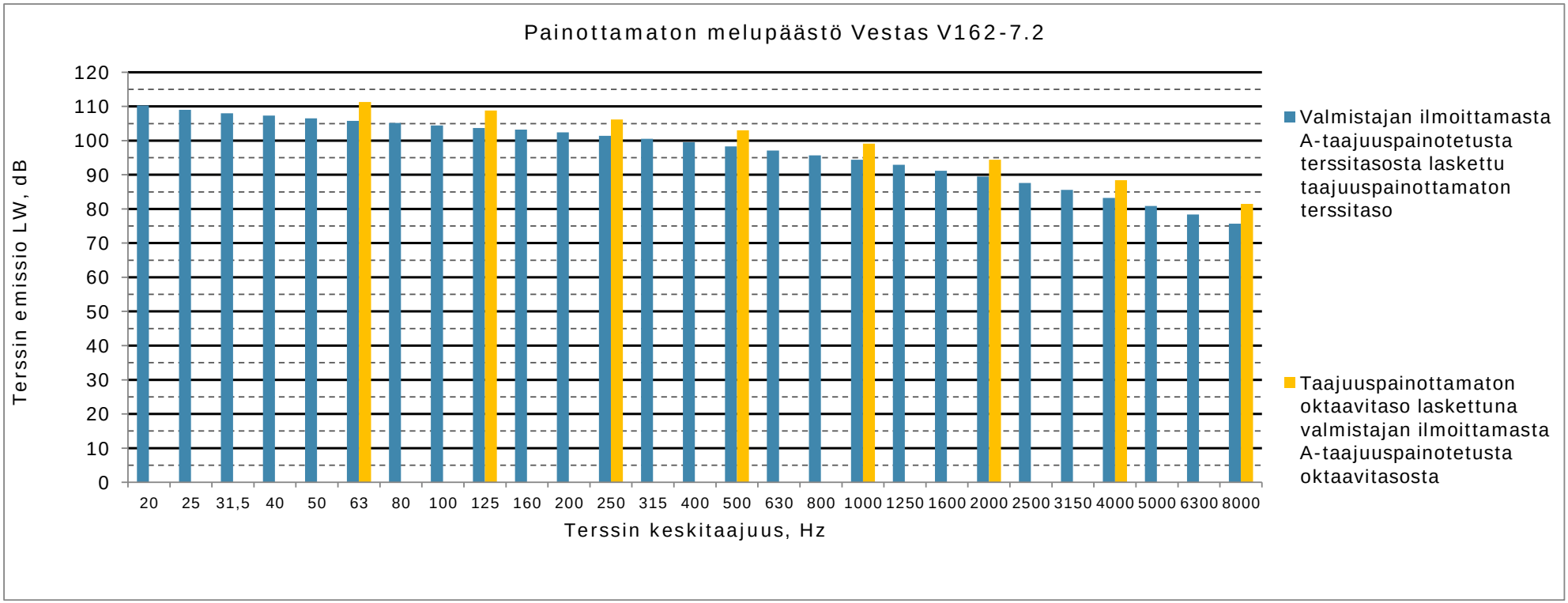

A-painotettu melupäästö Vestas V162-5.6
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0079-5298_01, 23.1.2019

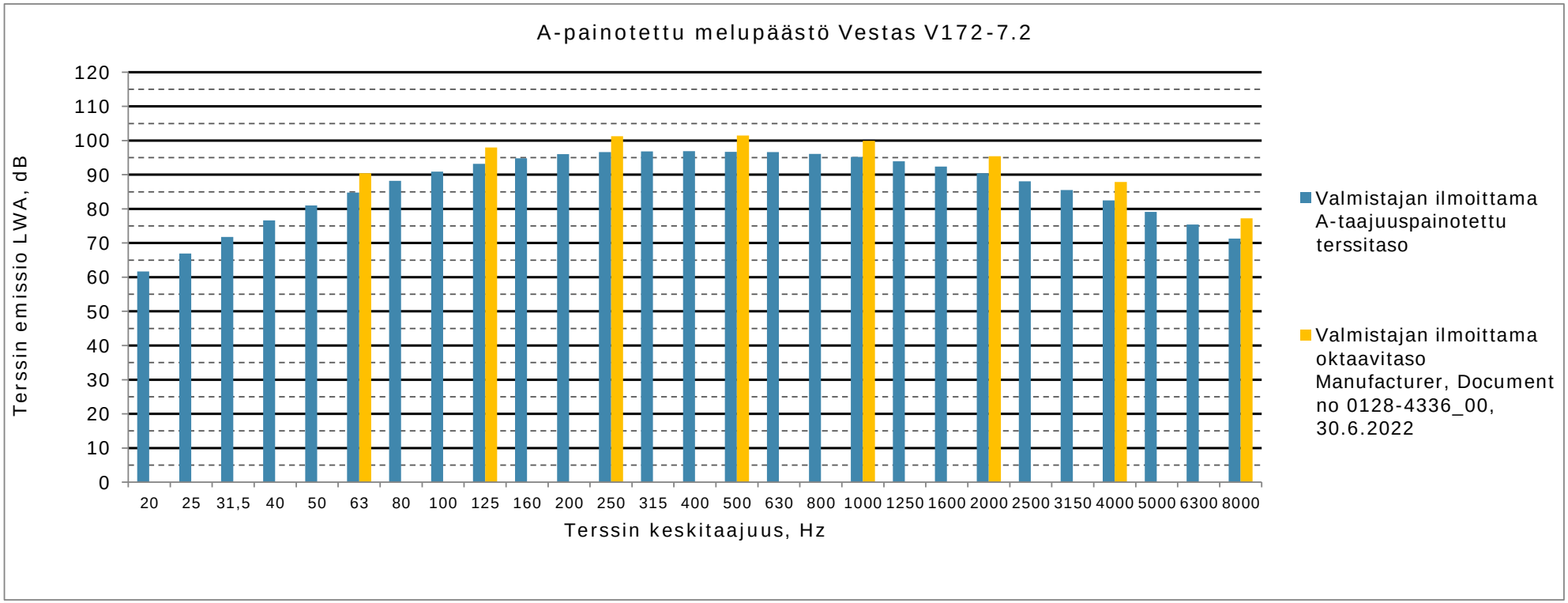

Painottamaton melupäästö Vestas V162-5.6
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

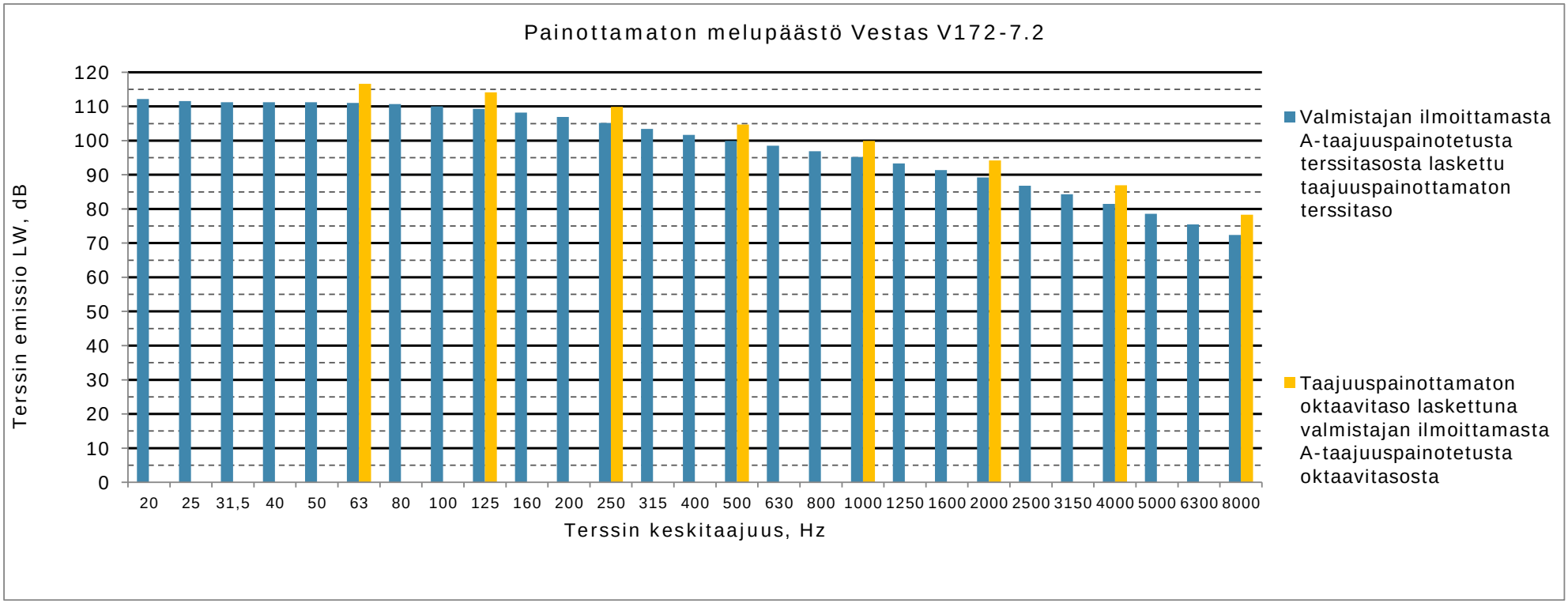

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0116-1715_00, 7.1.2022

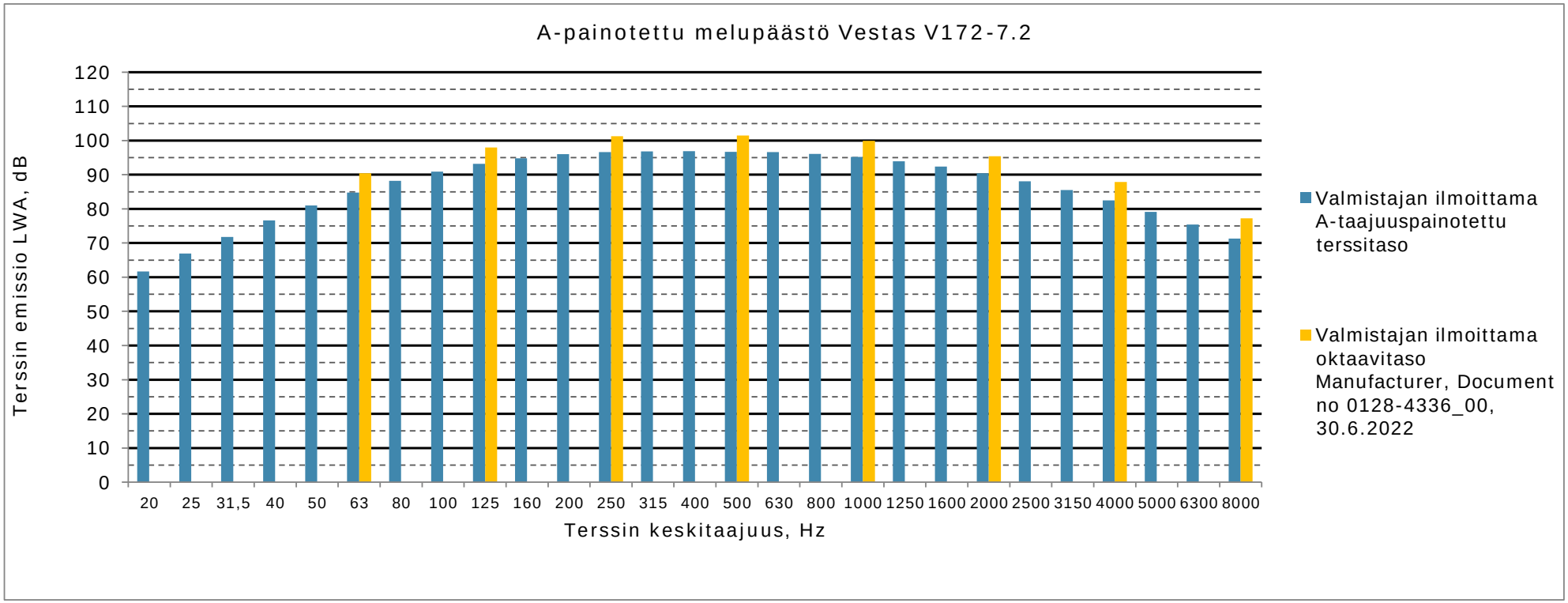

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

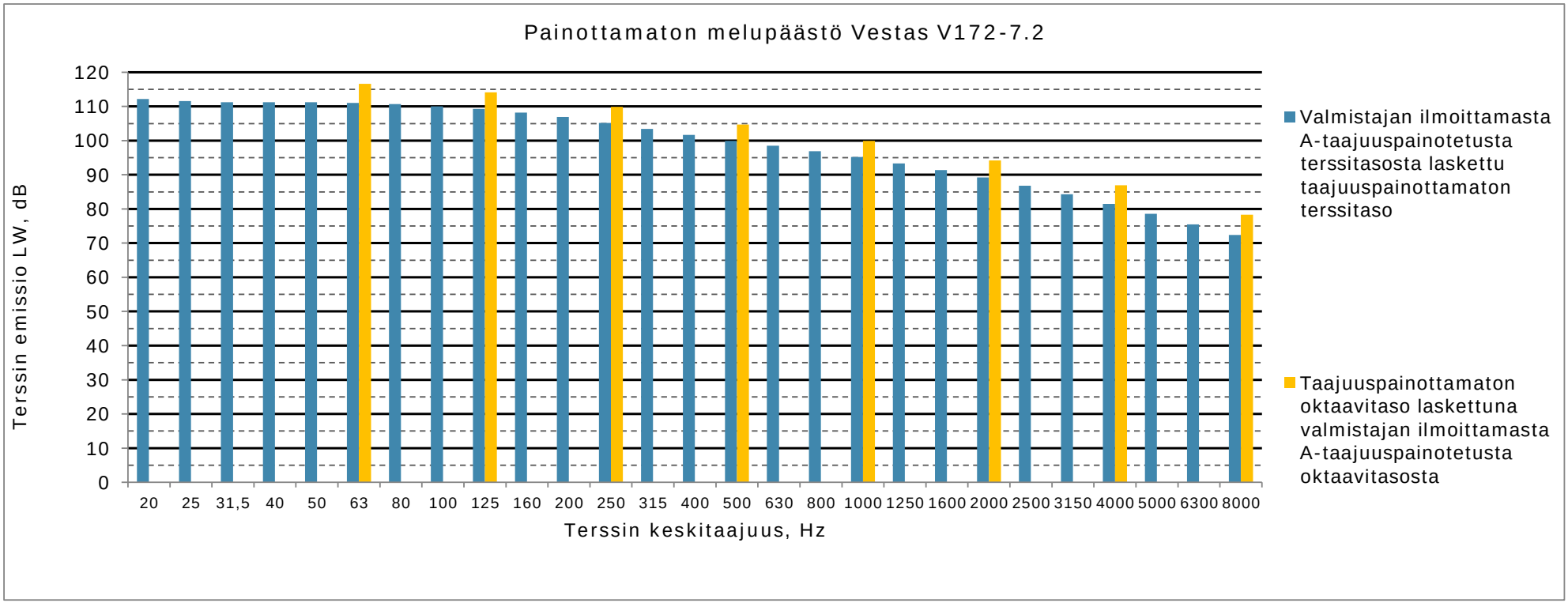

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0105-5200_00, 21.4.2021

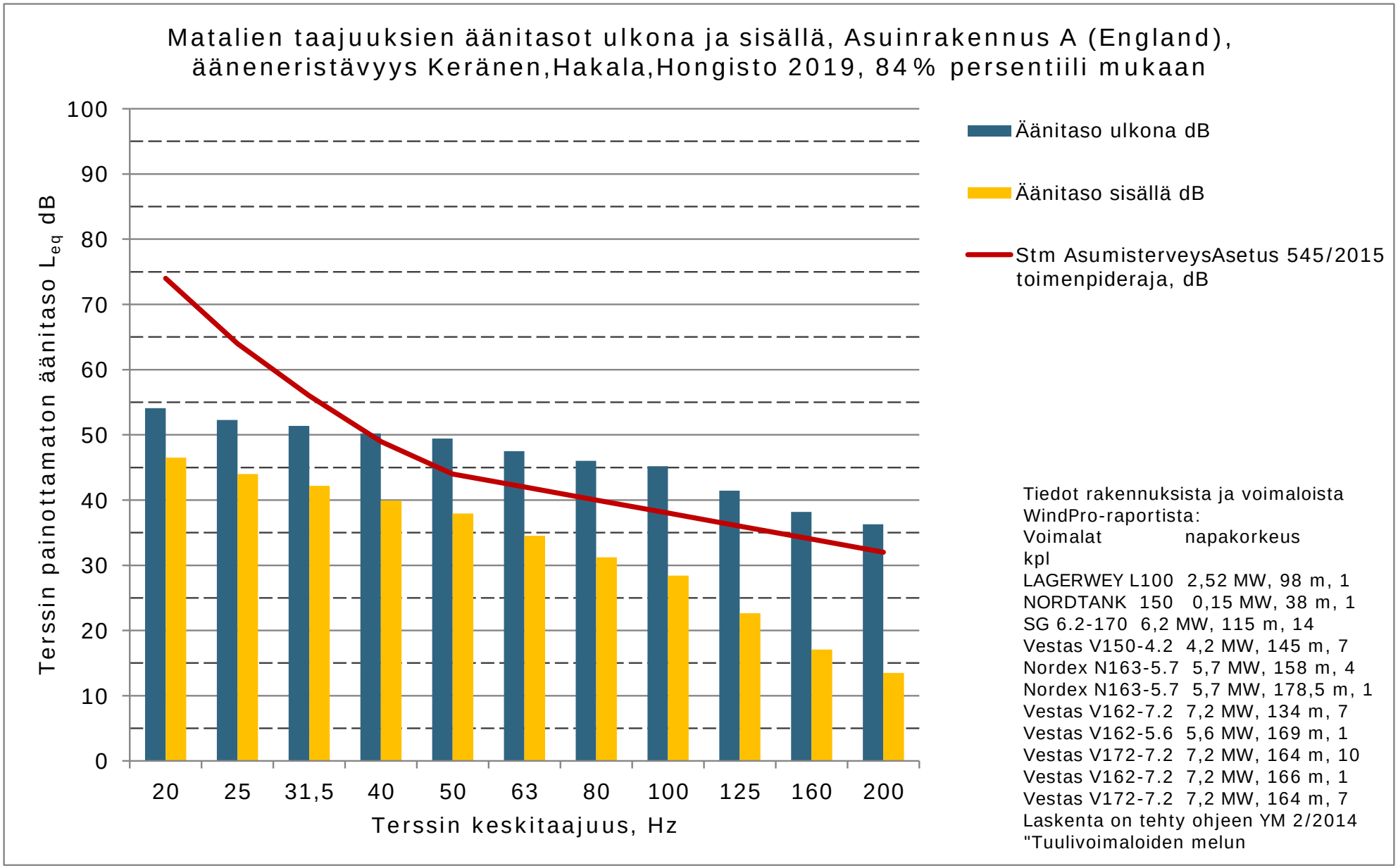

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022

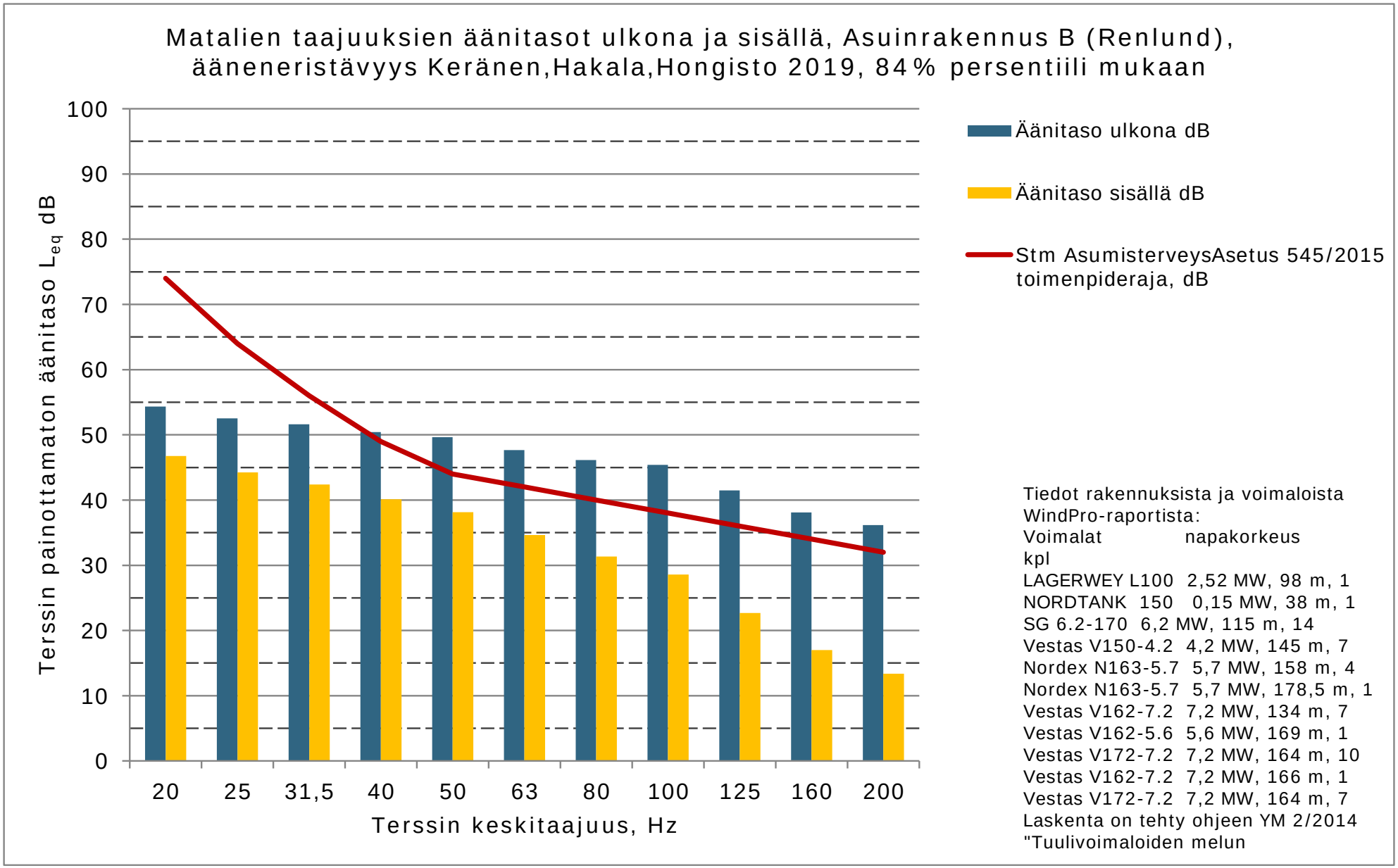

Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta



Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7

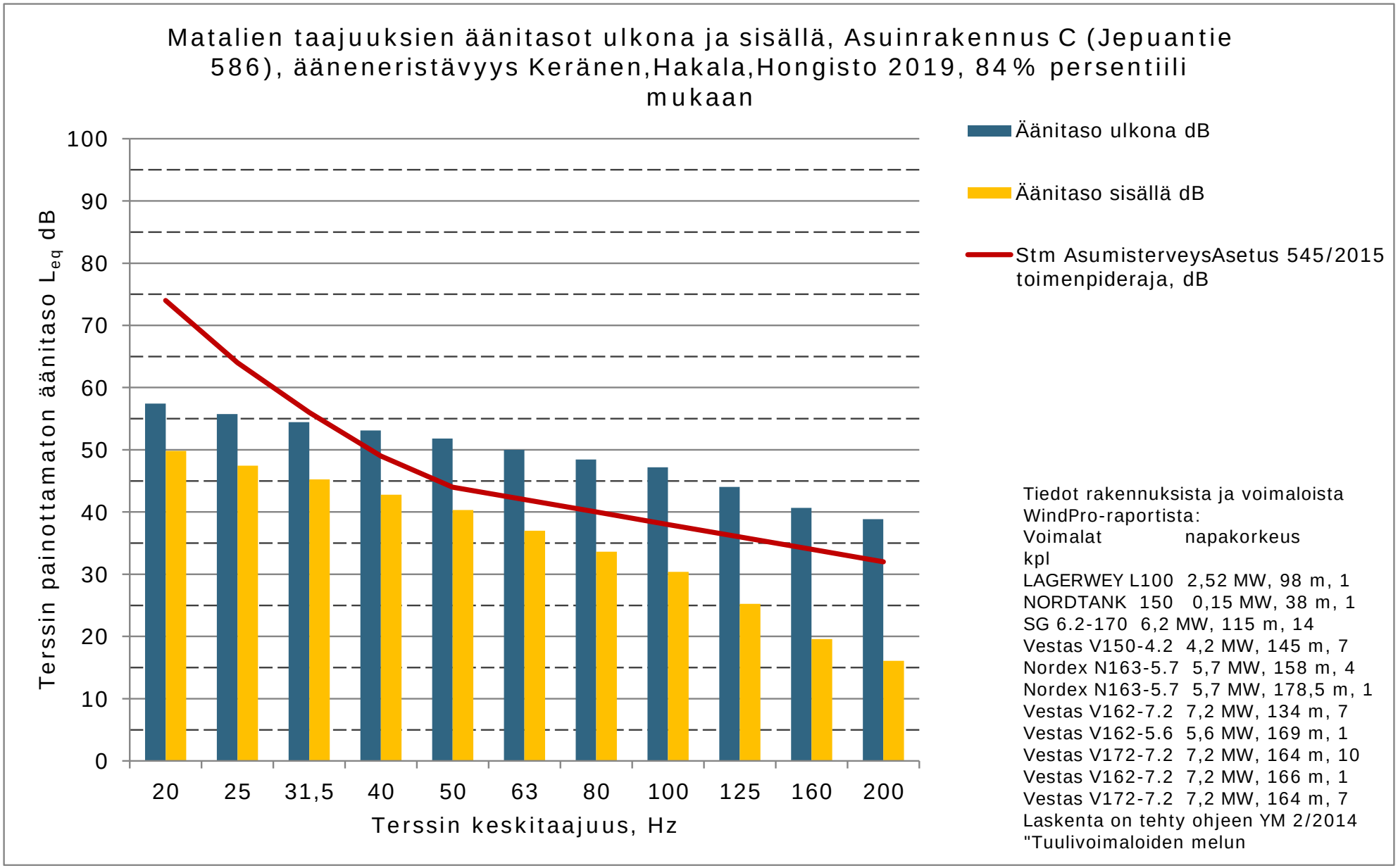
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

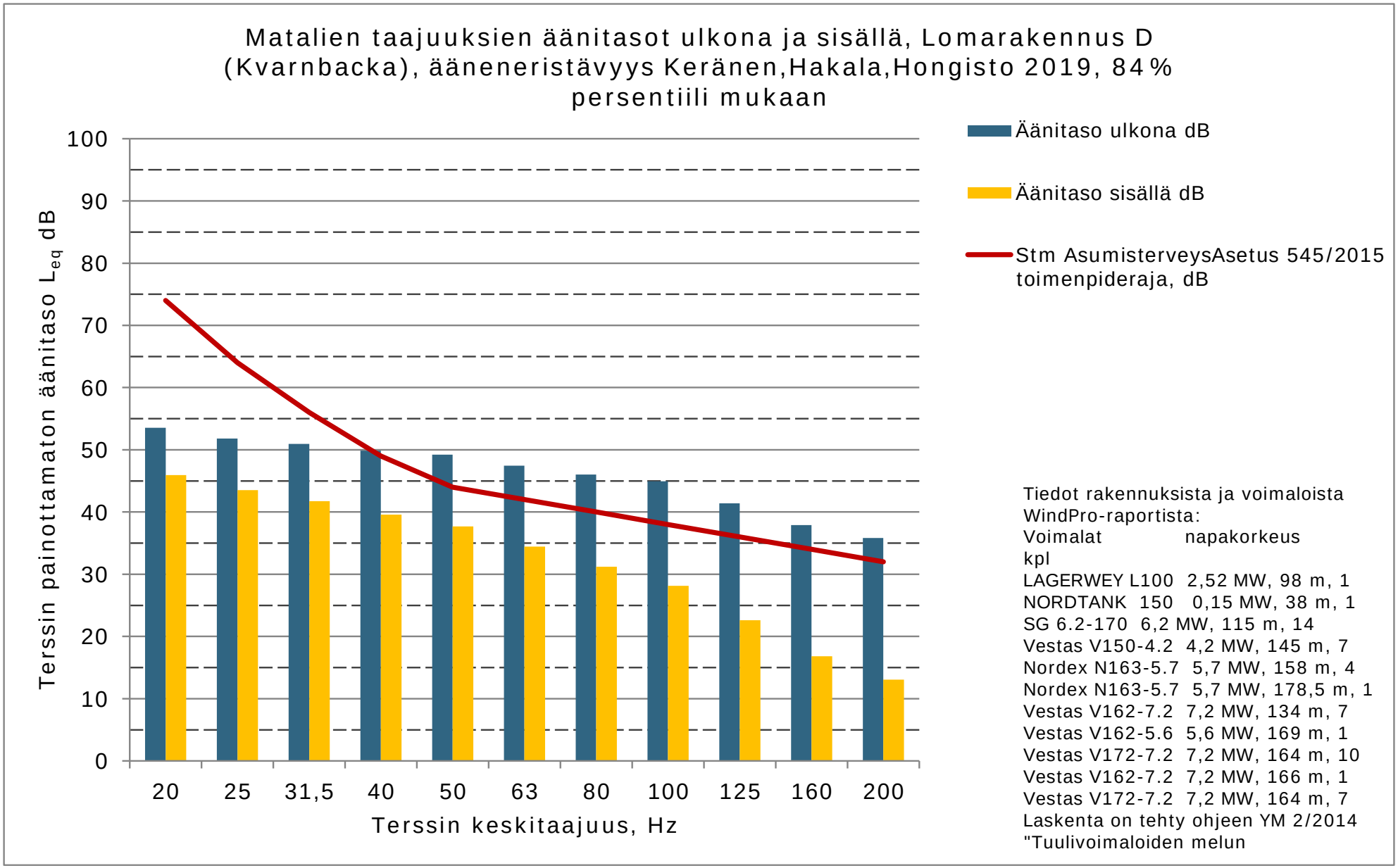


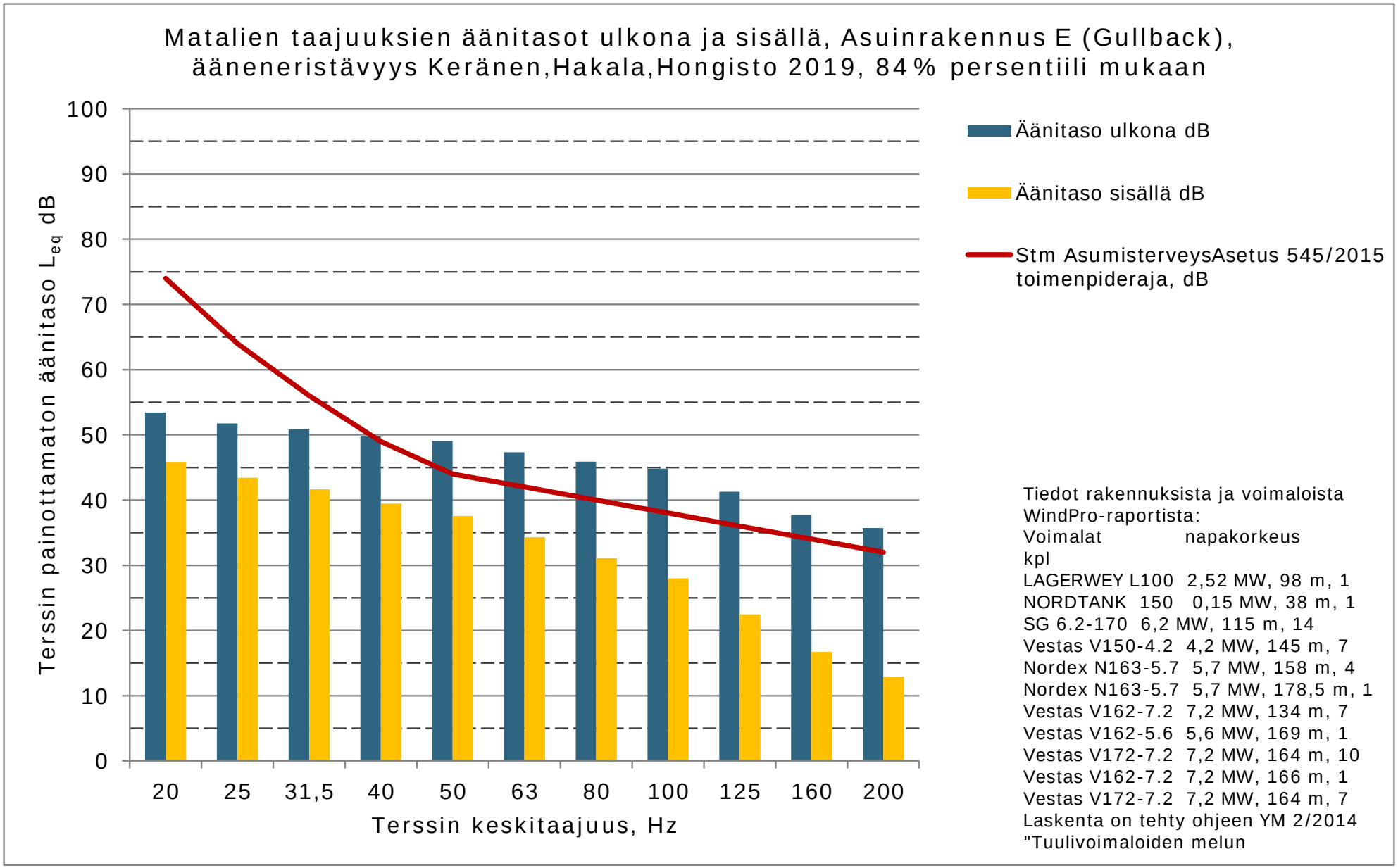
Tiedot rakennuksista ja voimaloista WindPro-raportista:

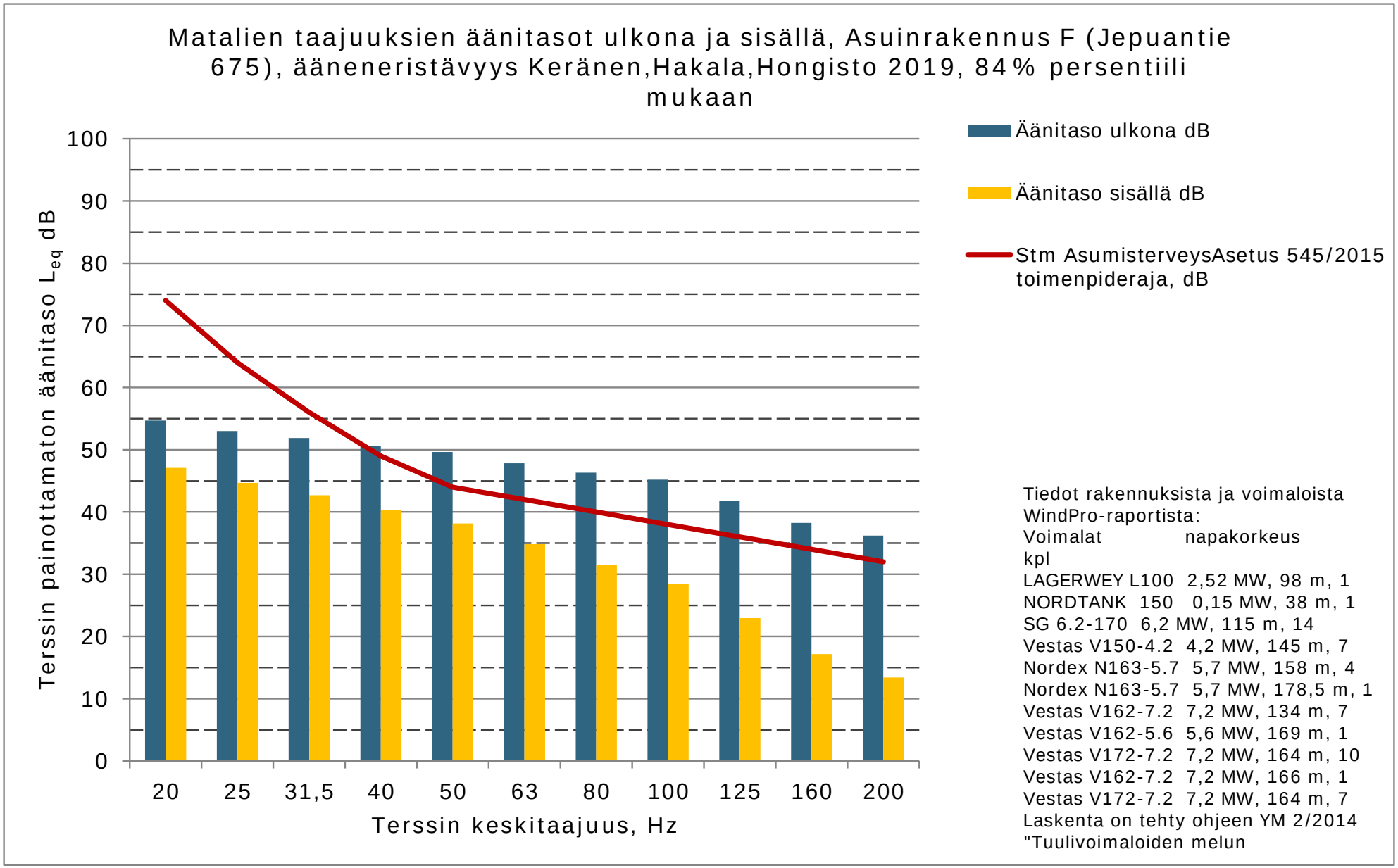
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7

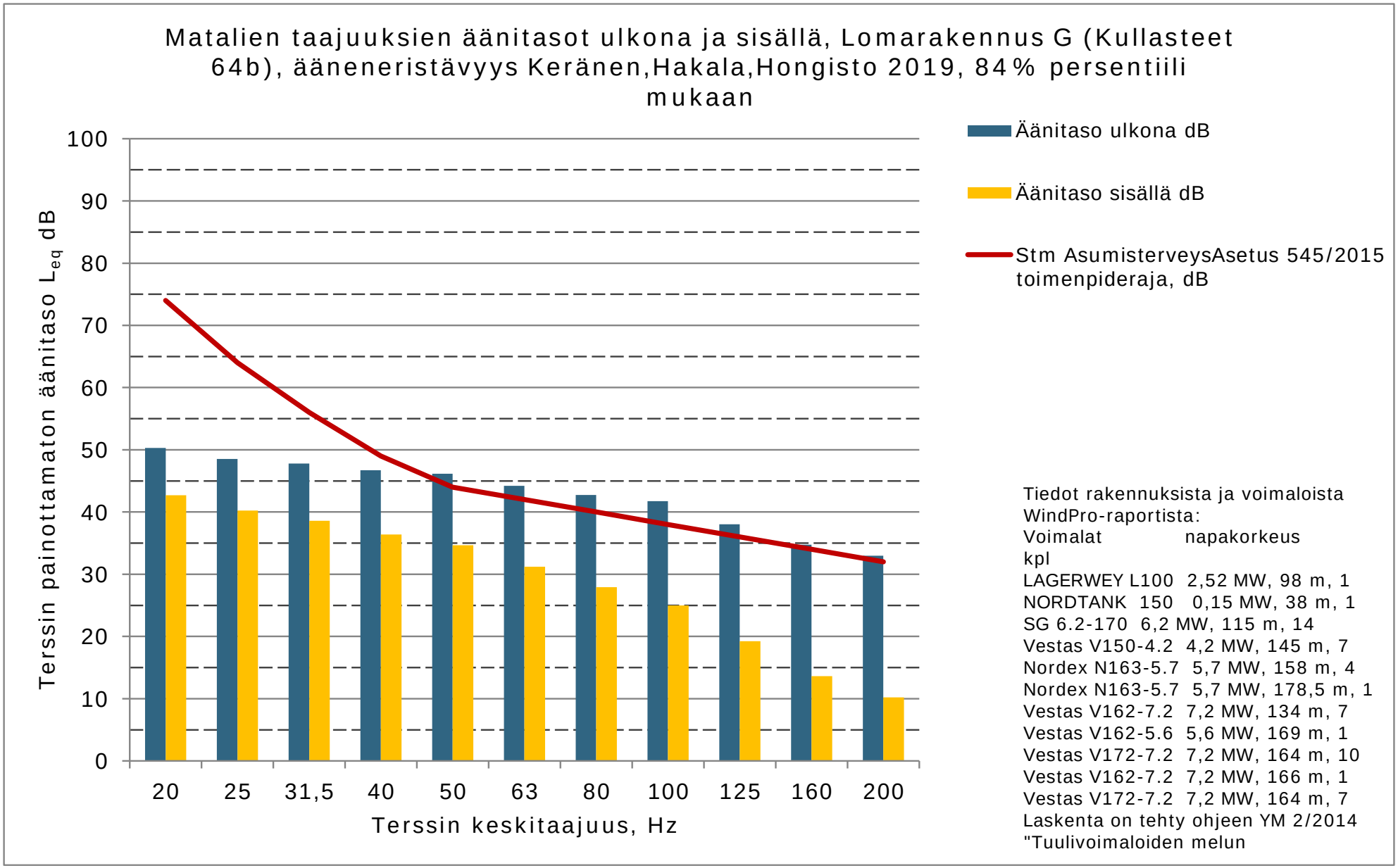
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

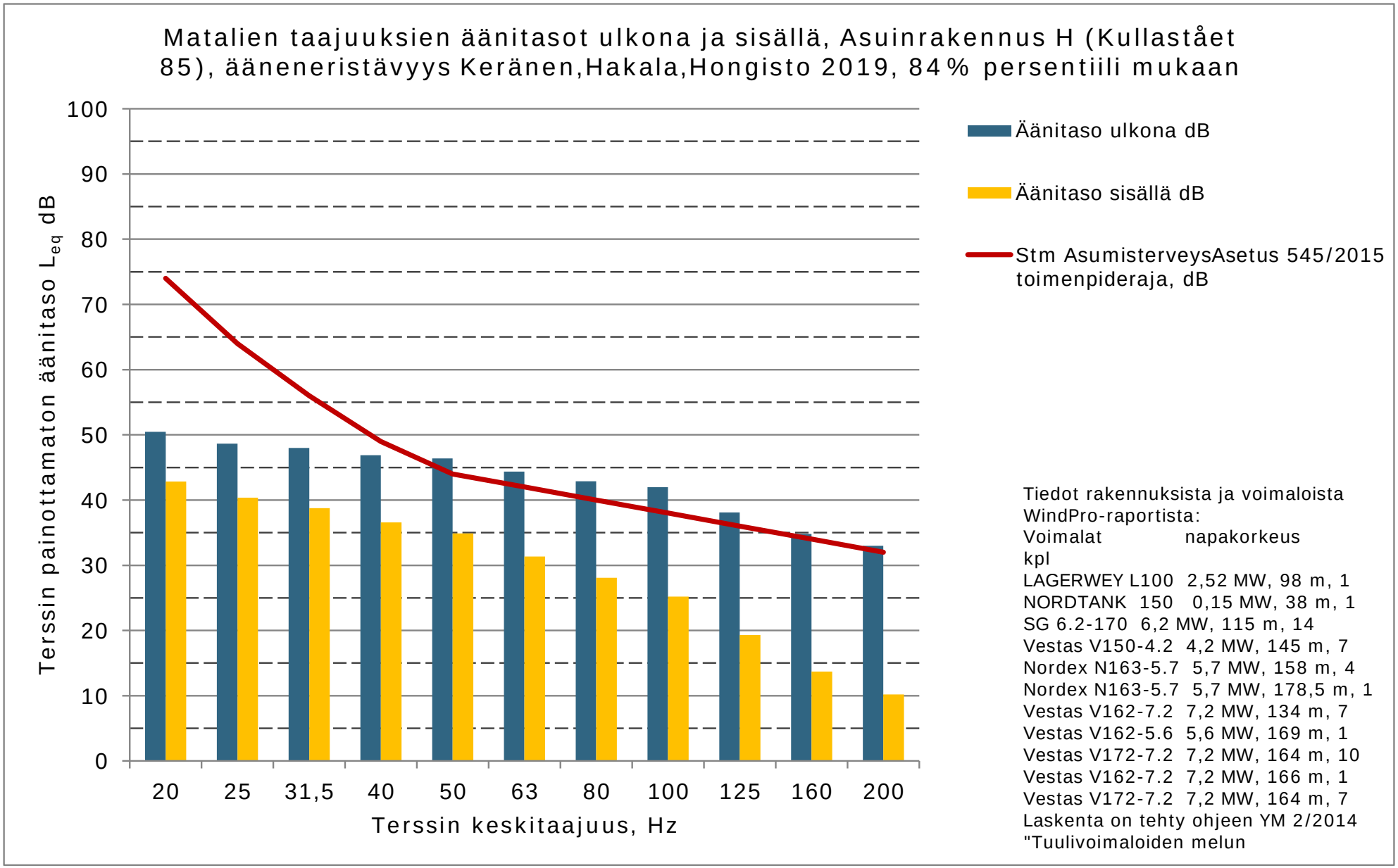

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Jepuantie 586), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

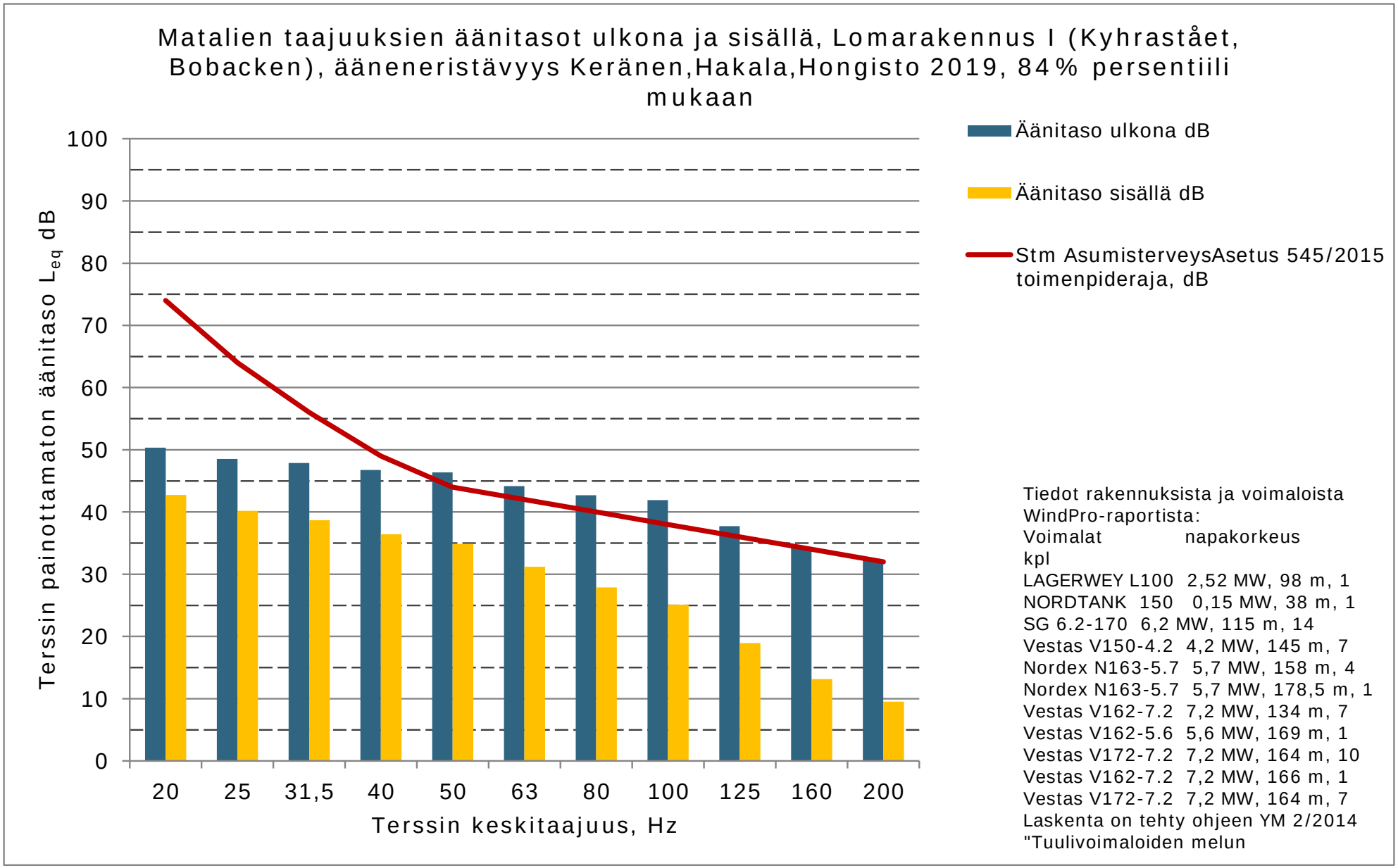

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D (Kvarnbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

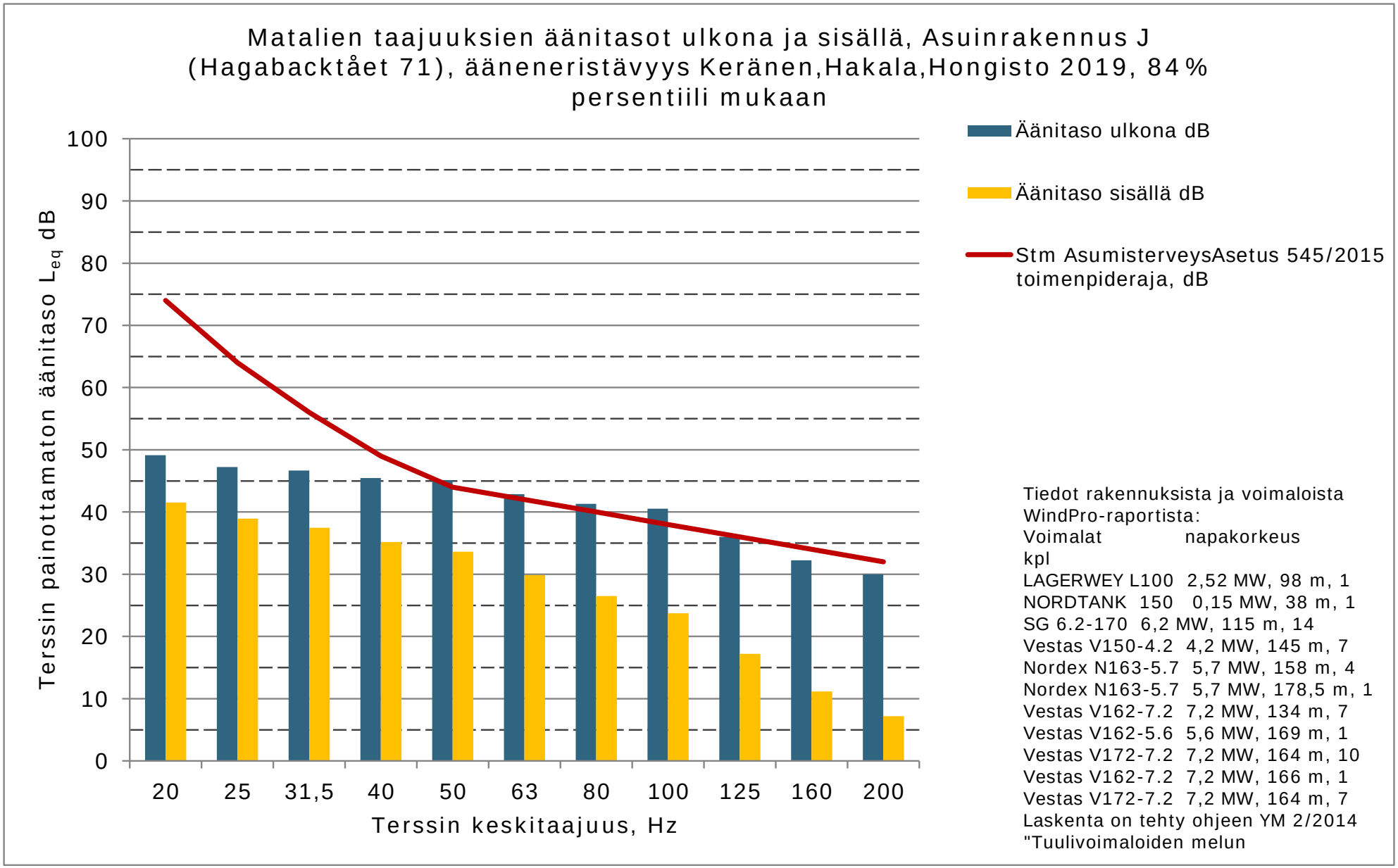

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Gullback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

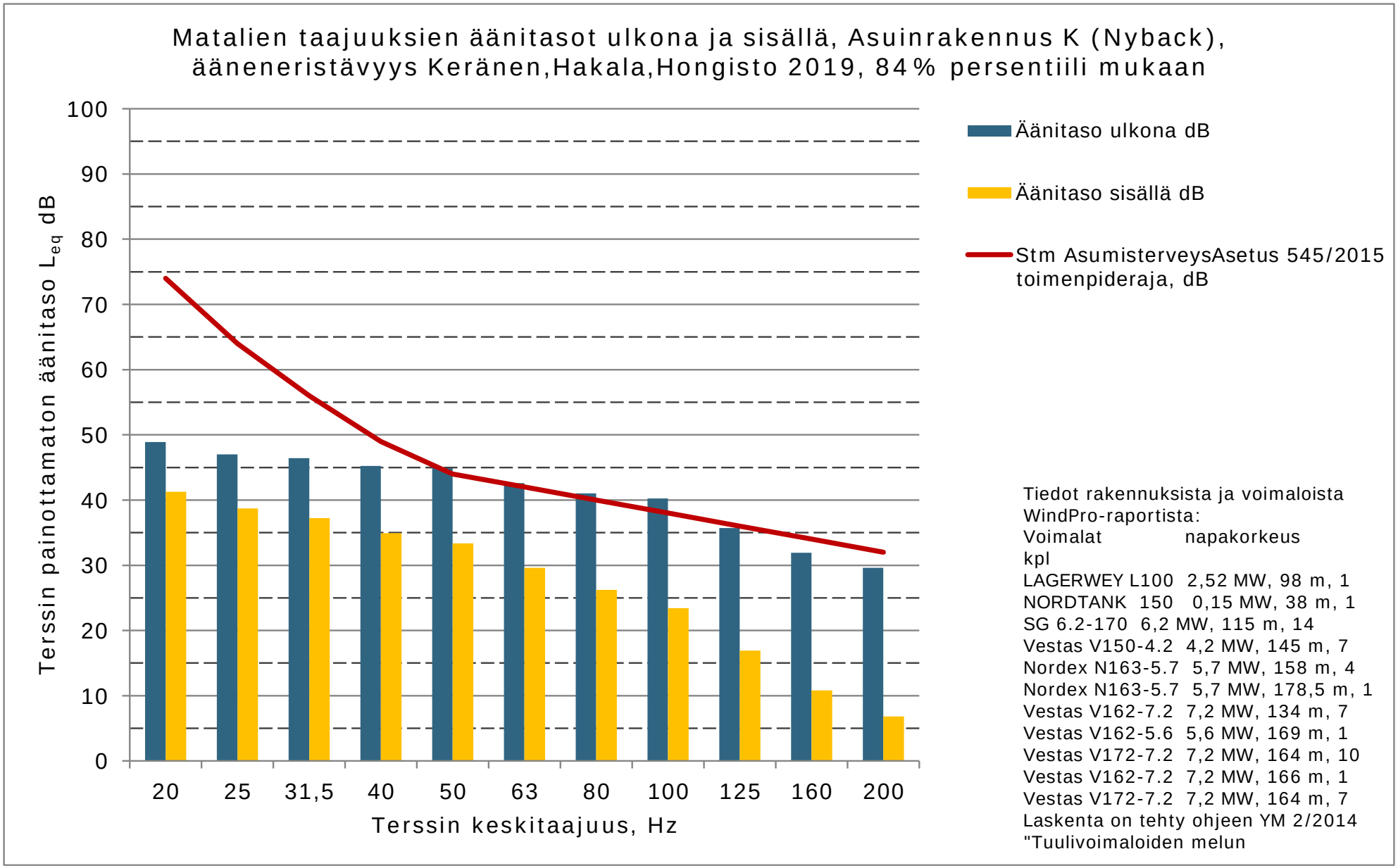

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Jepuantie 675), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

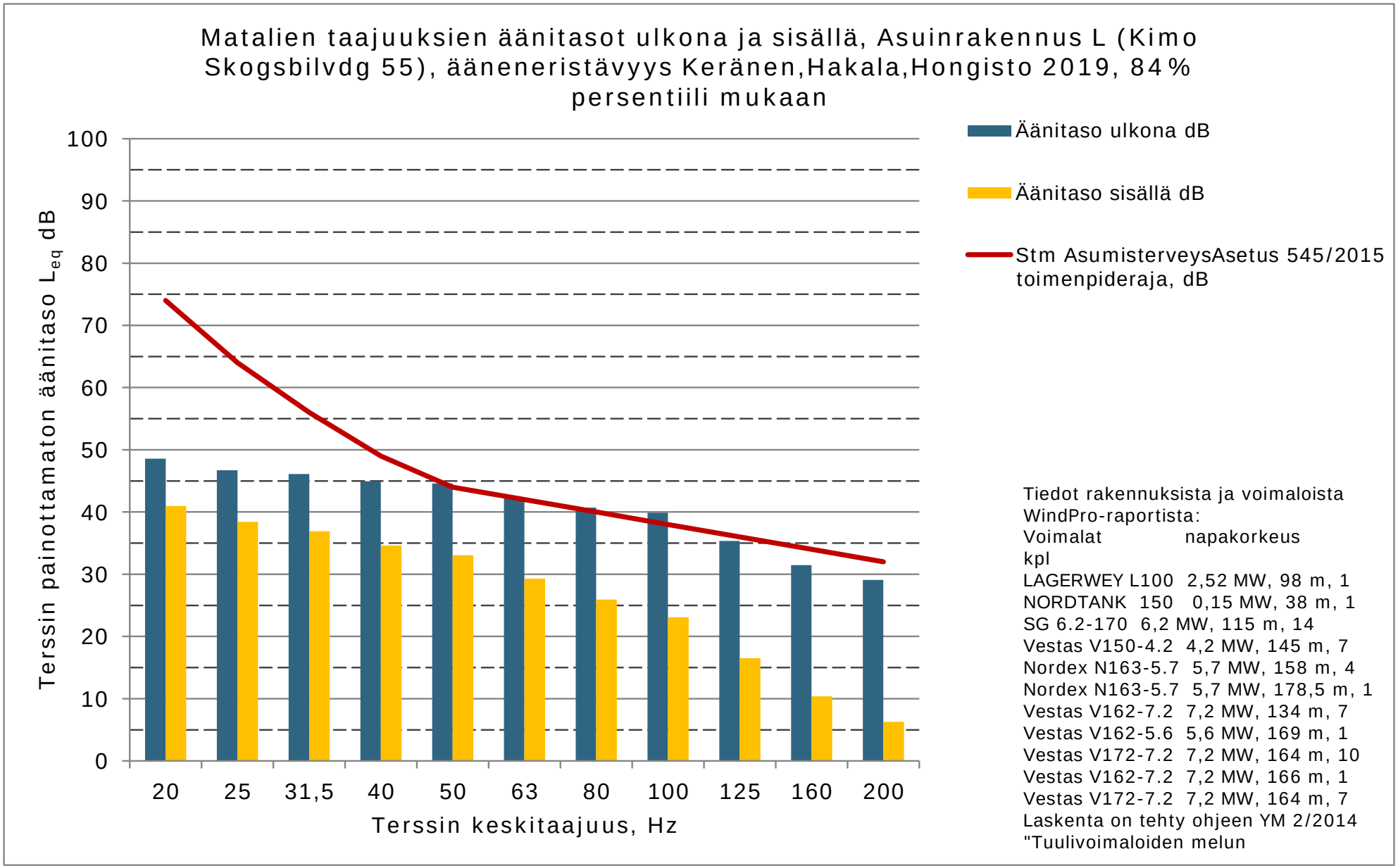

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Kullasteet 64b), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Kullastået 85), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

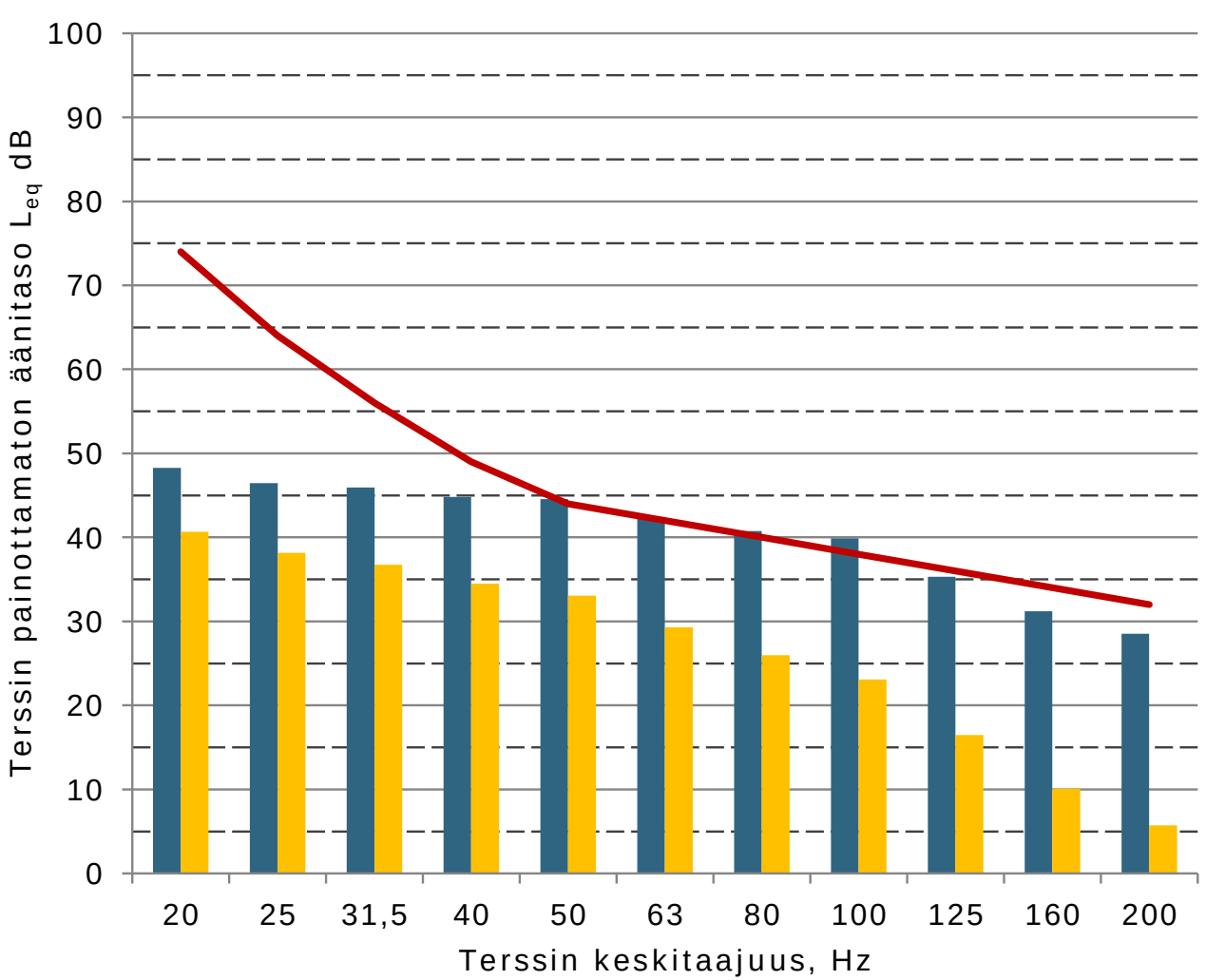

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Kyhrastået, Bobacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

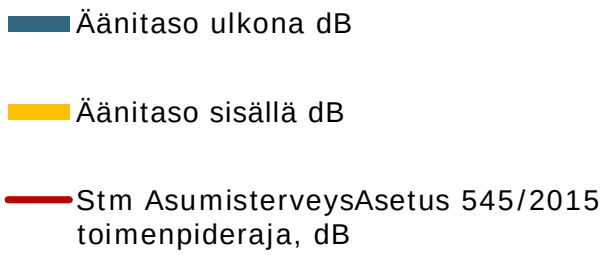

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Hagabacktået 71), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Nyback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Kimo Skogsbilvdg 55), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus M (Fårmossen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

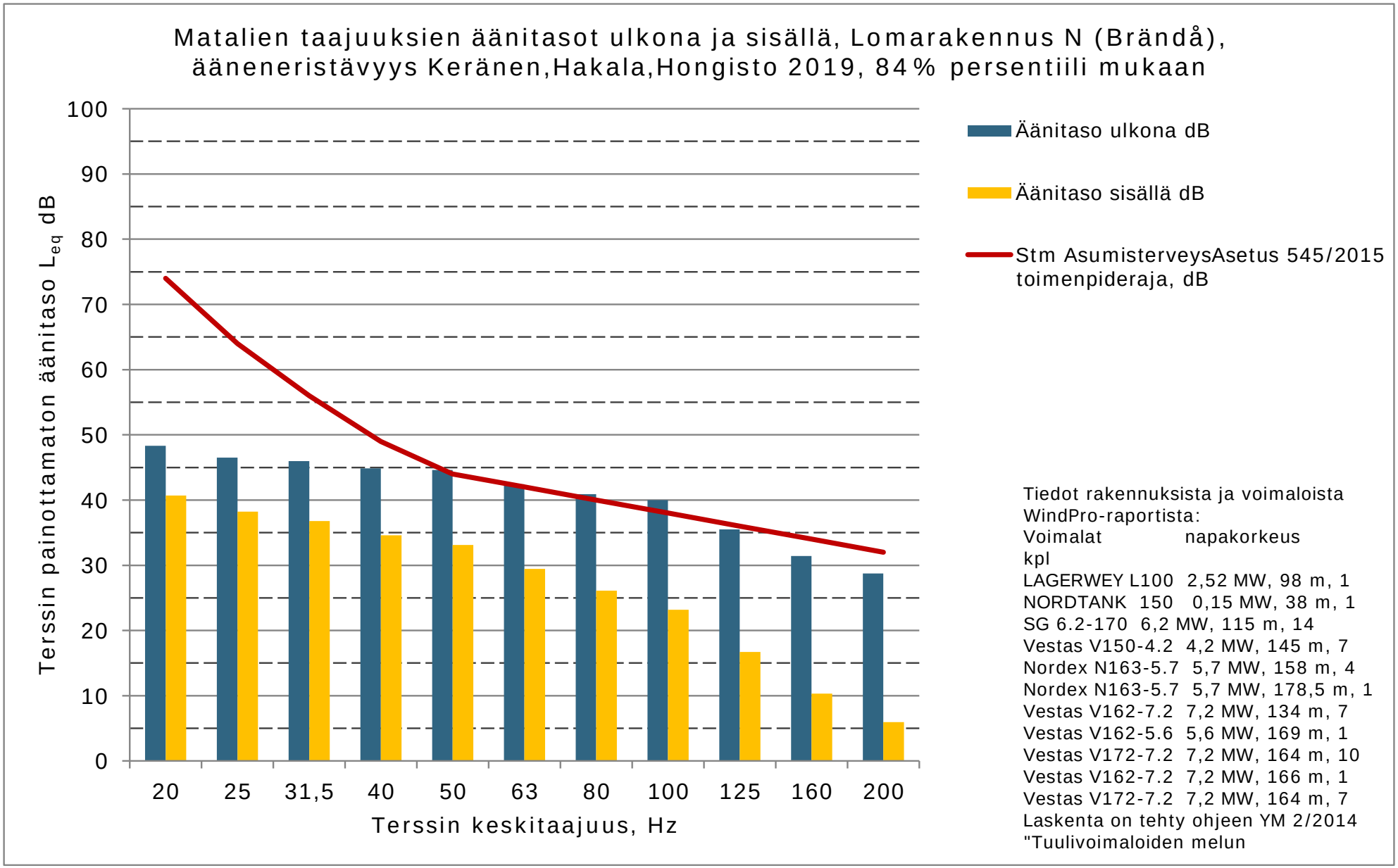




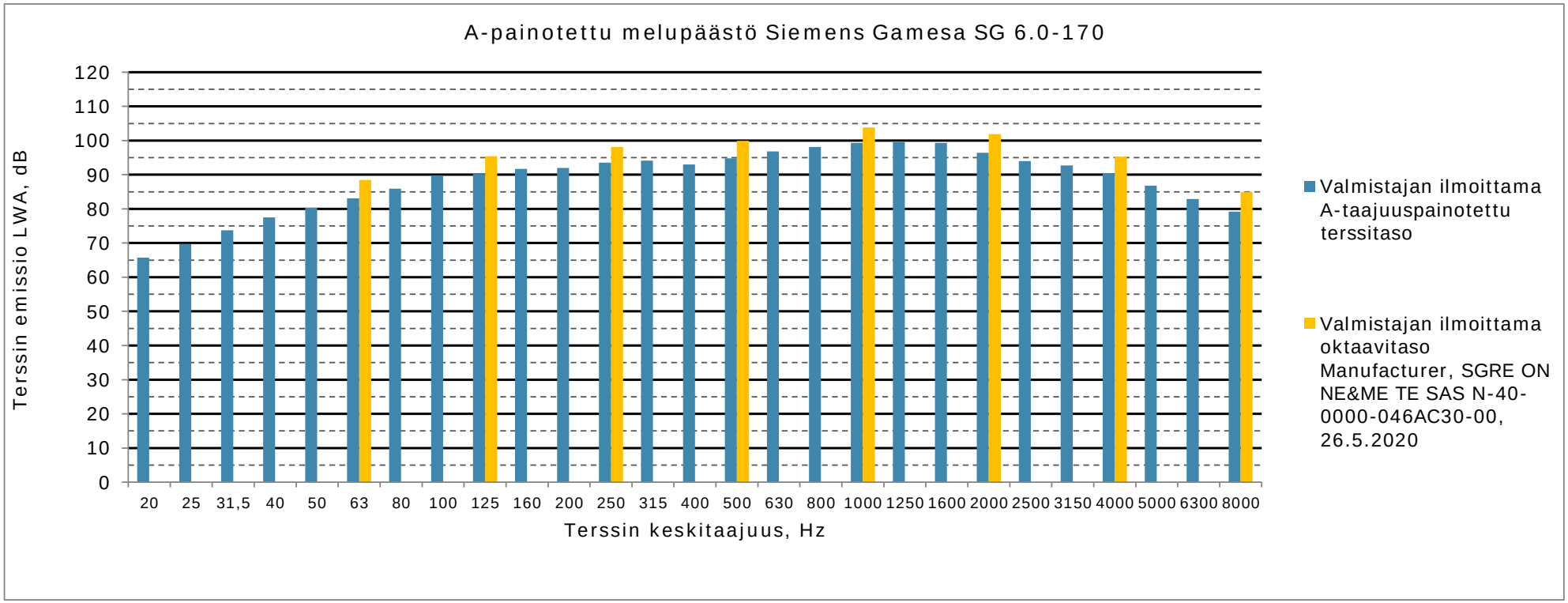
Tiedot rakennuksista ja voimaloista WindPro-raportista:

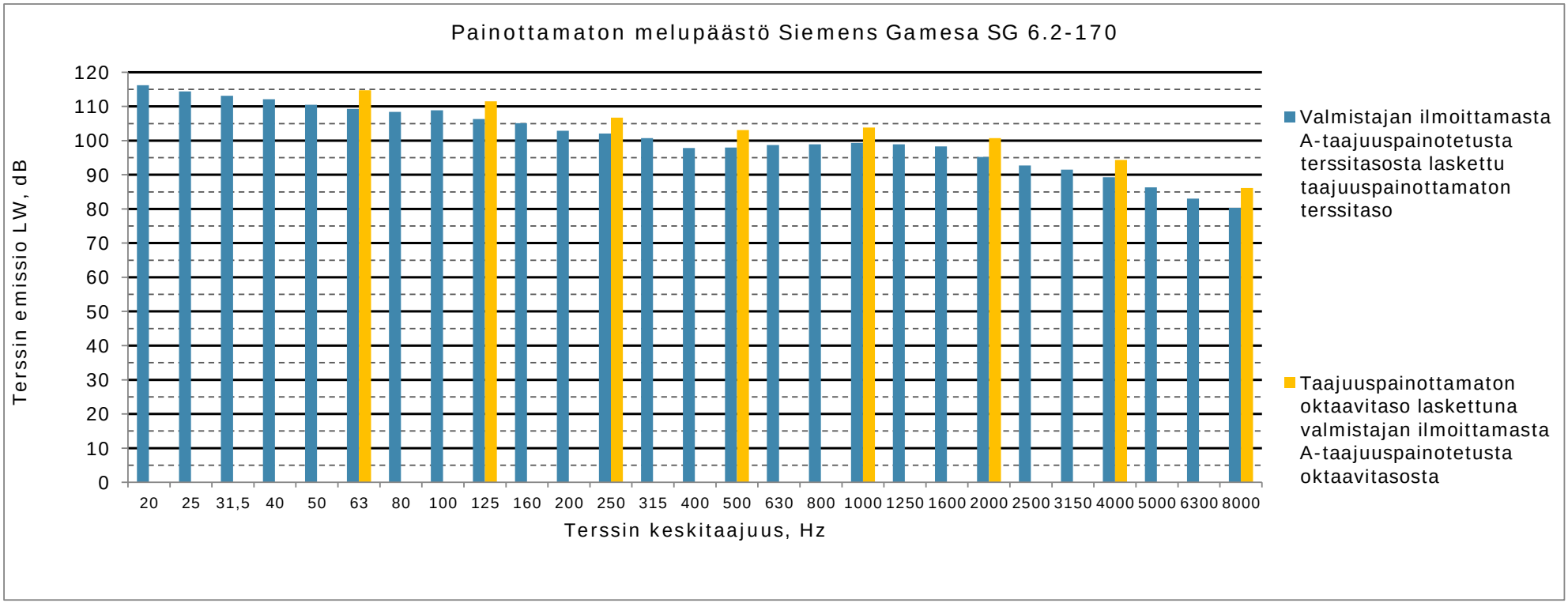
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7

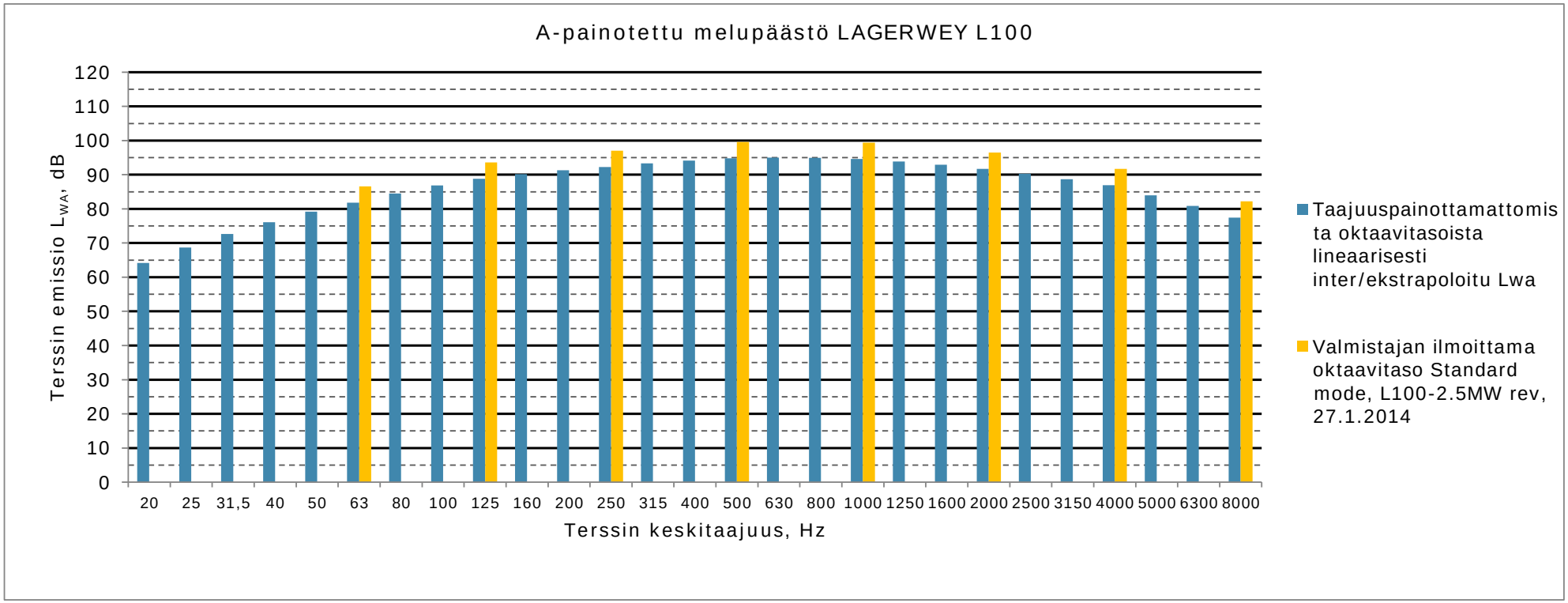
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

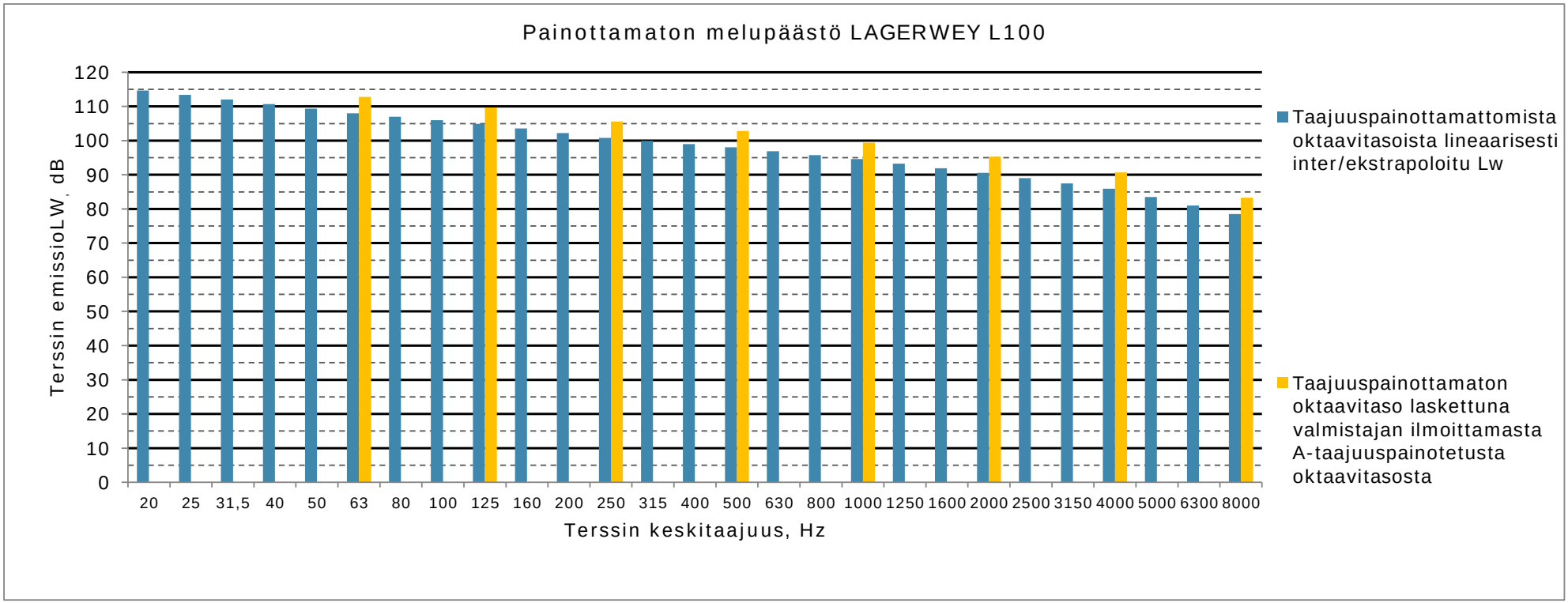

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Brändå), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun

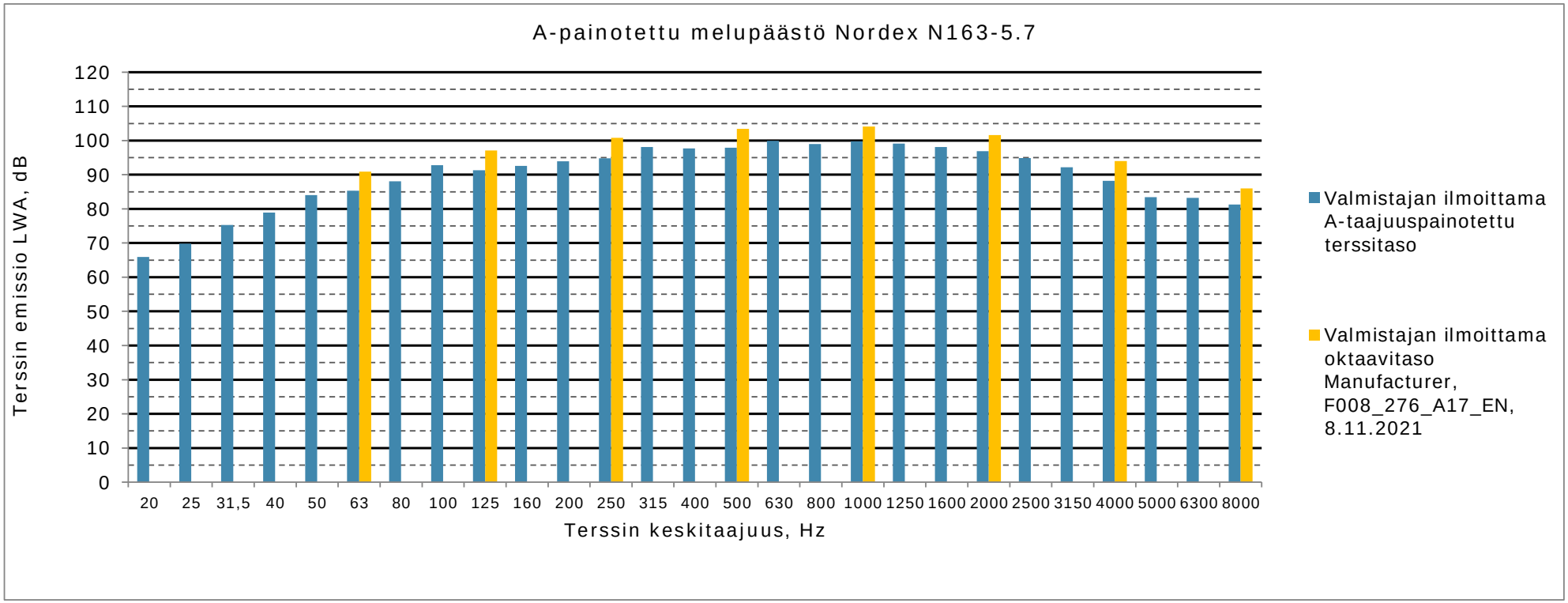
Bilaga 5. Vargitmossens vindkraftsprojekt – byggnadsspecifika värden för lågfrekvent buller i projektalternativ 1 (ALT1)

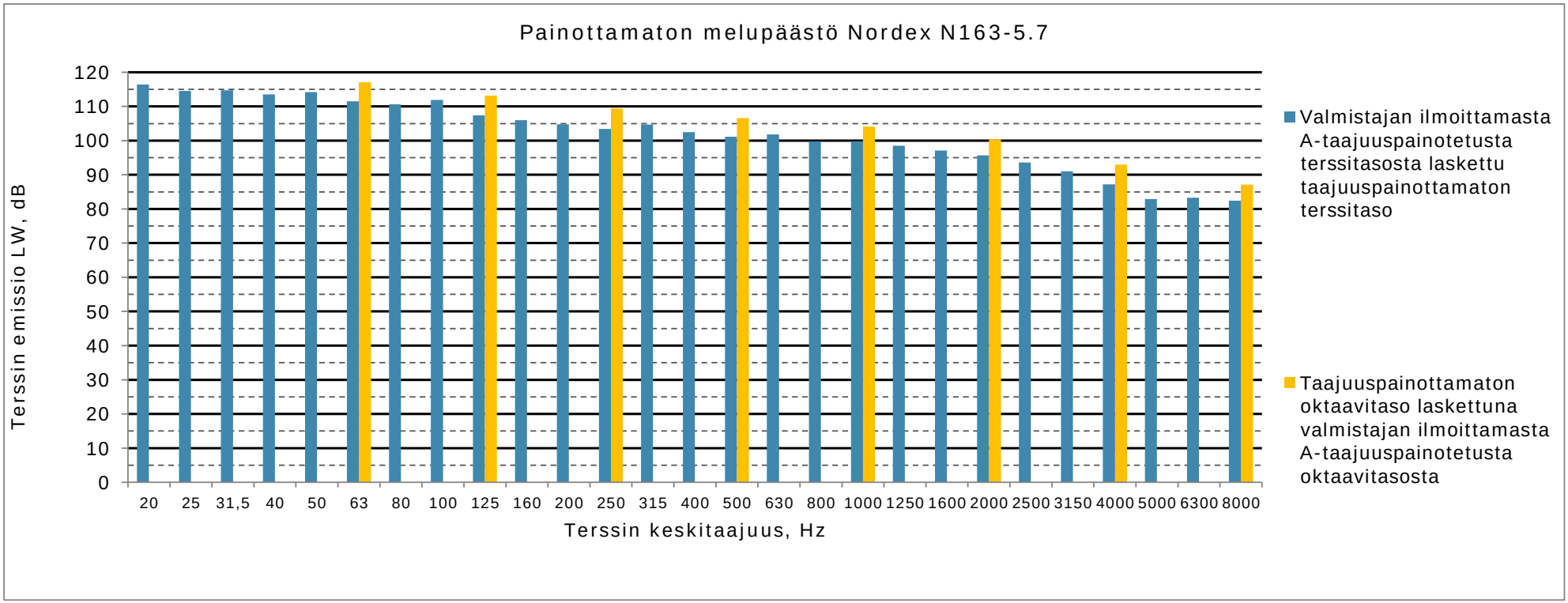

A-painotettu melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

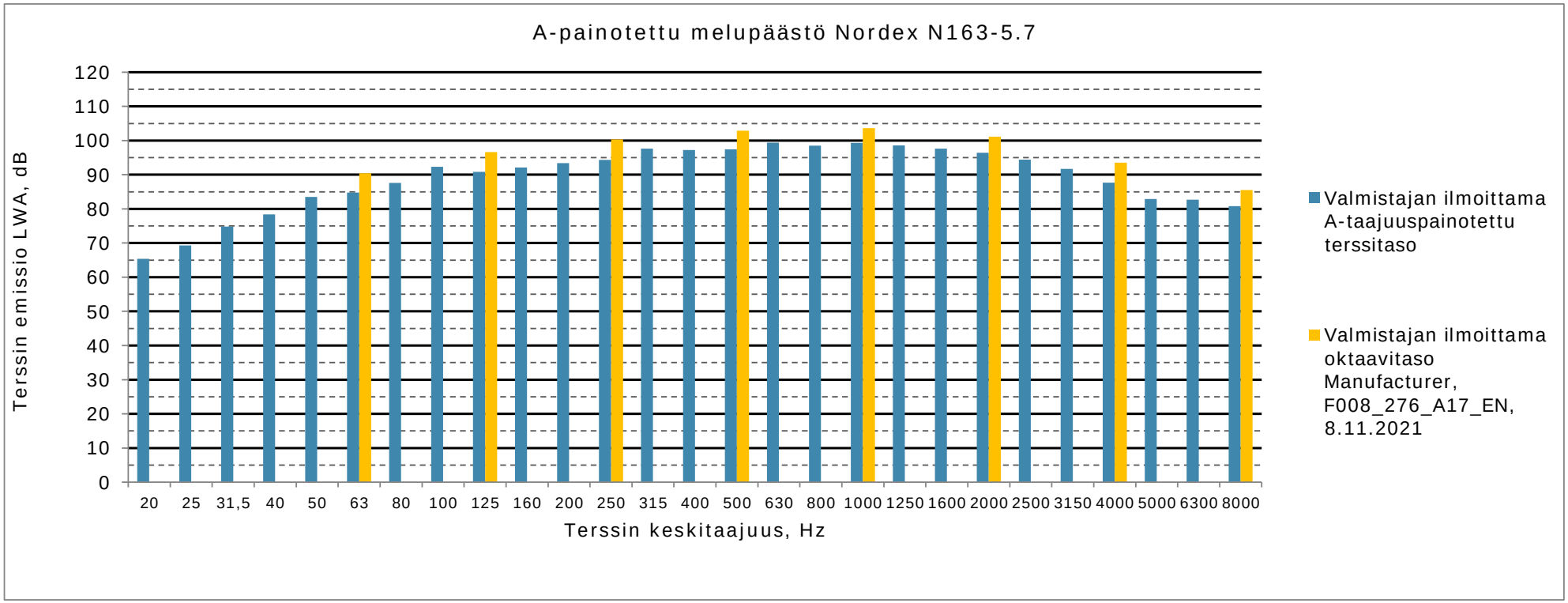

Painottamaton melupäästö Siemens Gamesa SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

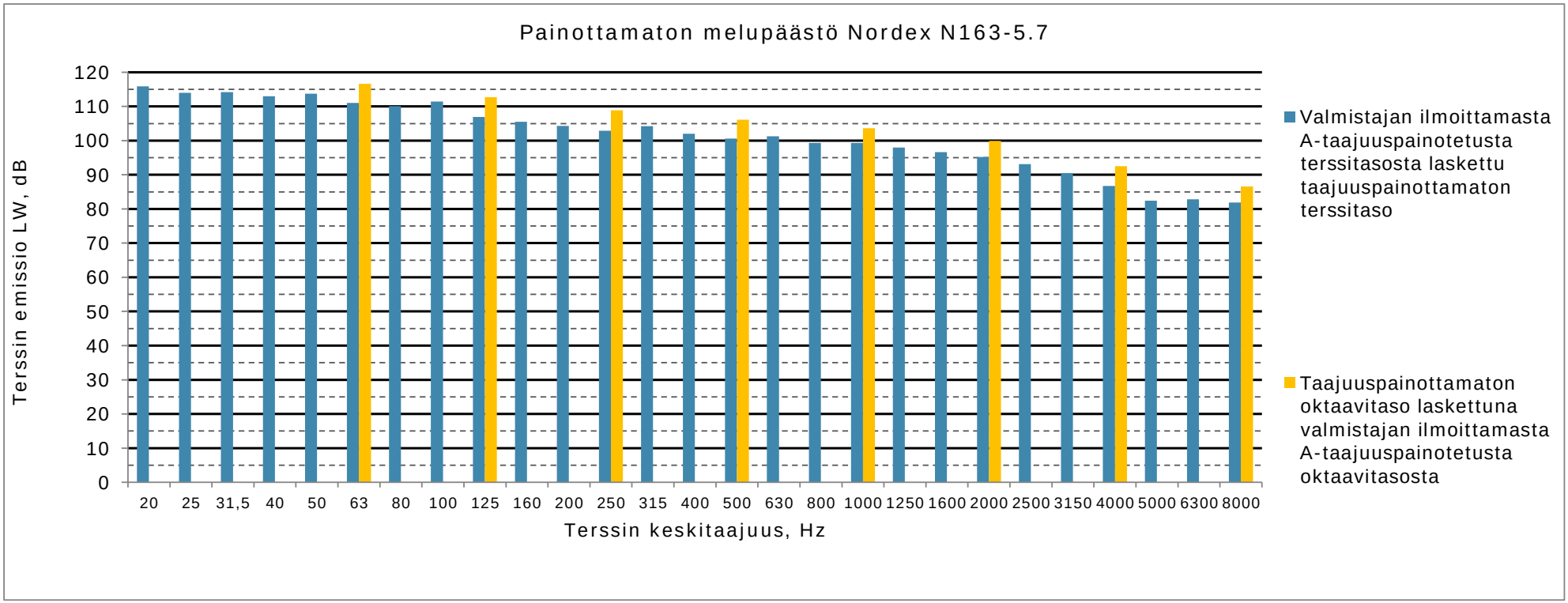

A-painotettu melupäästö LAGERWEY L100
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Standard mode, L100-2.5MW rev, 27.1.2014

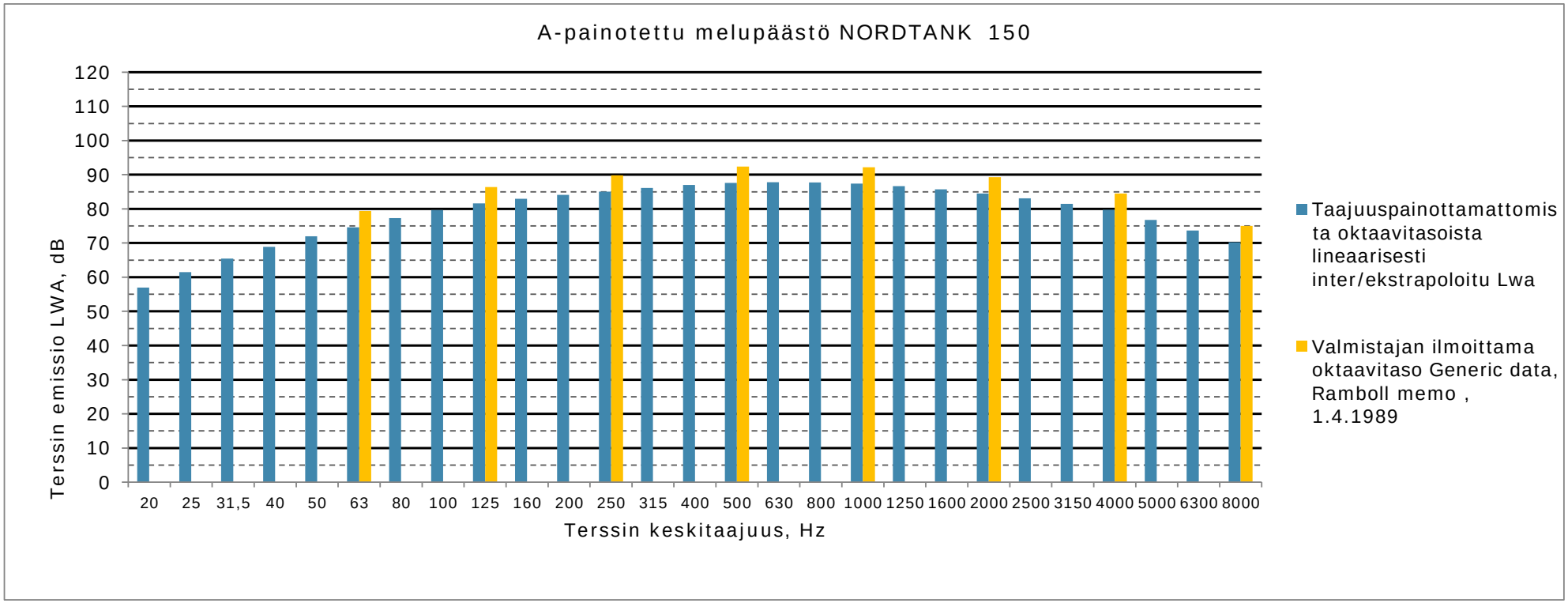

Painottamaton melupäästö LAGERWEY L100
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

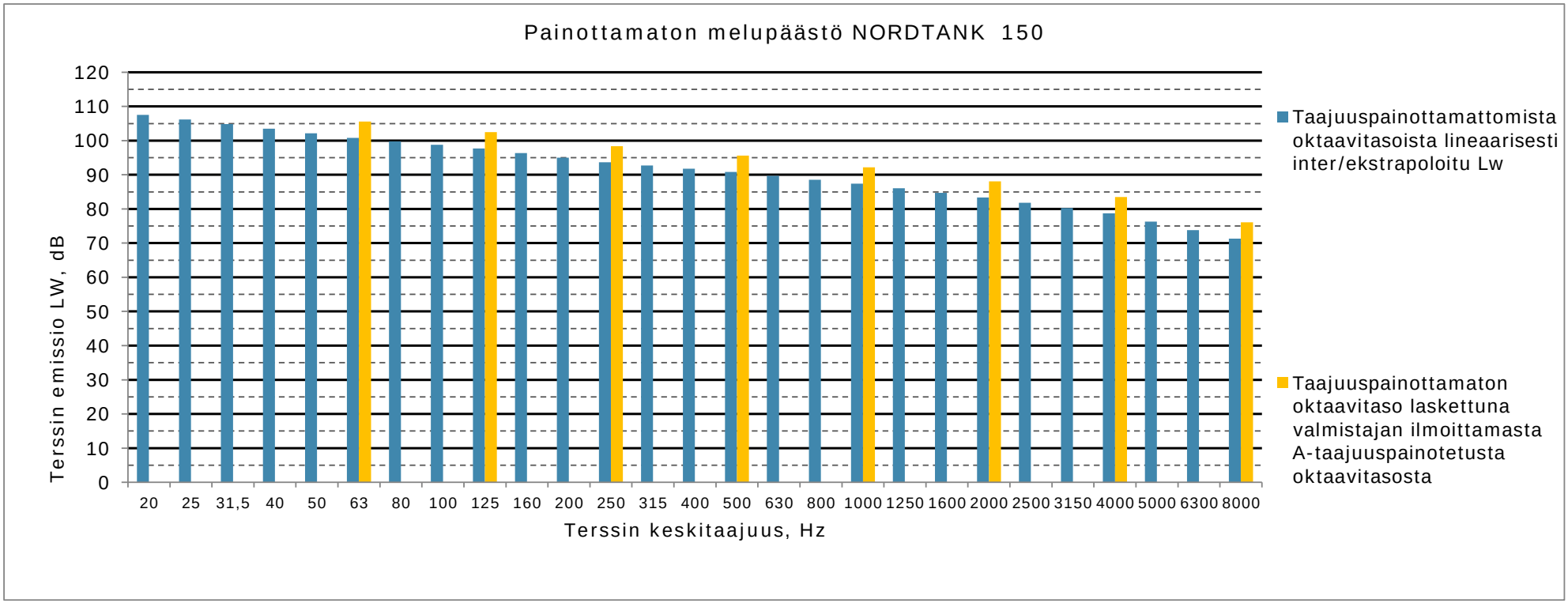

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

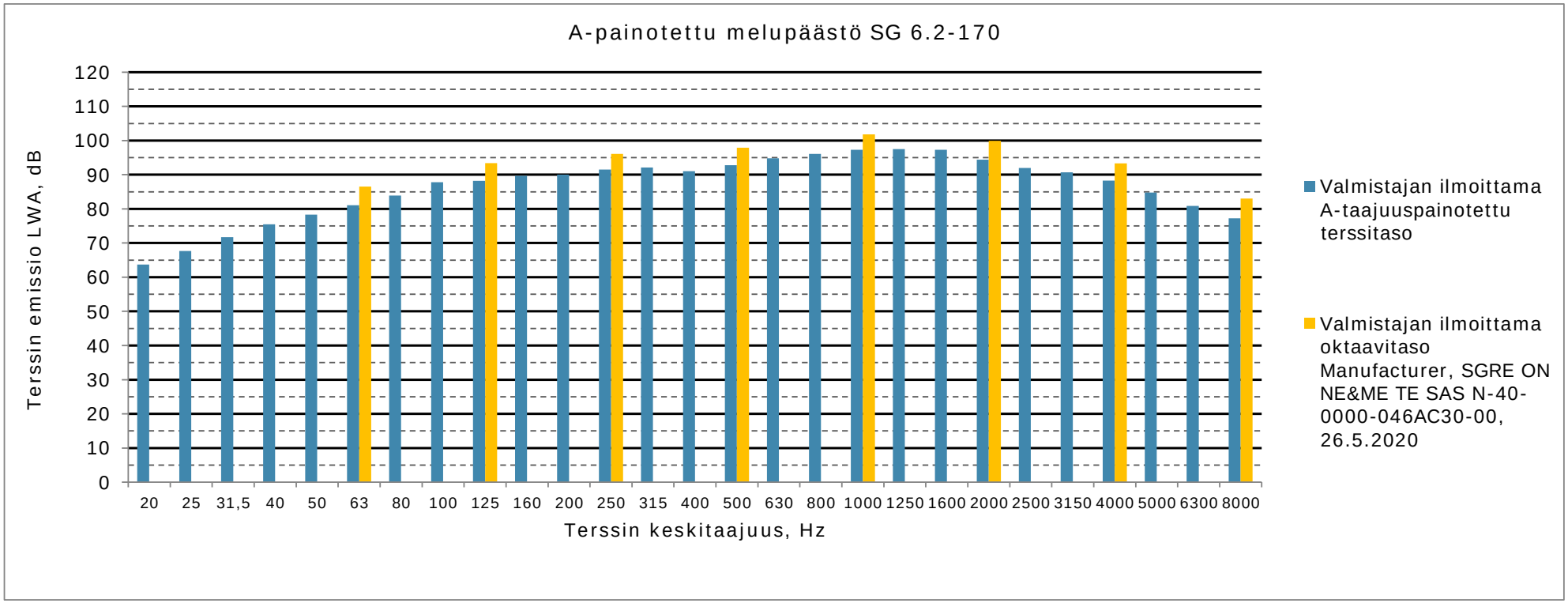

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

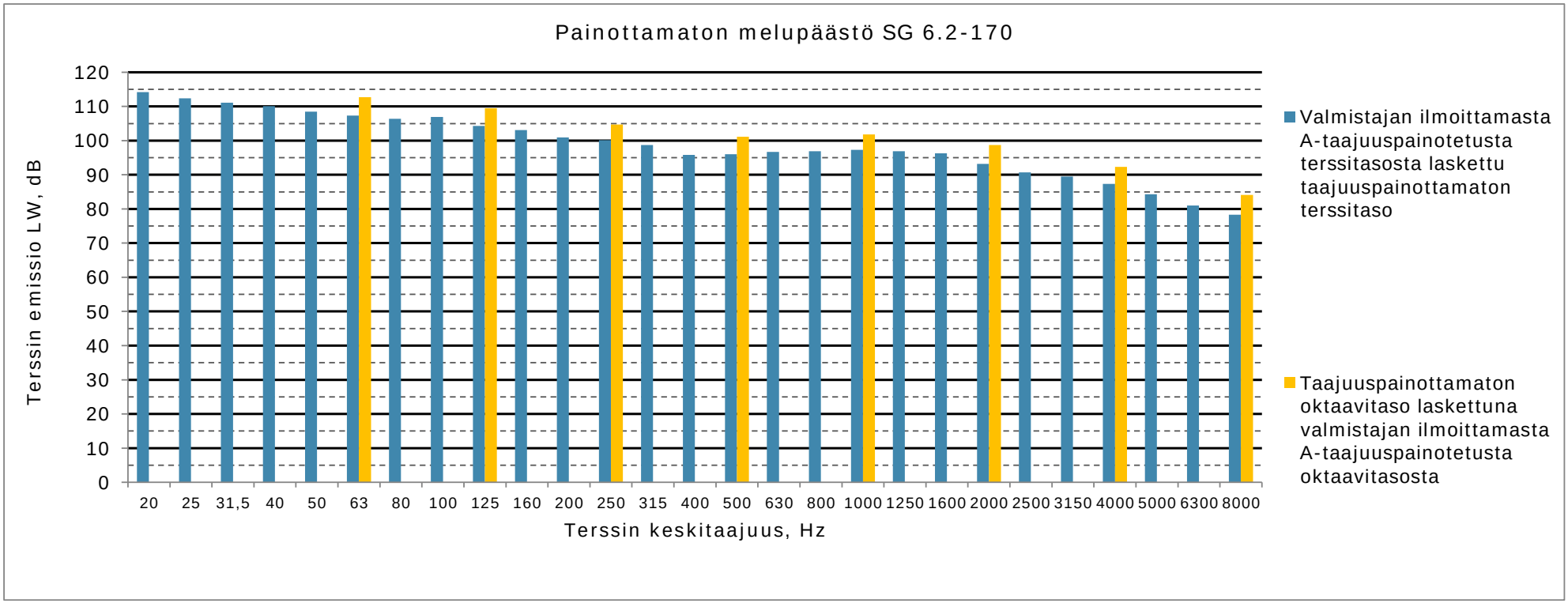

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

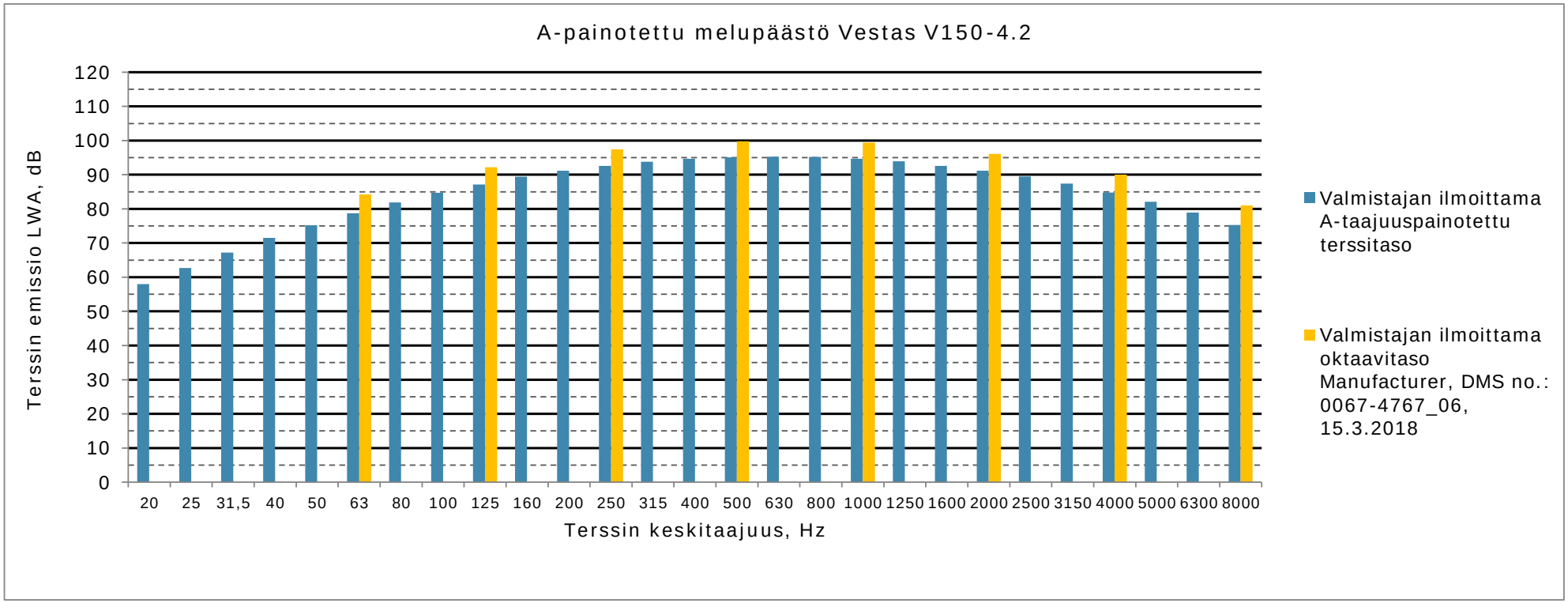

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

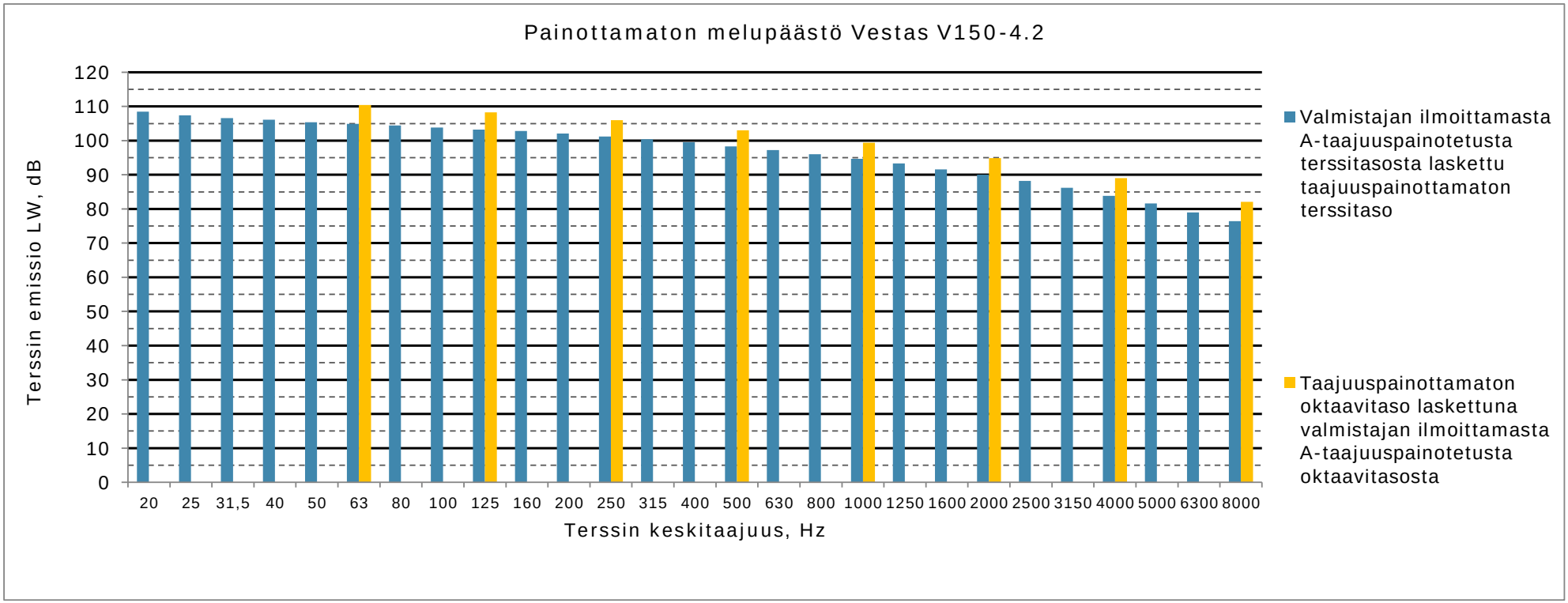

A-painotettu melupäästö NORDTANK 150
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Generic data, Ramboll memo , 1.4.1989

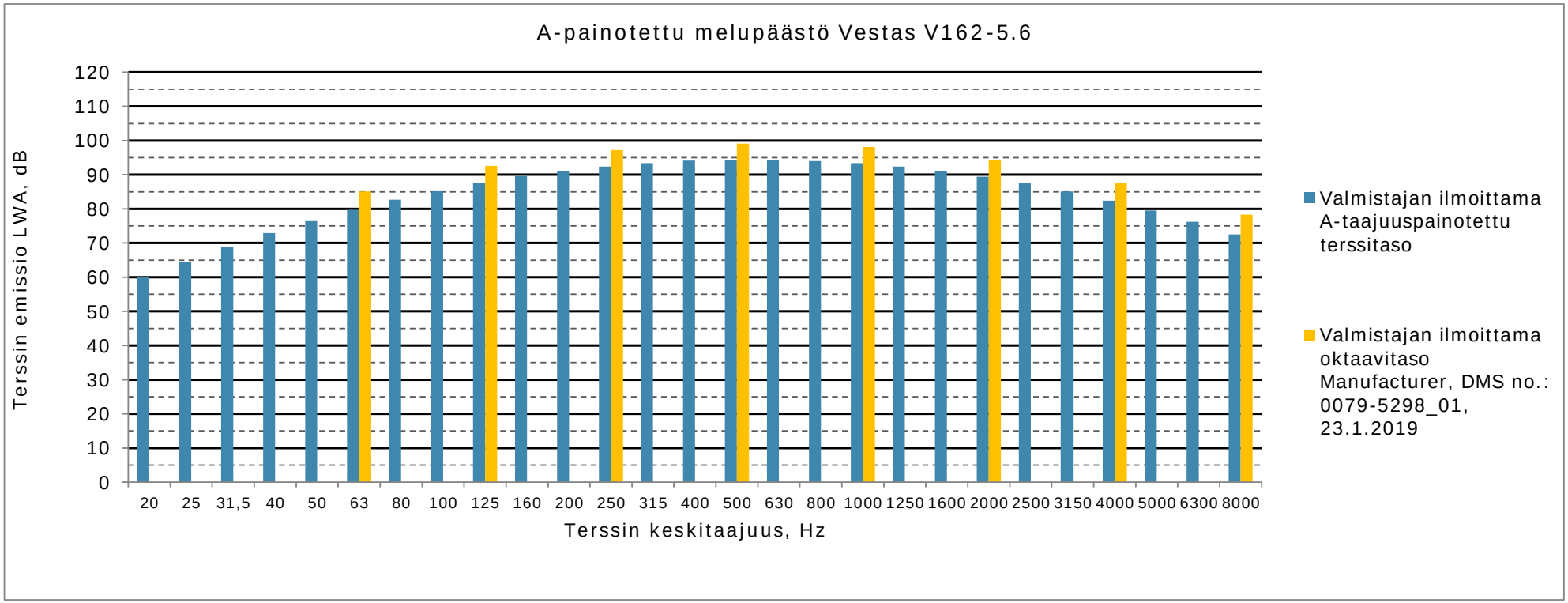

Painottamaton melupäästö NORDTANK 150
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

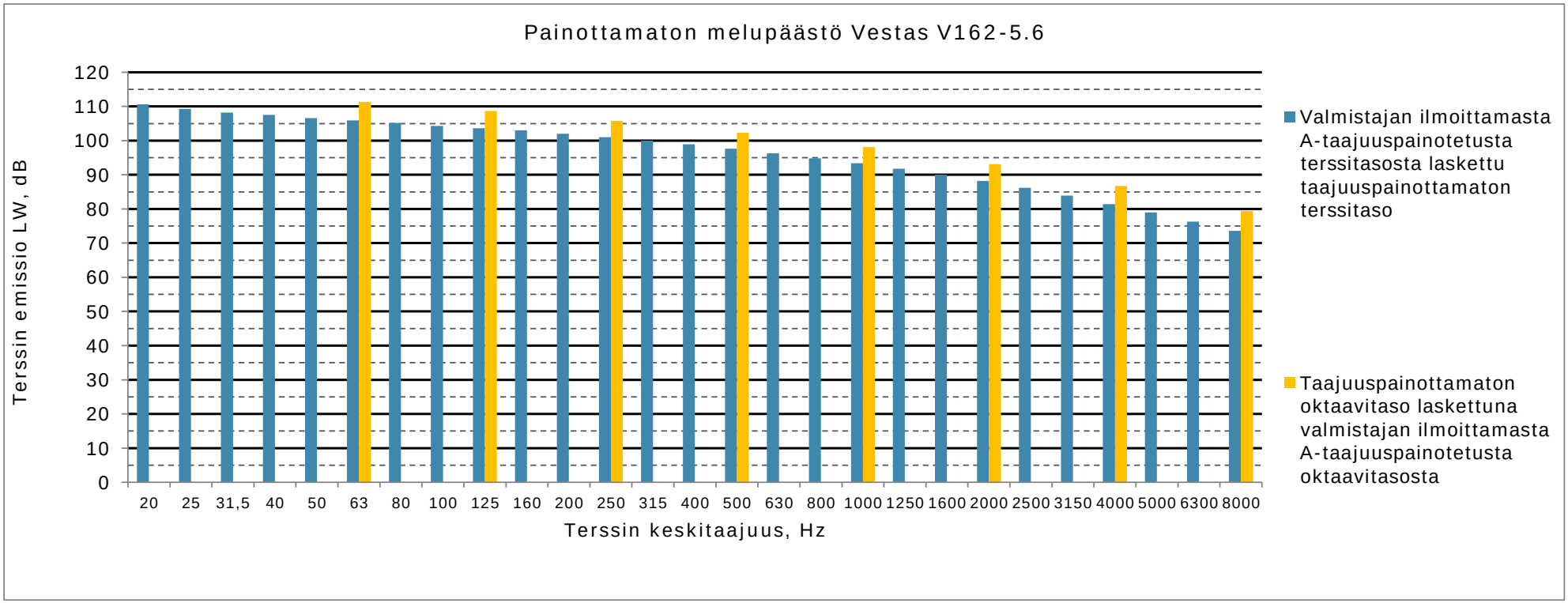

A-painotettu melupäästö SG 6.2-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

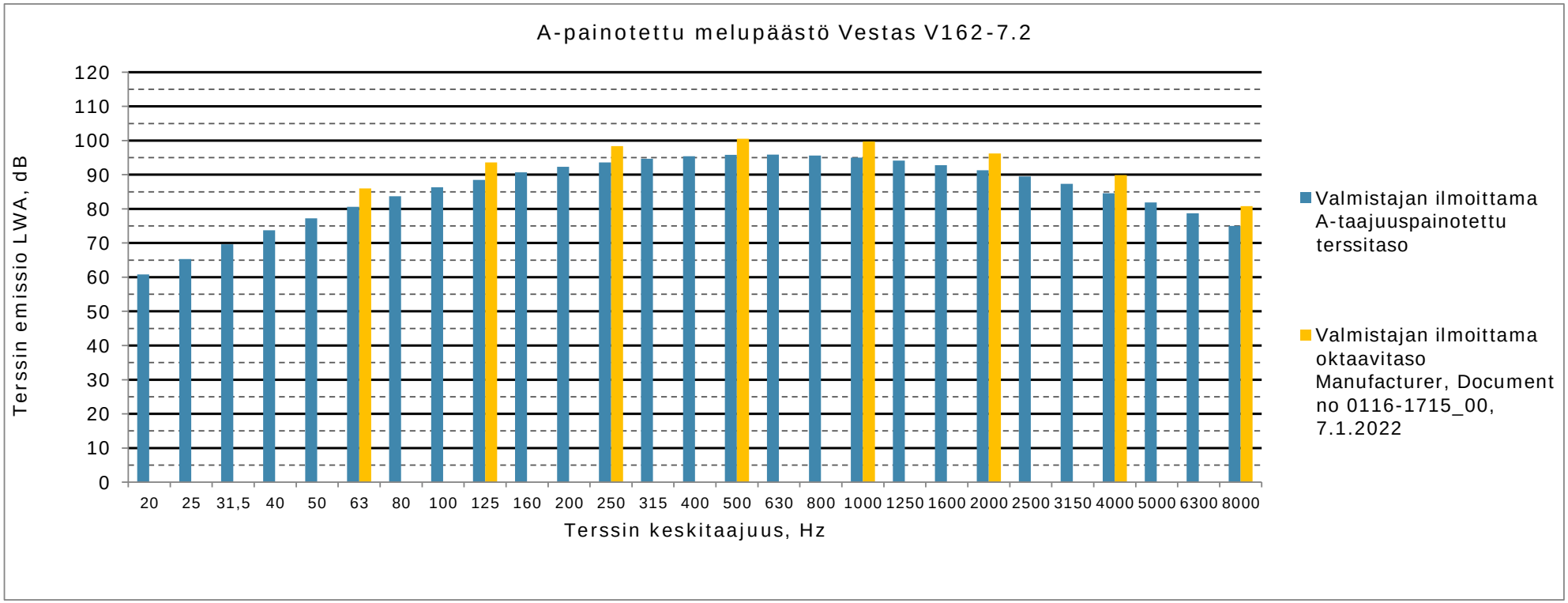

Painottamaton melupäästö SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

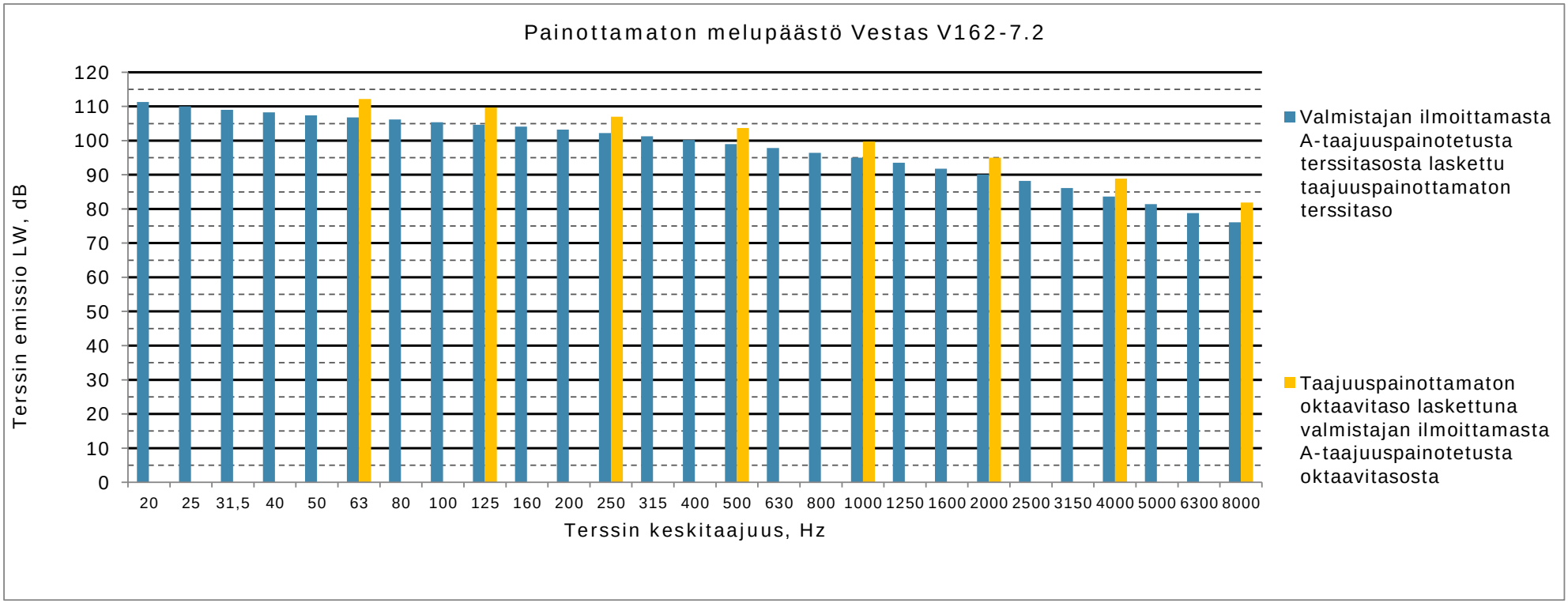

A-painotettu melupäästö Vestas V150-4.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0067-4767_06, 15.3.2018

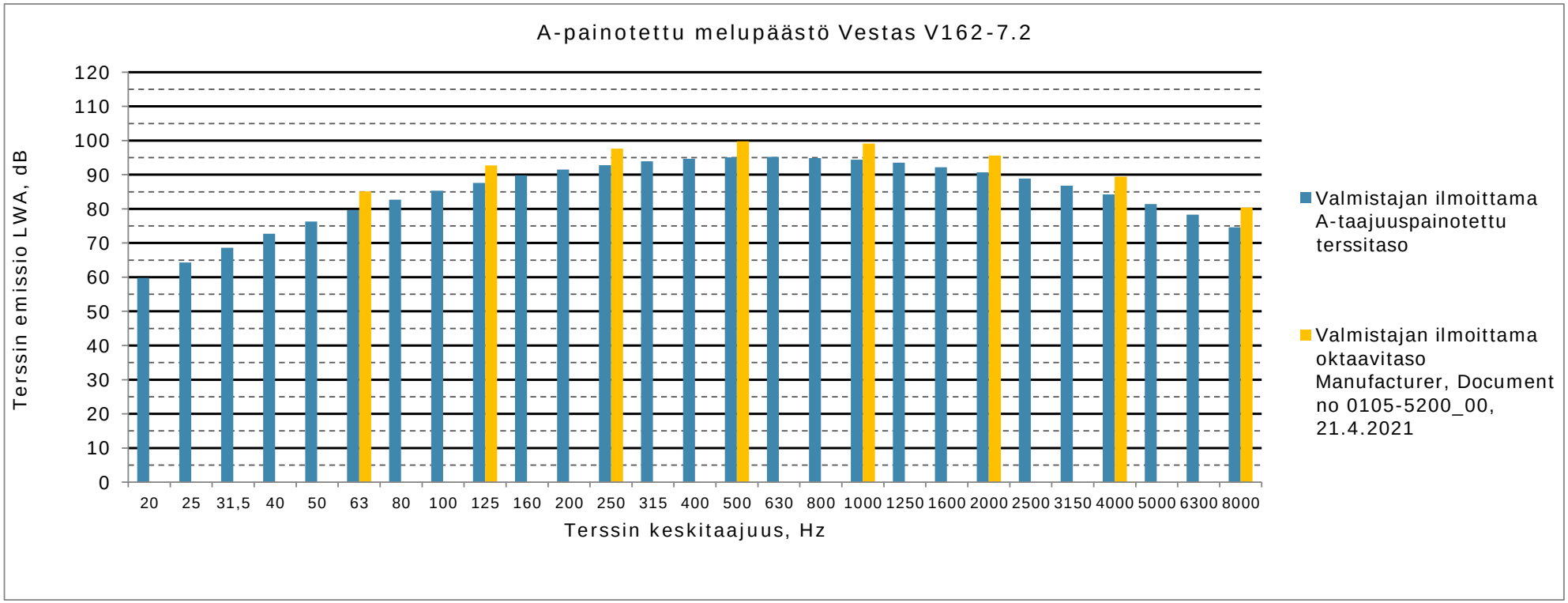

Painottamaton melupäästö Vestas V150-4.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

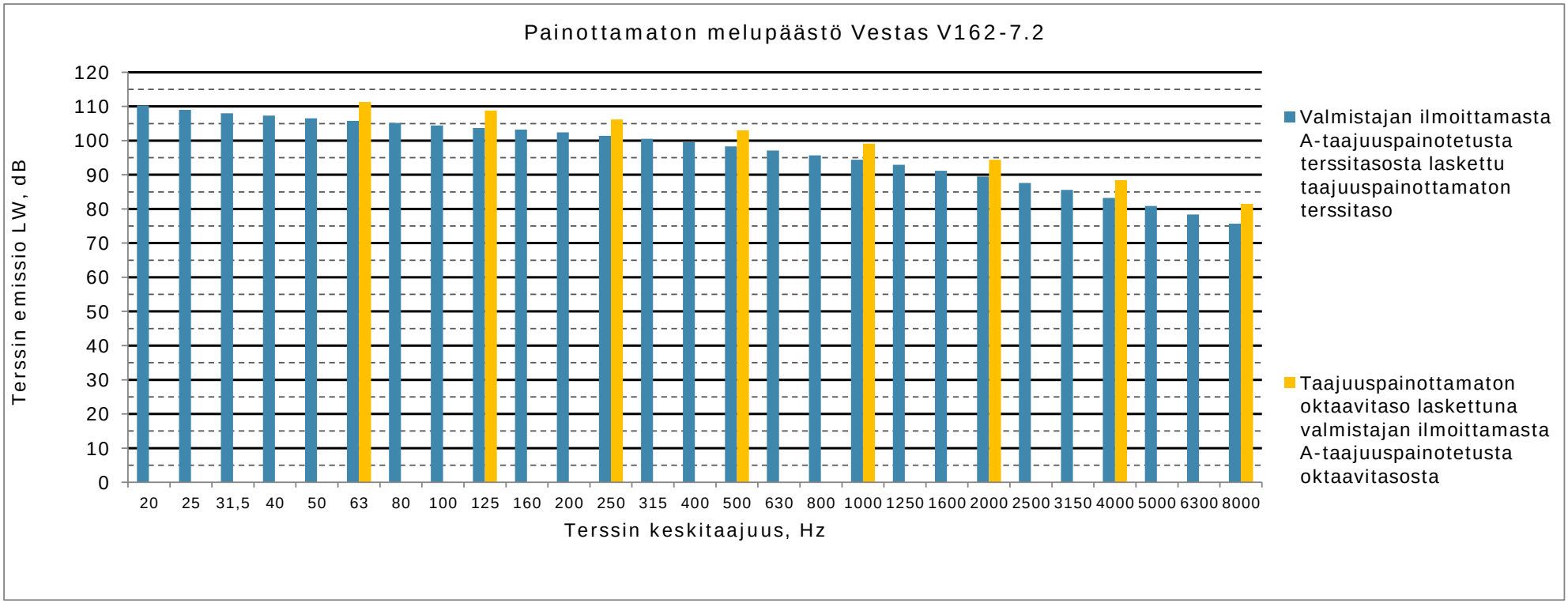

A-painotettu melupäästö Vestas V162-5.6
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0079-5298_01, 23.1.2019

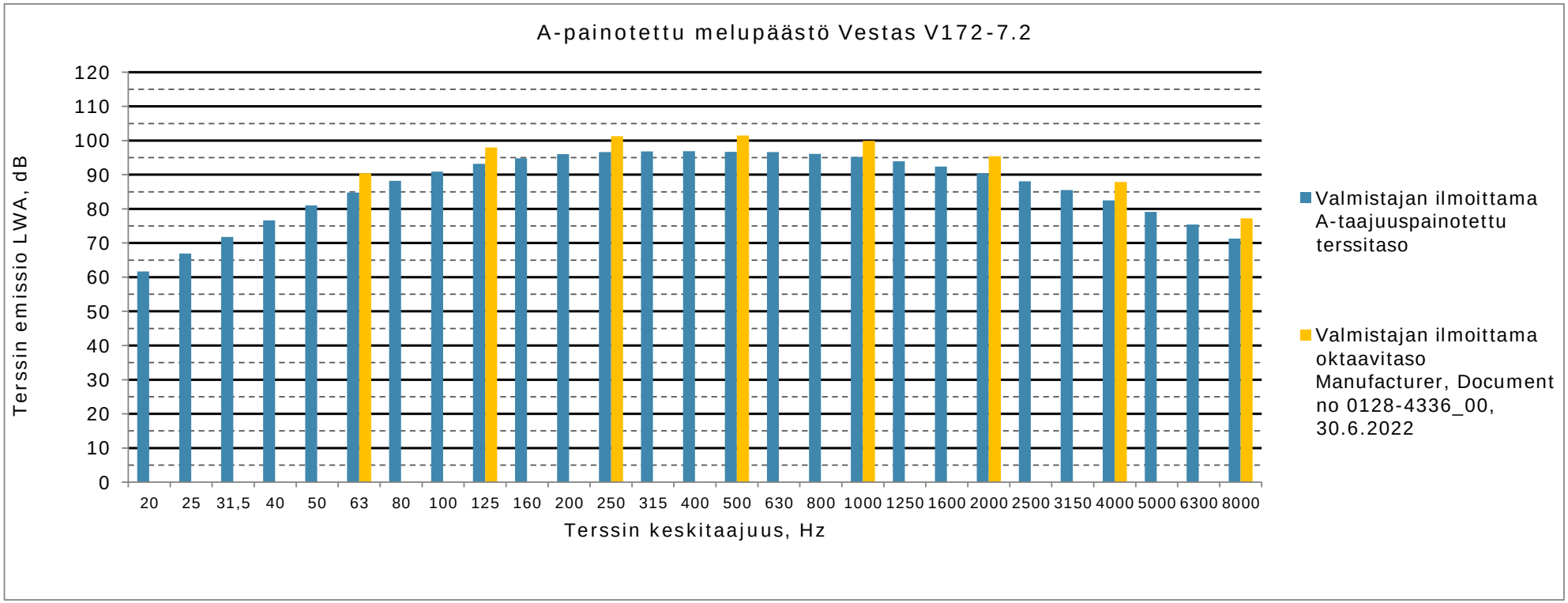

Painottamaton melupäästö Vestas V162-5.6
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

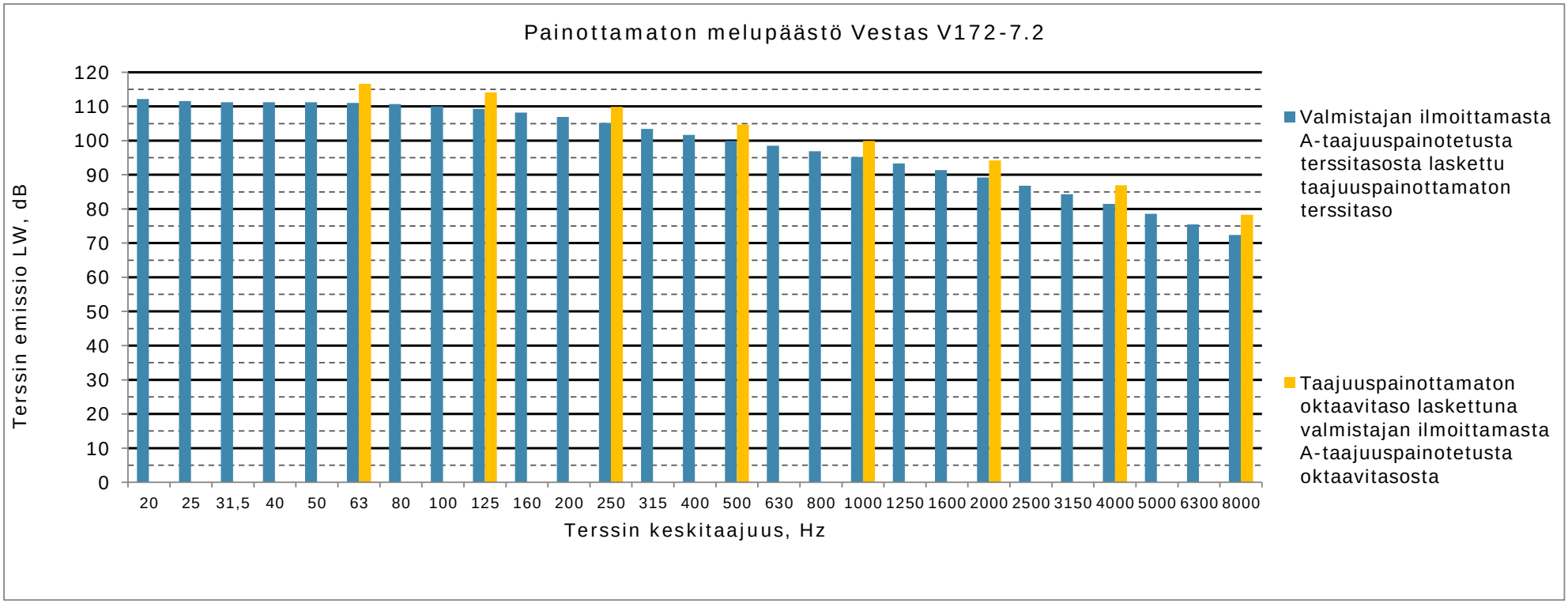

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0116-1715_00, 7.1.2022

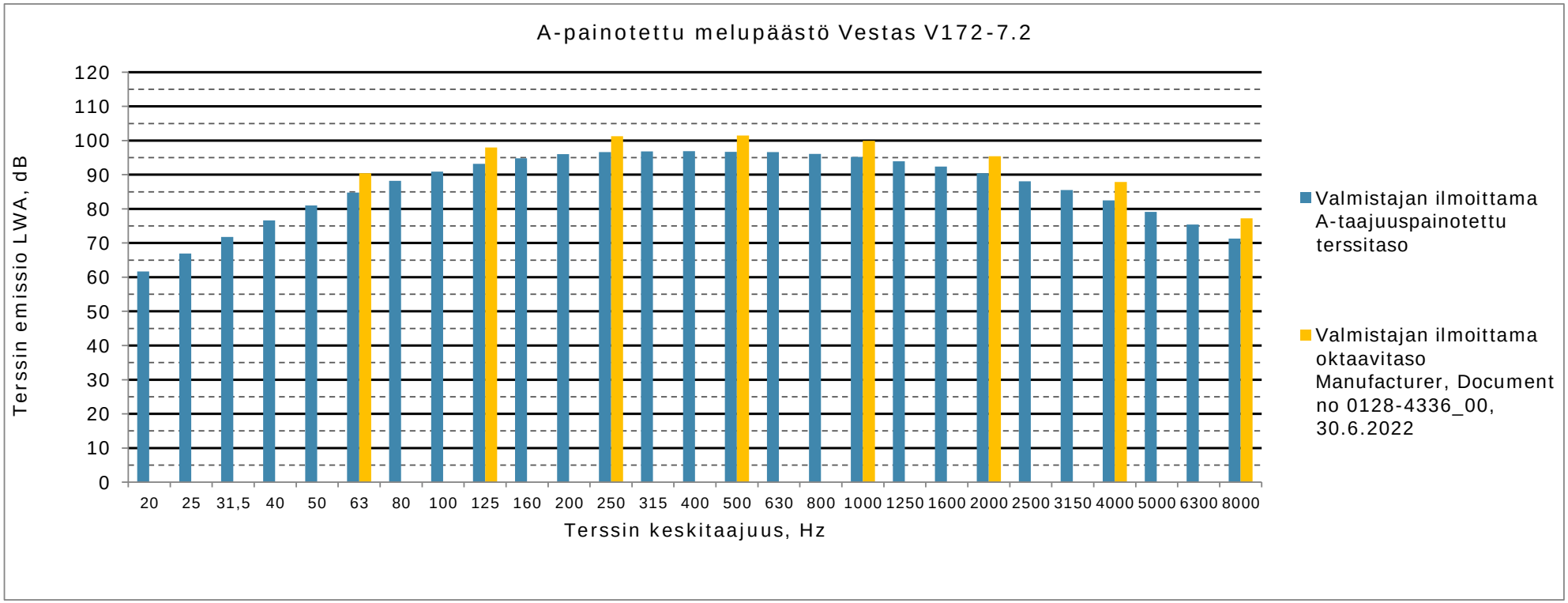

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

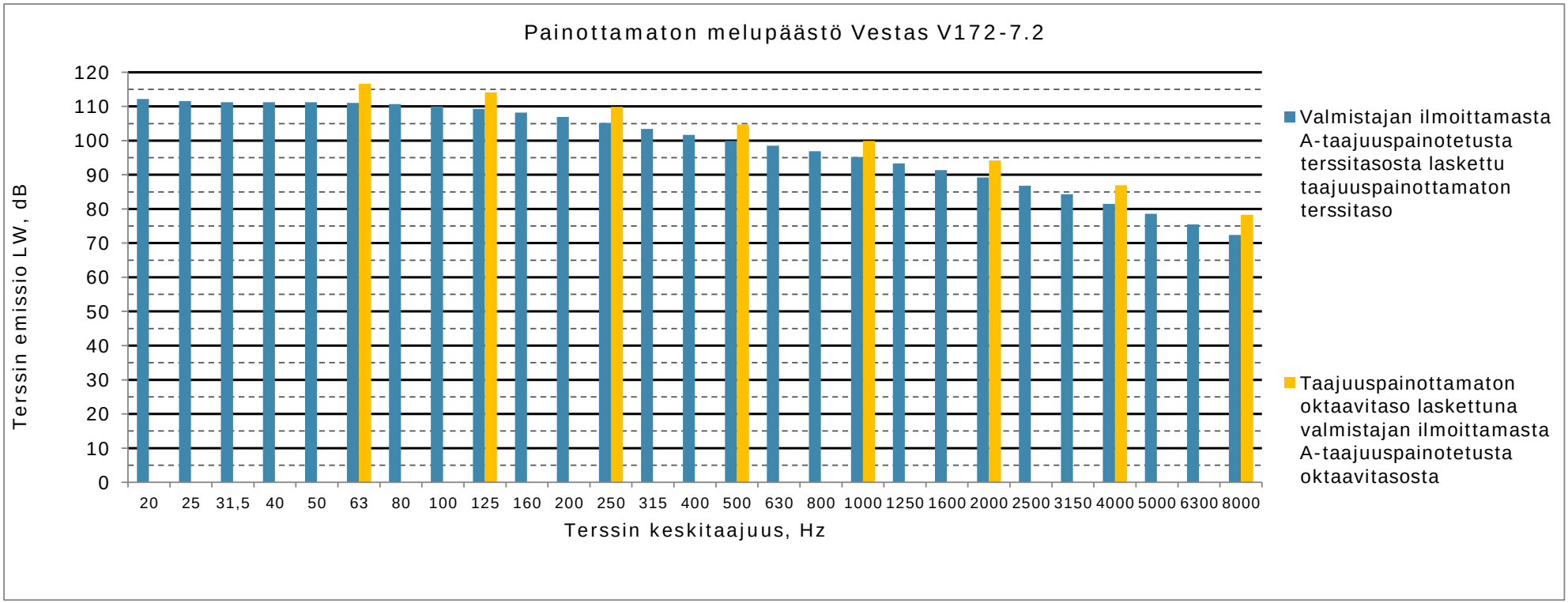

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0105-5200_00, 21.4.2021

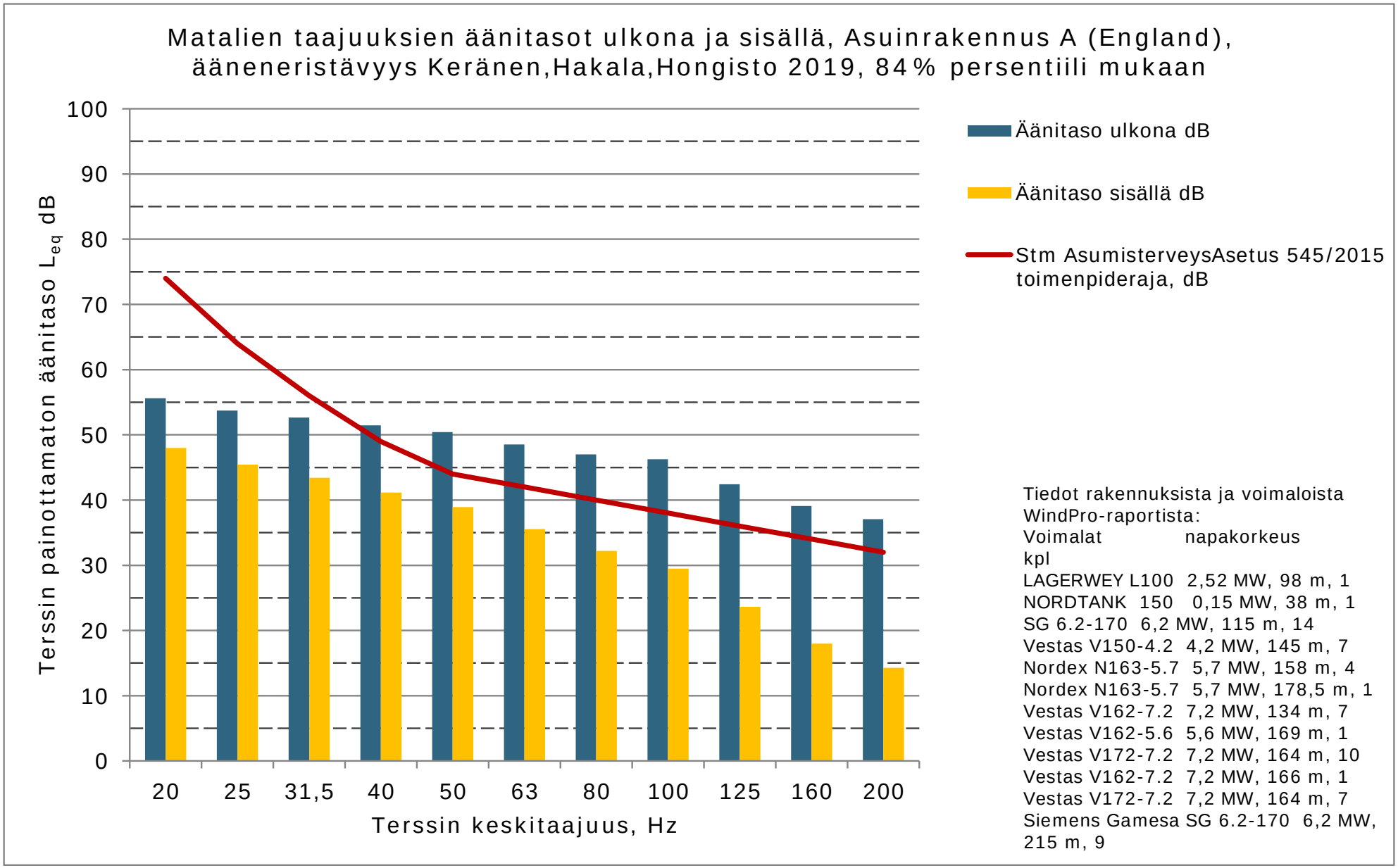

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

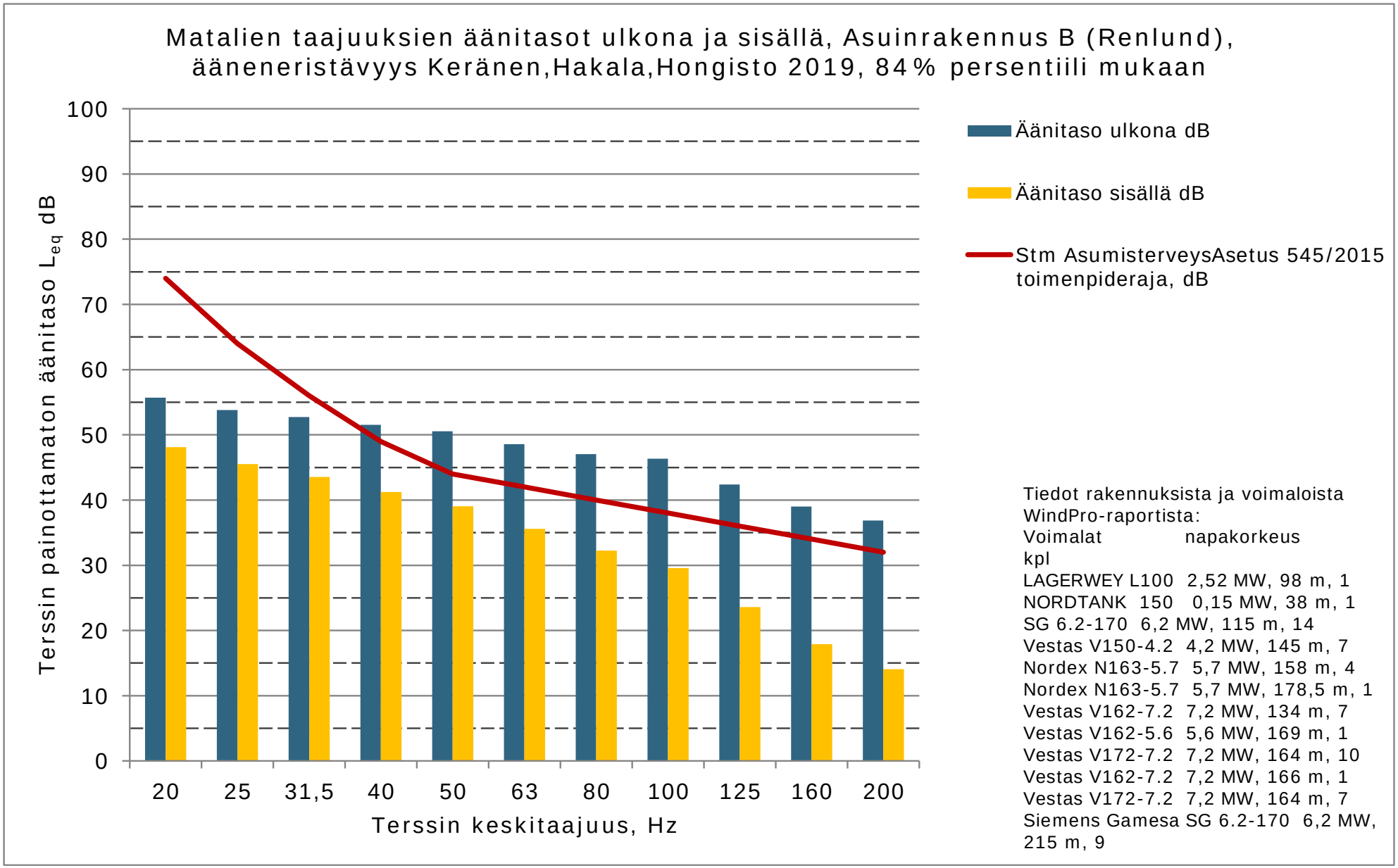

A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta



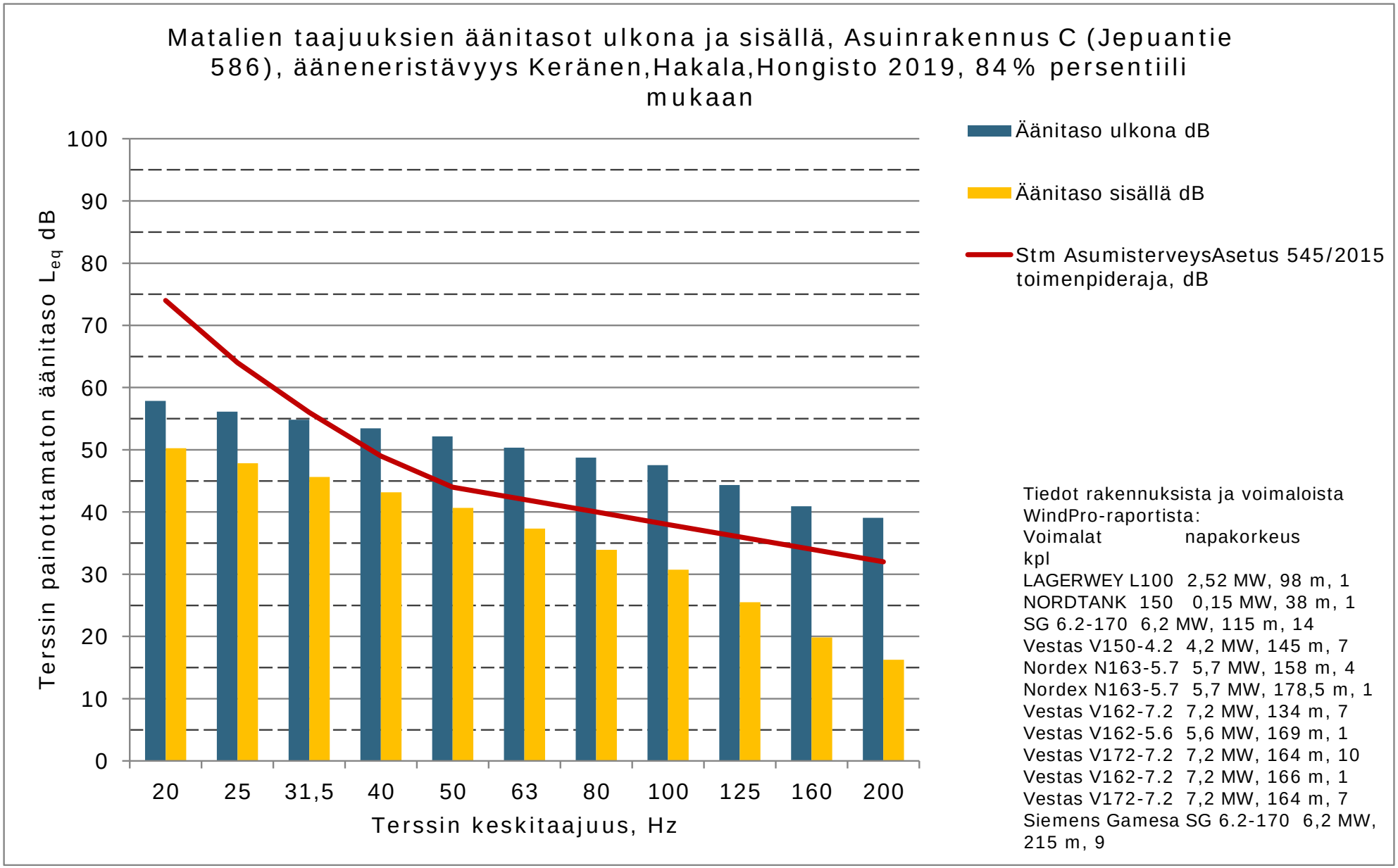
Tiedot rakennuksista ja voimaloista WindPro-raportista:

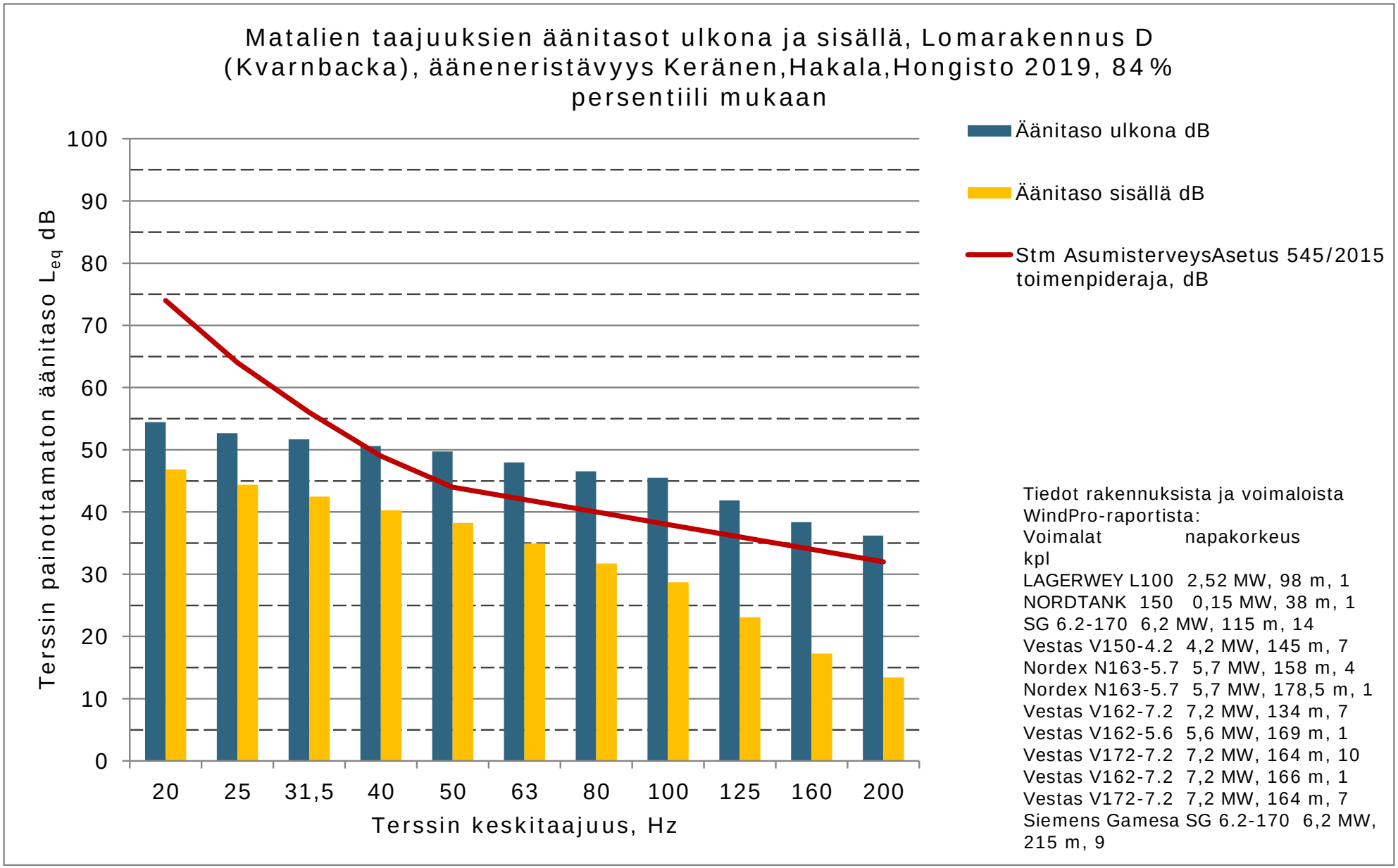
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9

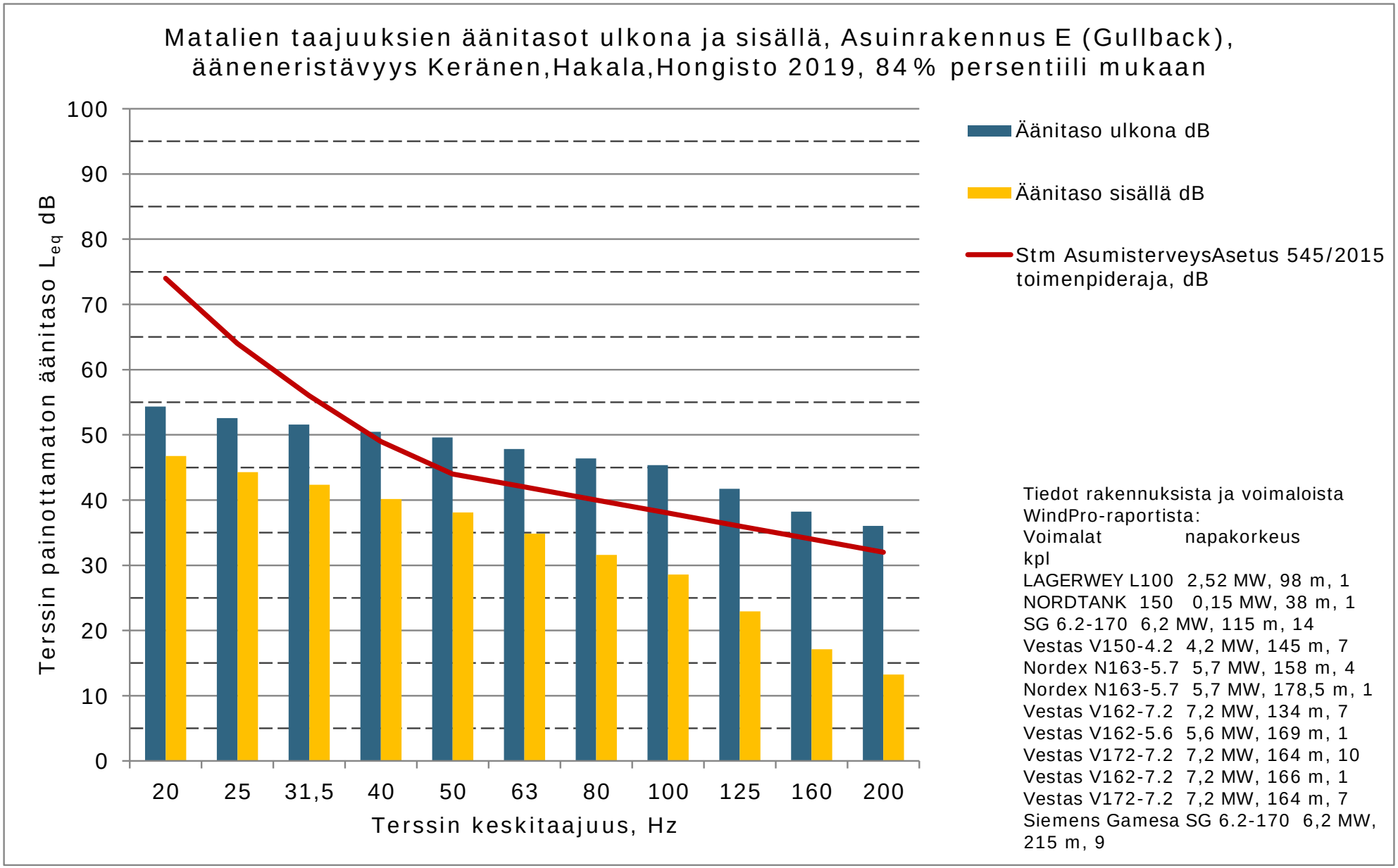


Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9

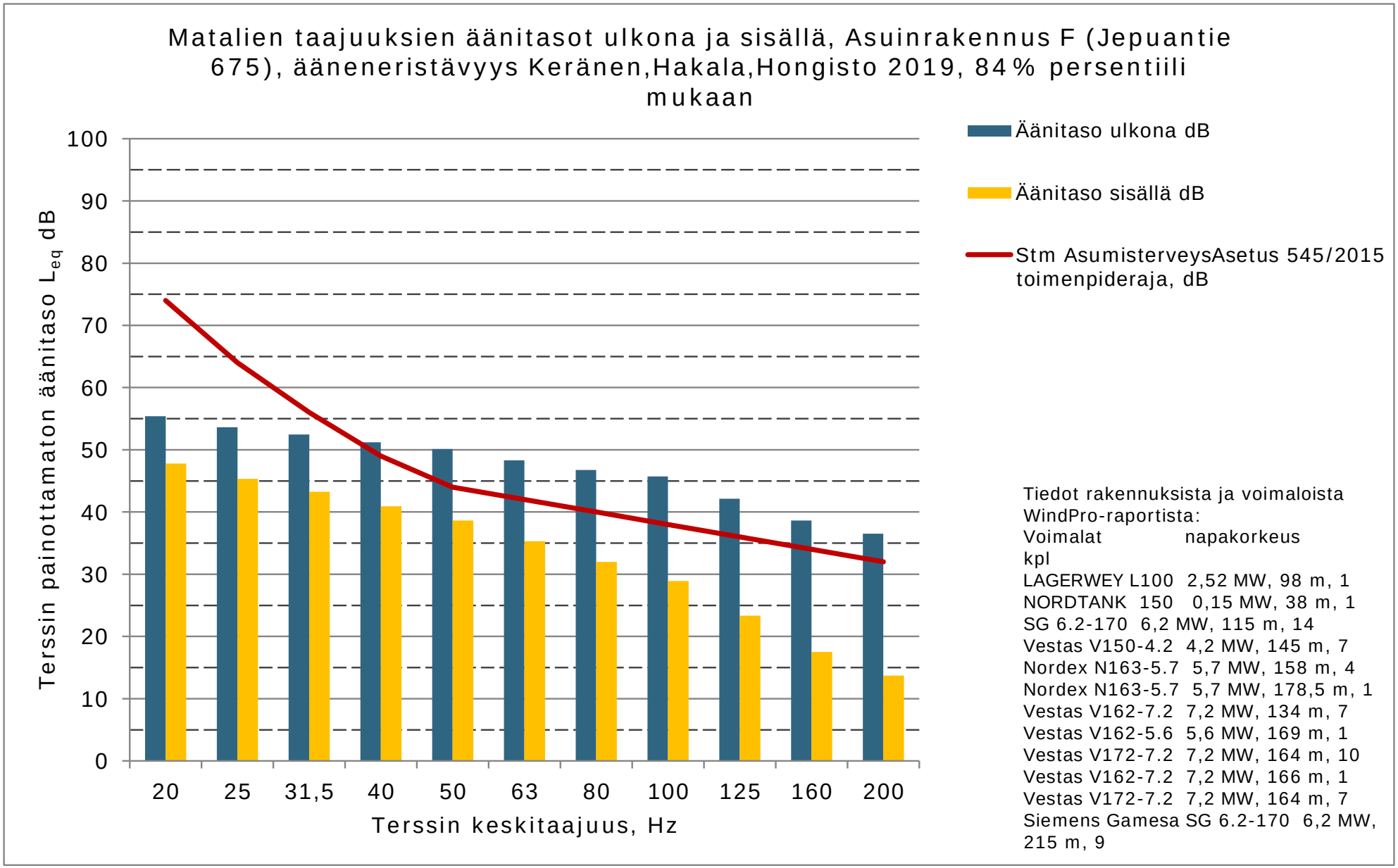

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Jepuantie 586), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

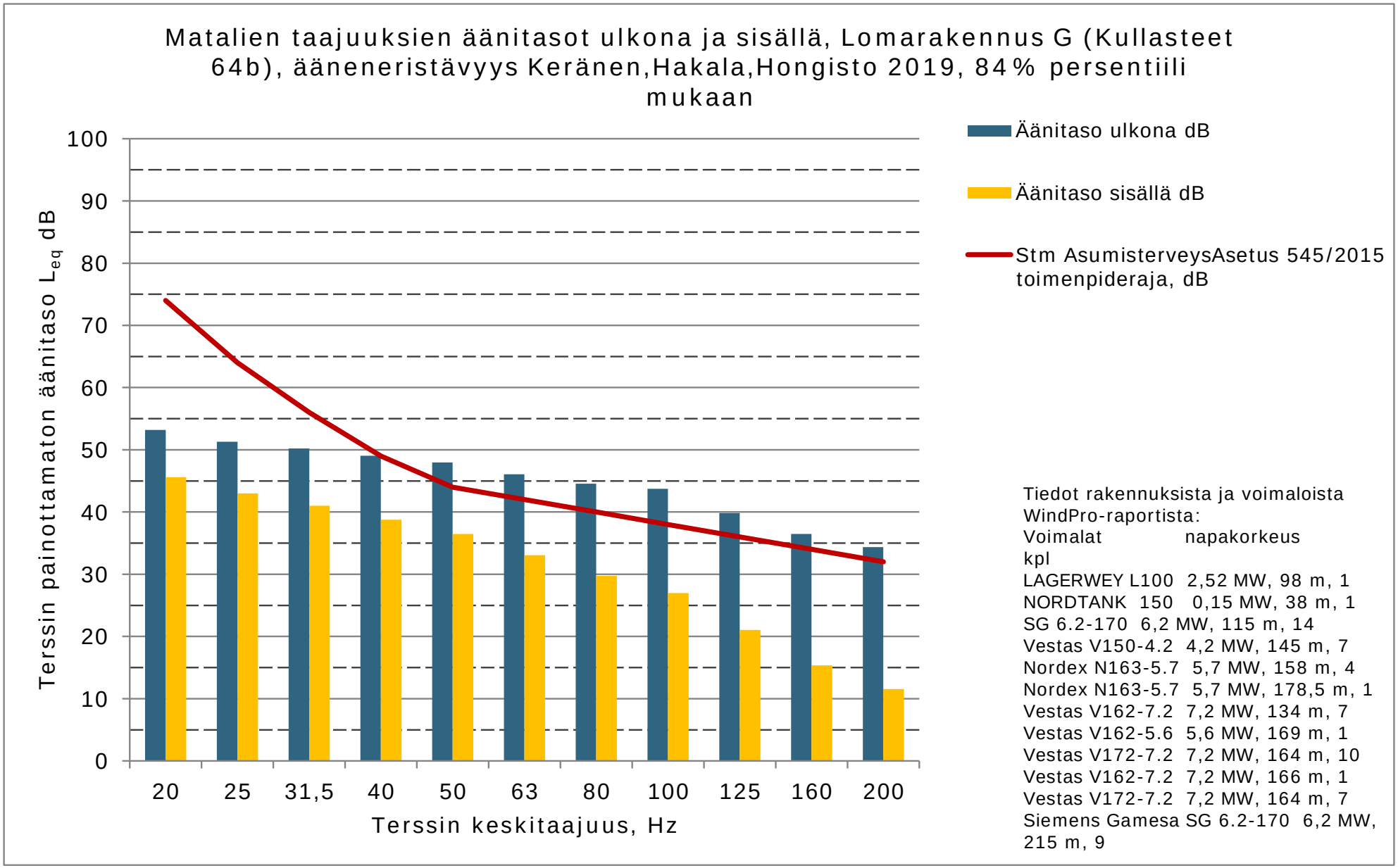

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D (Kvarnbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

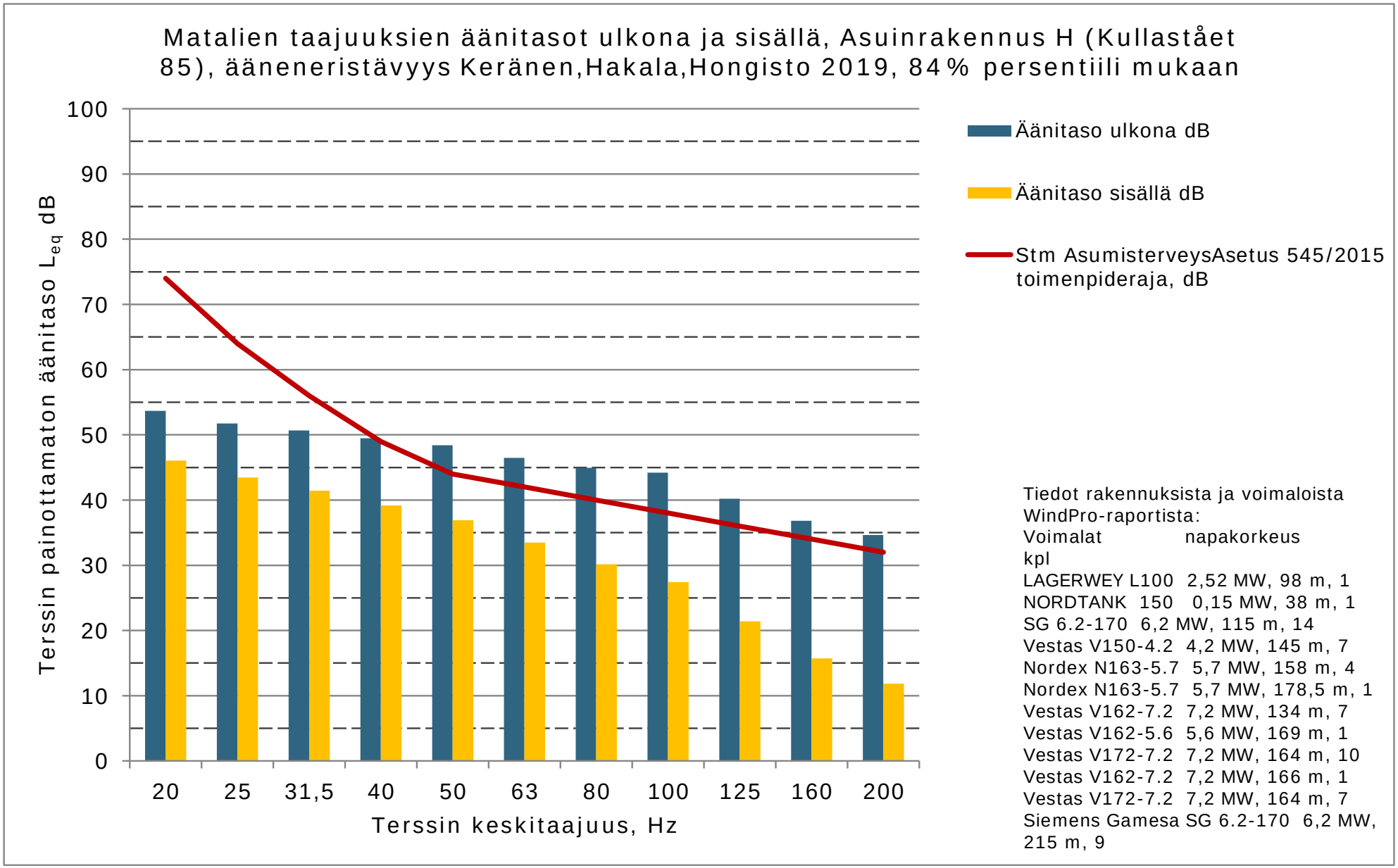


Tiedot rakennuksista ja voimaloista WindPro-raportista:

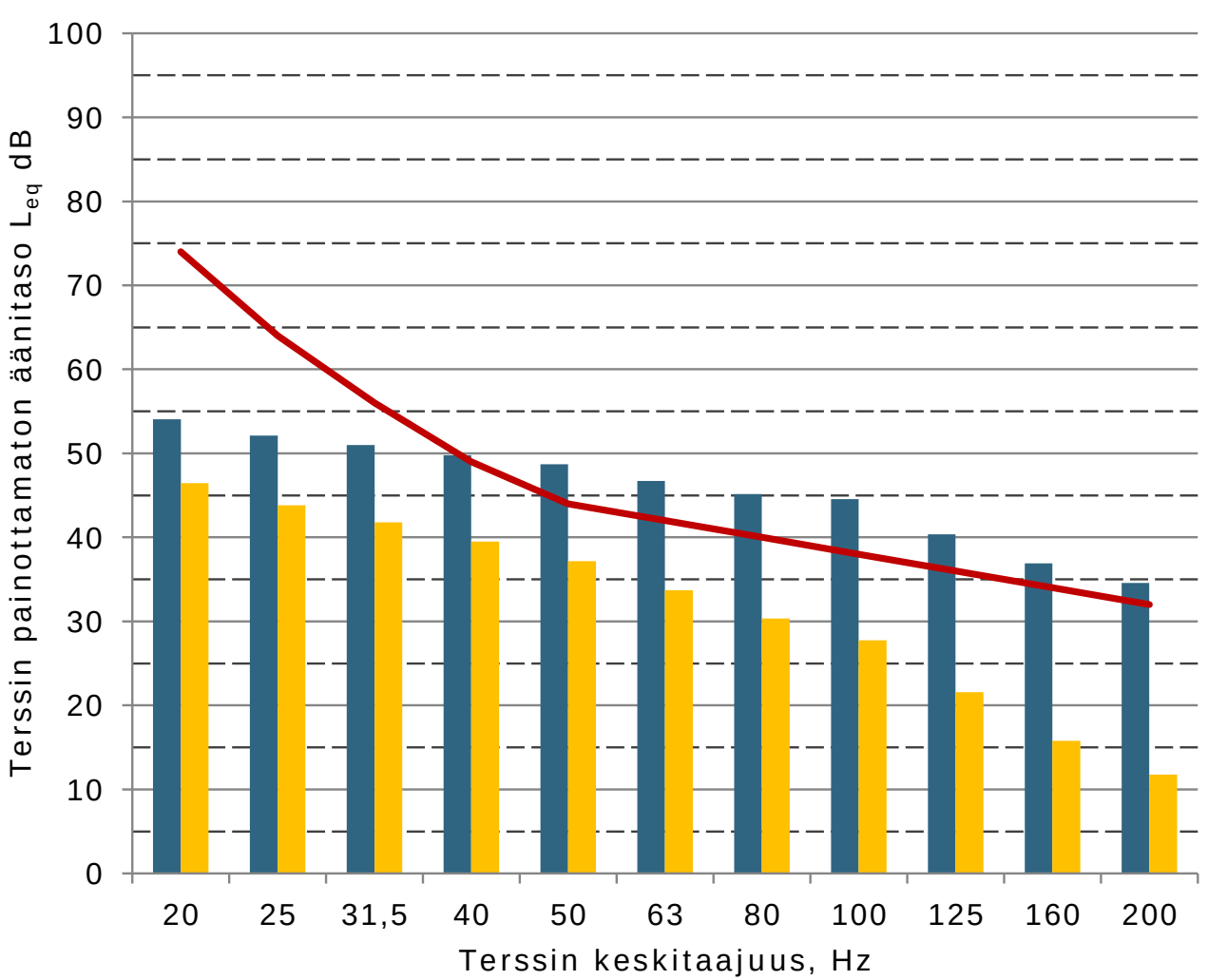
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9

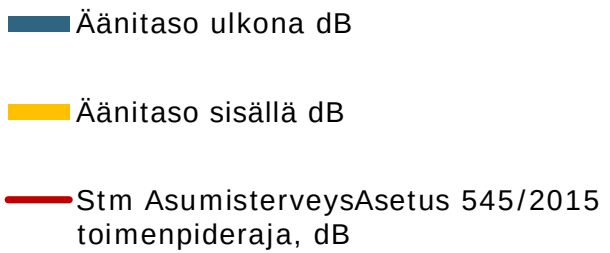

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Jepuantie 675), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Kullasteet 64b), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Kullastået 85), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

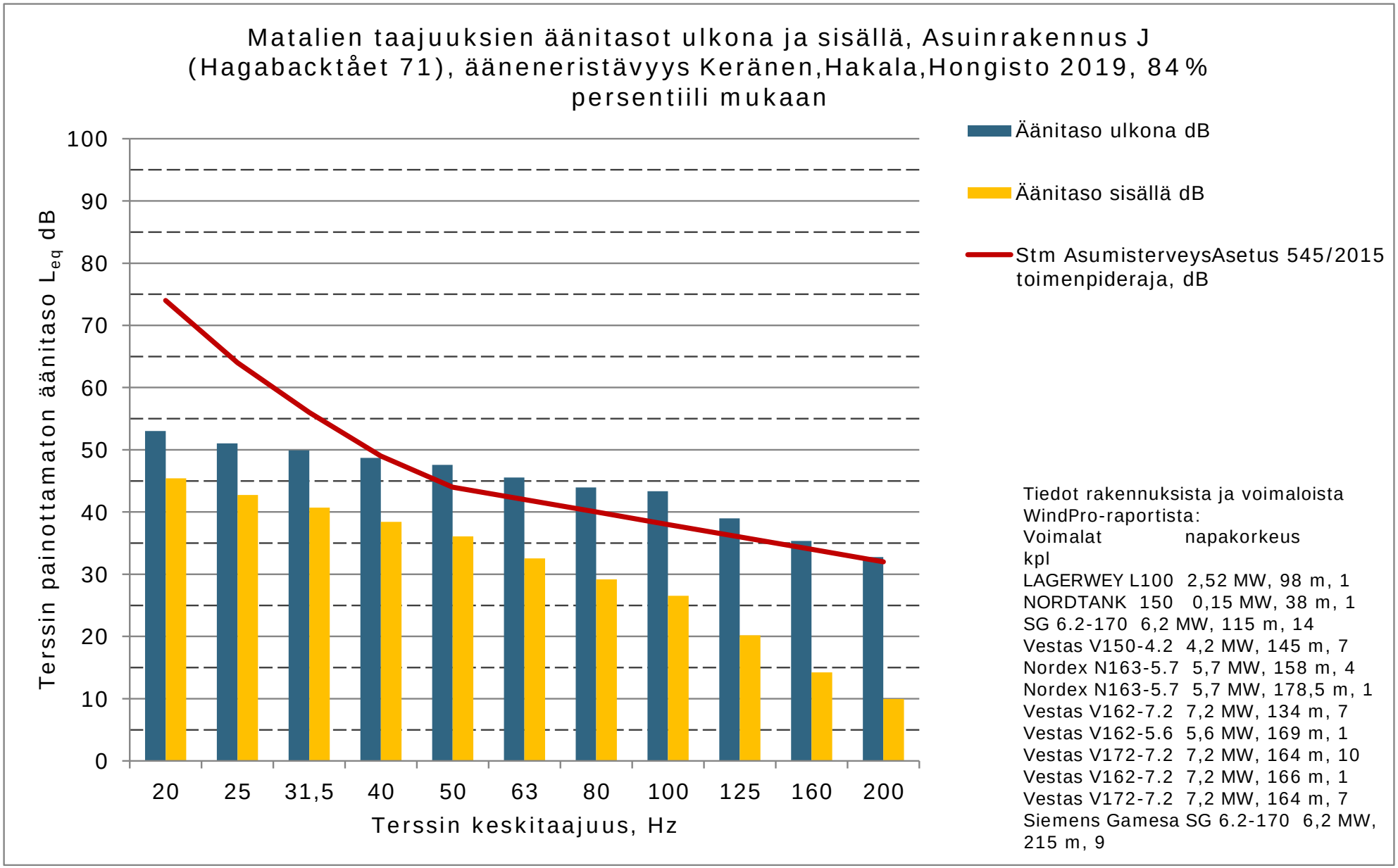
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Kyhrastået, Bobacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

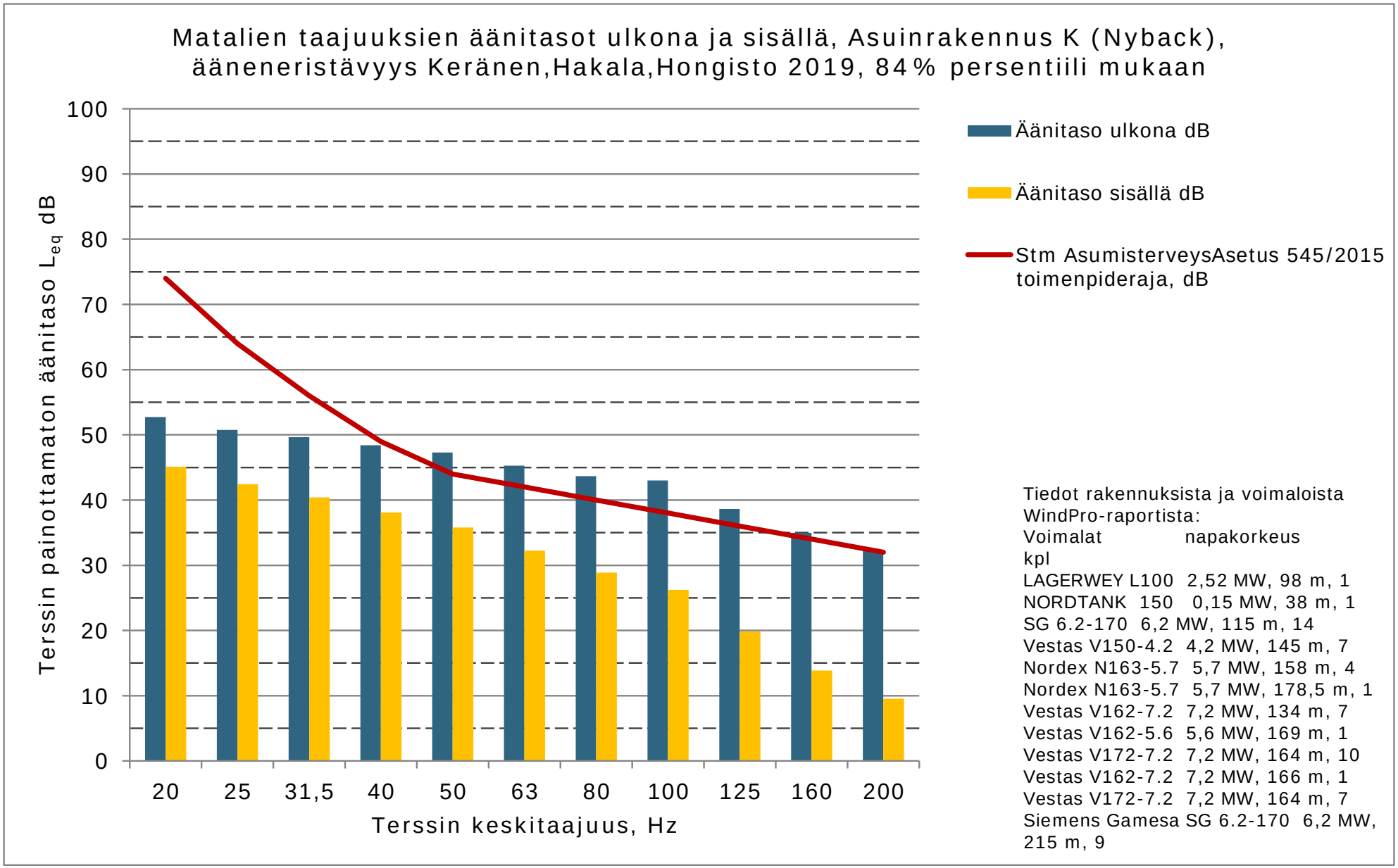




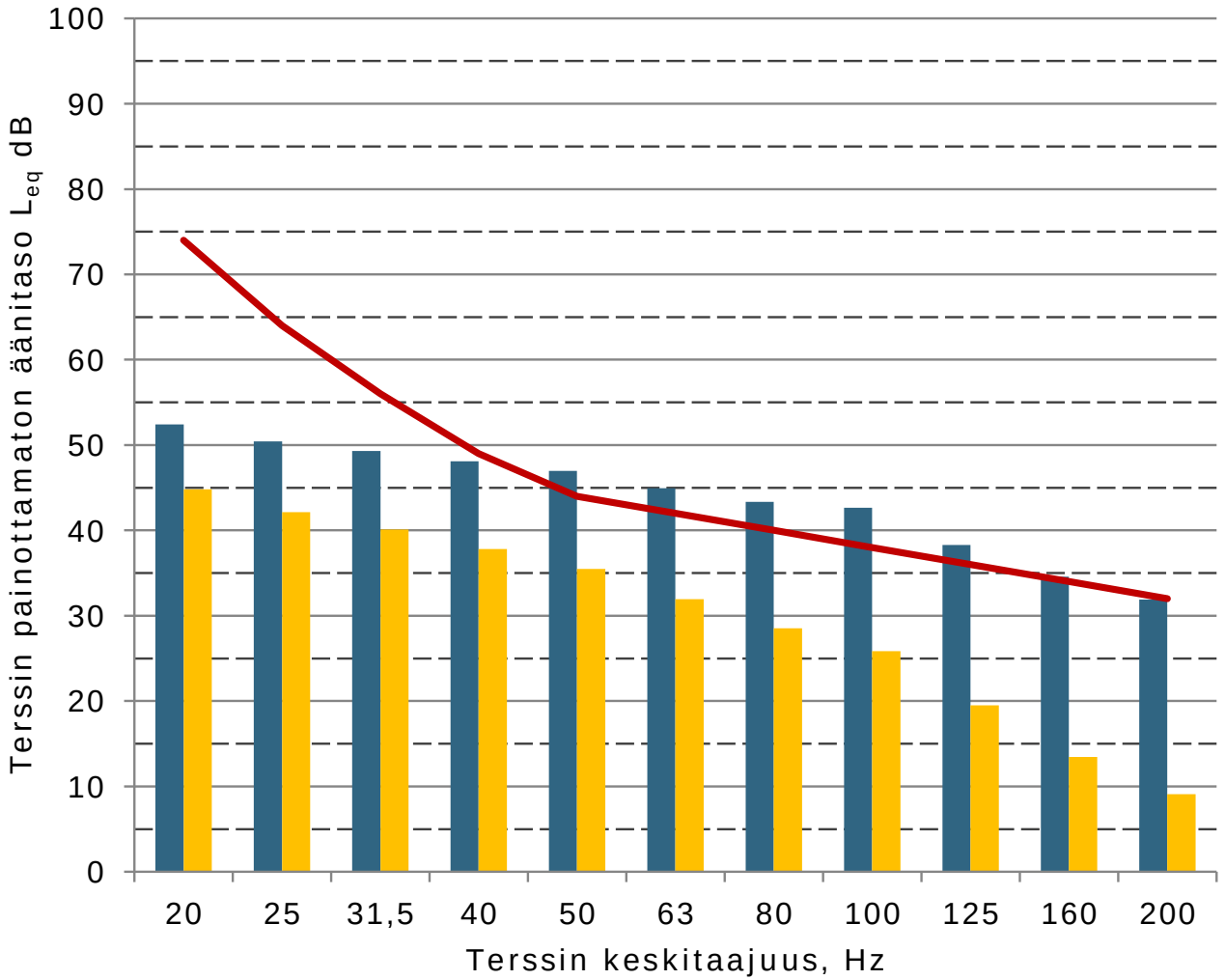
Tiedot rakennuksista ja voimaloista WindPro-raportista:

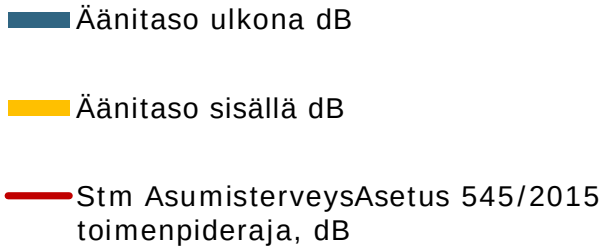
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Hagabacktået 71), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Nyback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

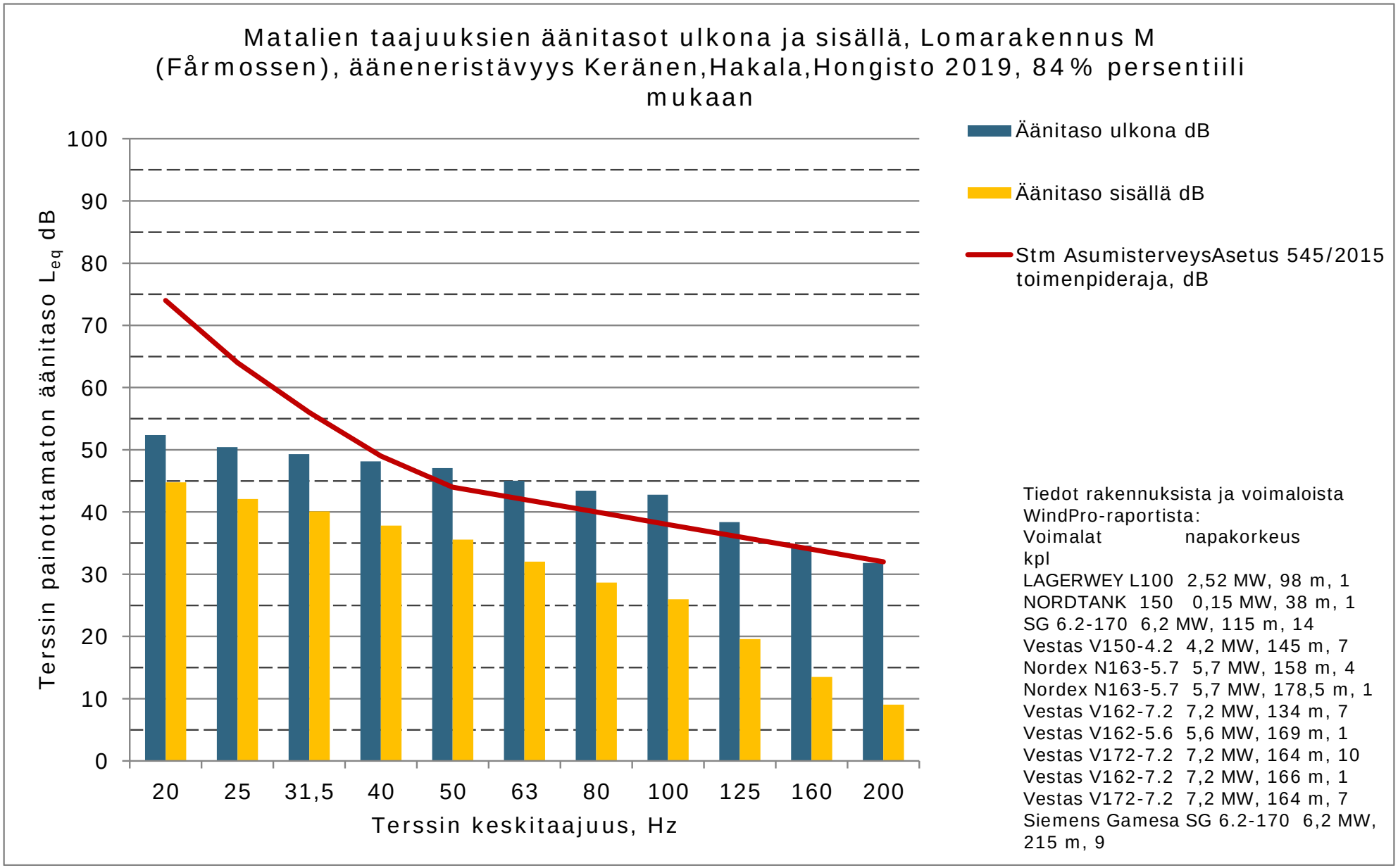
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Kimo Skogsbilvdg 55), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

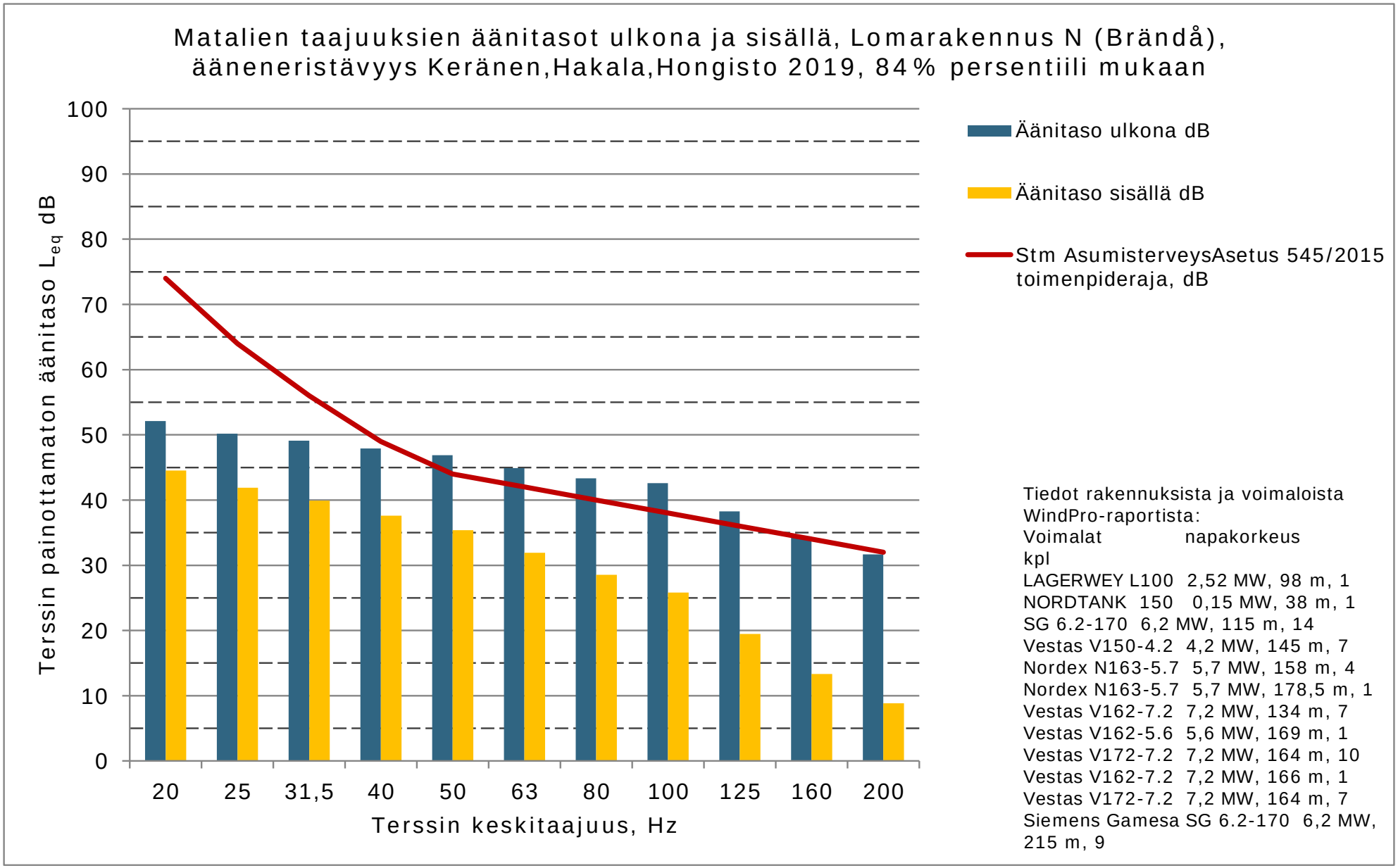




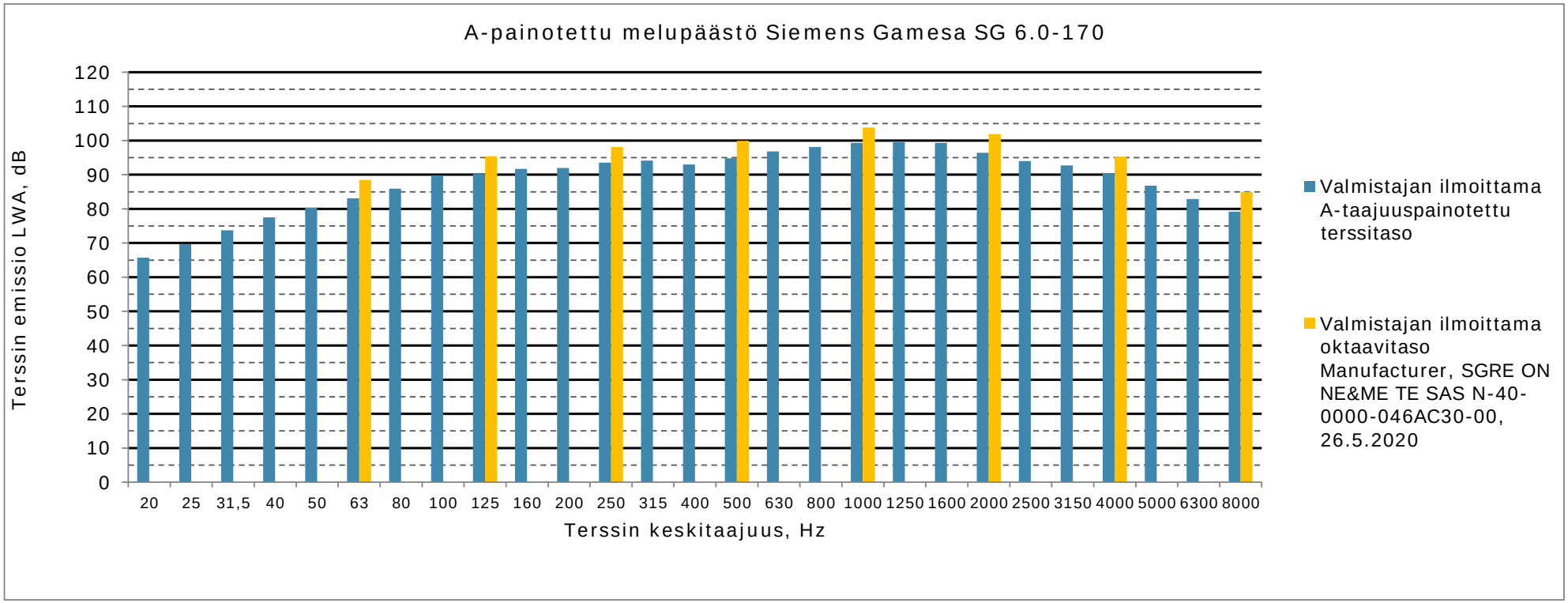
Tiedot rakennuksista ja voimaloista WindPro-raportista:

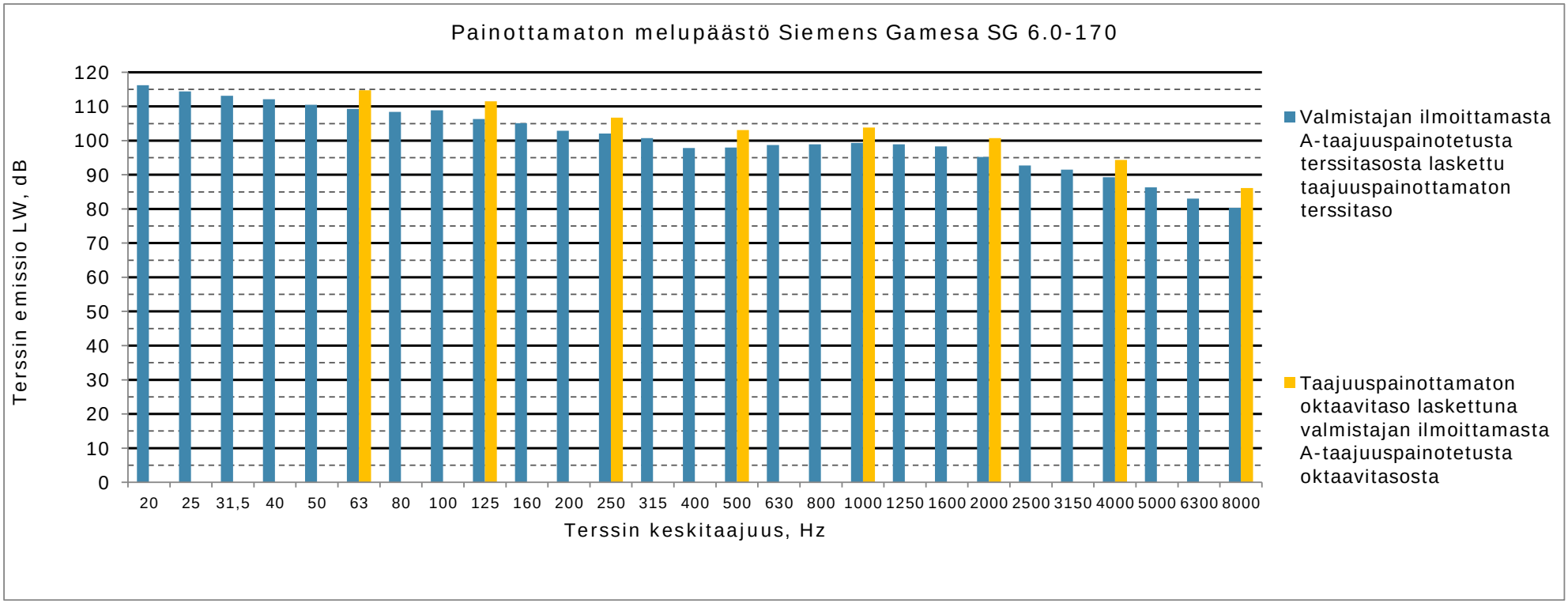
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9

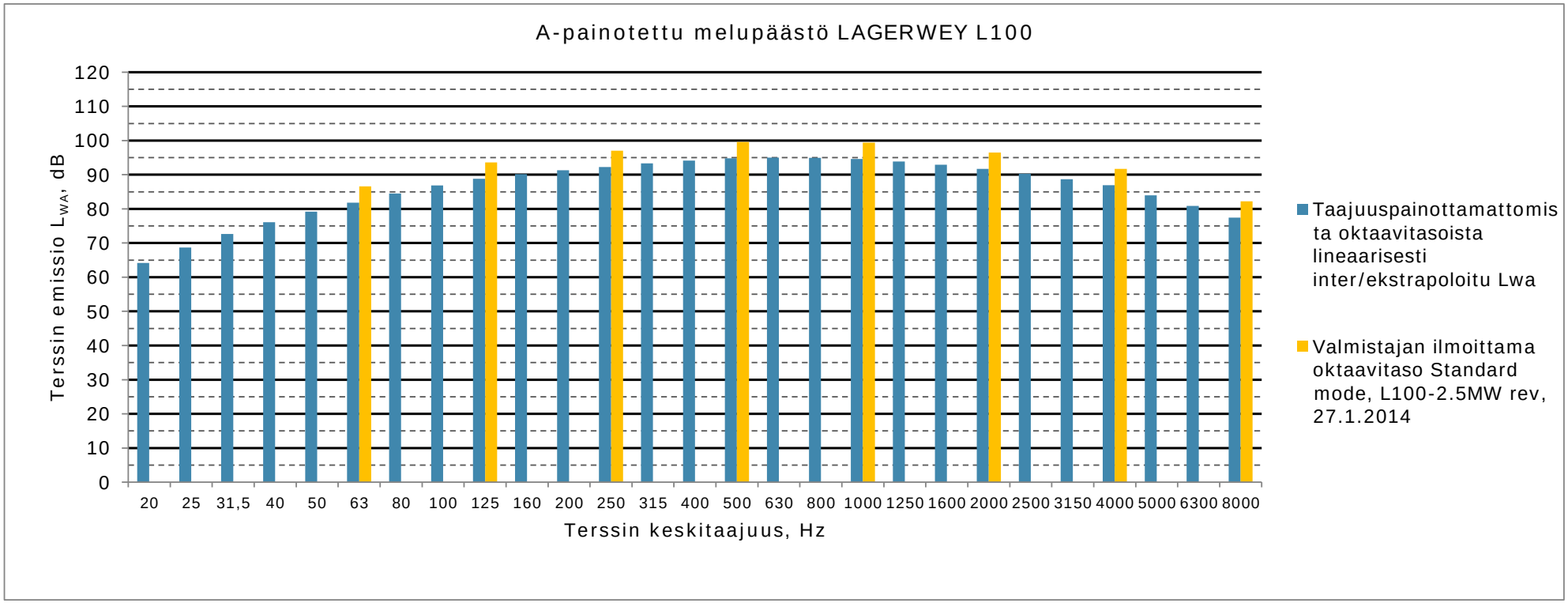

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus M (Fårmossen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

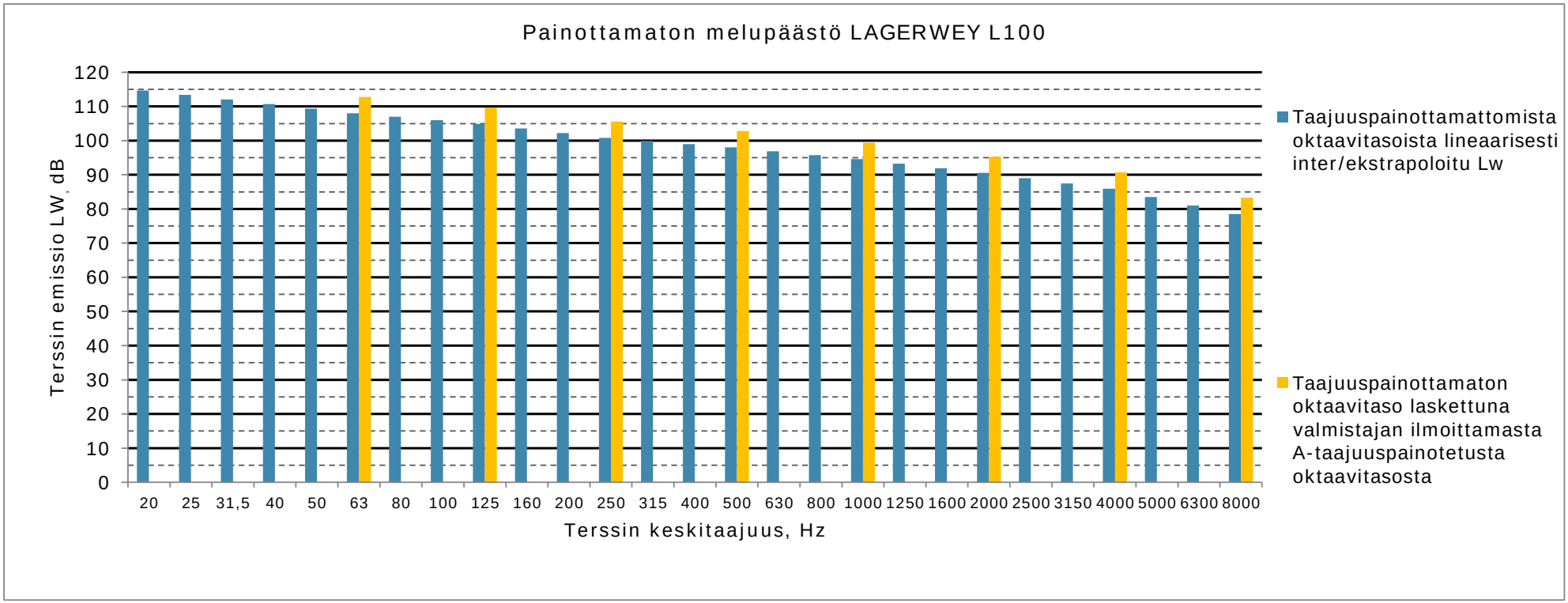

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Brändå), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

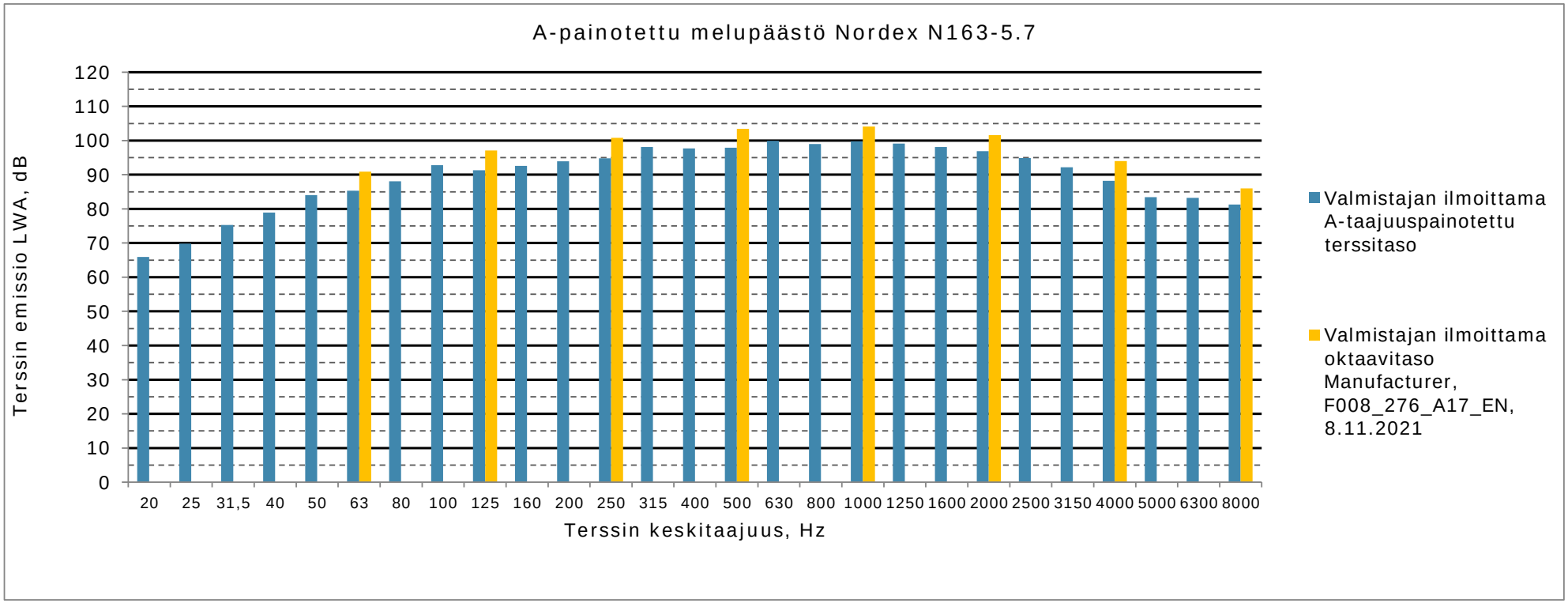
Bilaga 6. Vargitmossens vindkraftsprojekt – byggnadsspecifika värden för lågfrekvent buller i projektalternativ 2 (ALT2)

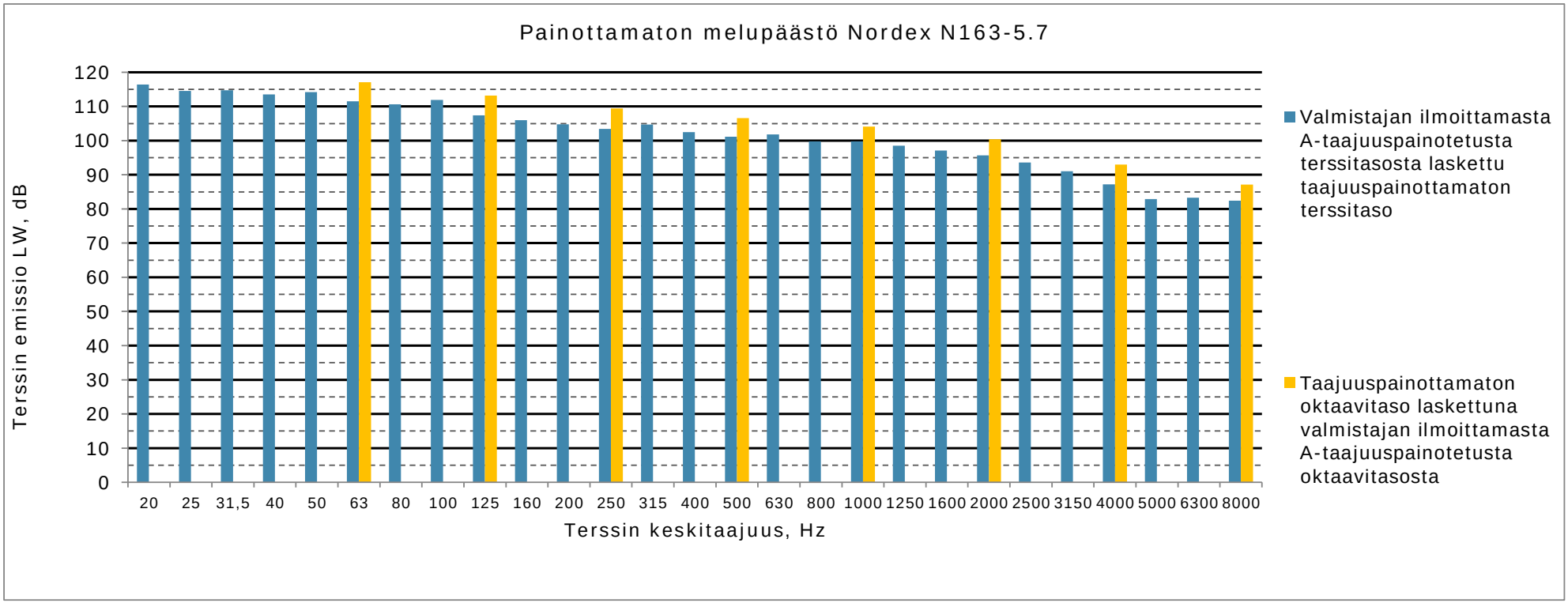

A-painotettu melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

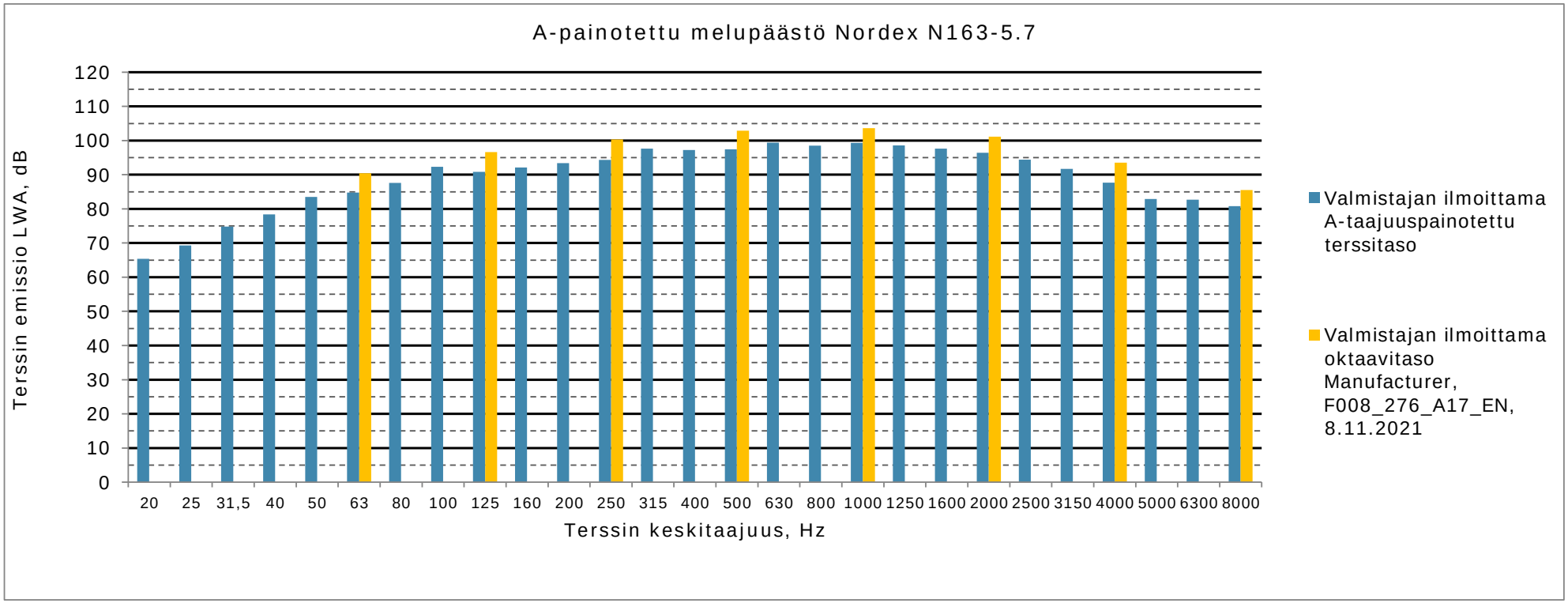

Painottamaton melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

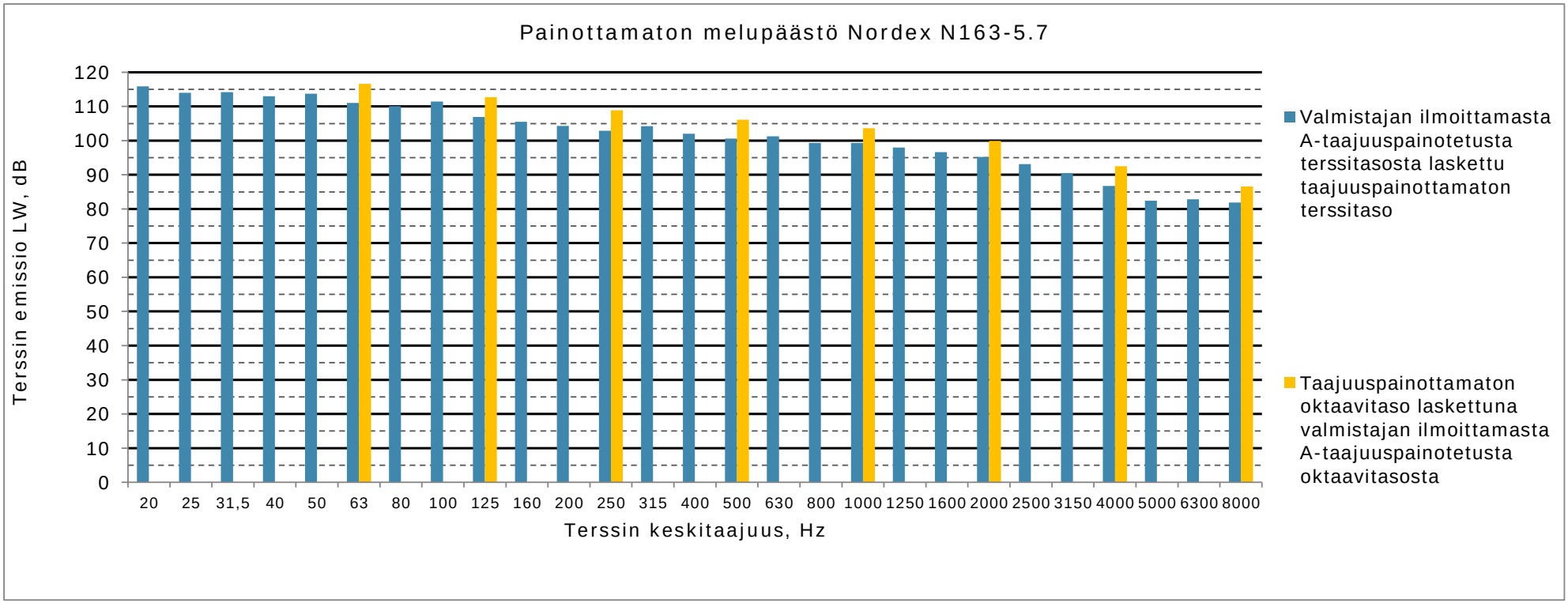

A-painotettu melupäästö LAGERWEY L100
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Standard mode, L100-2.5MW rev, 27.1.2014

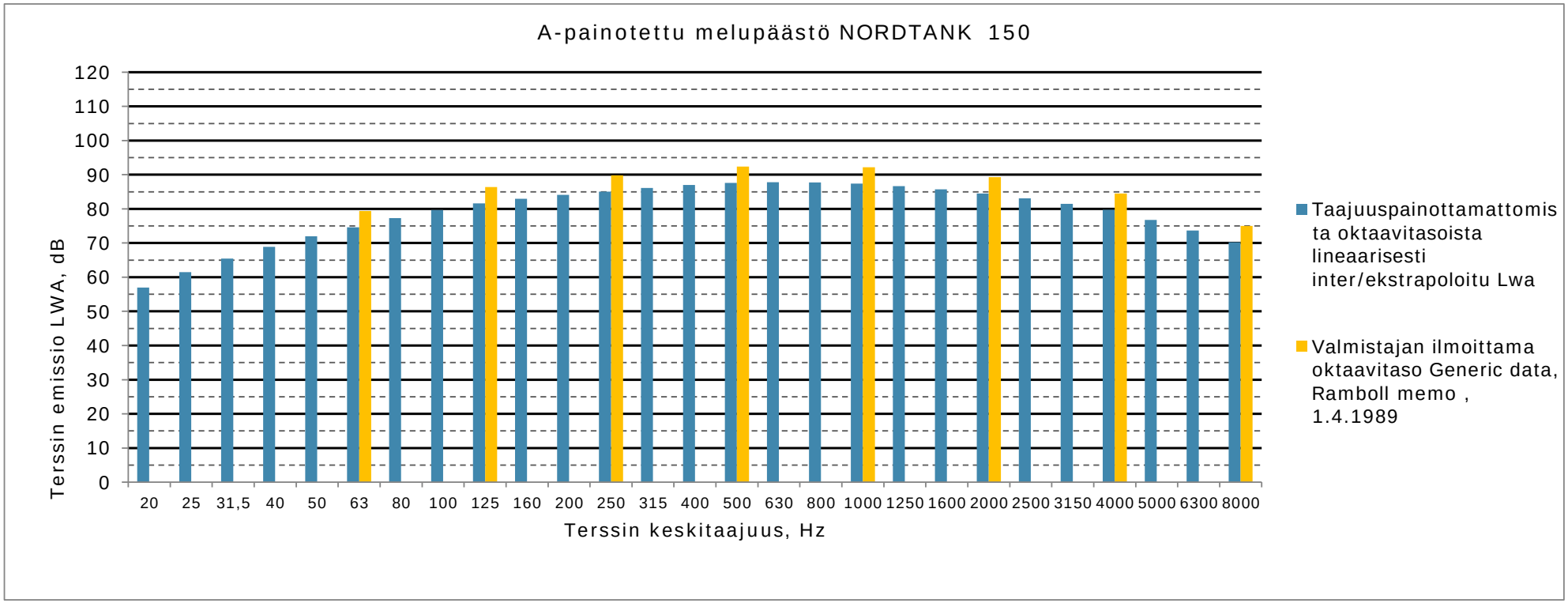

Painottamaton melupäästö LAGERWEY L100
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

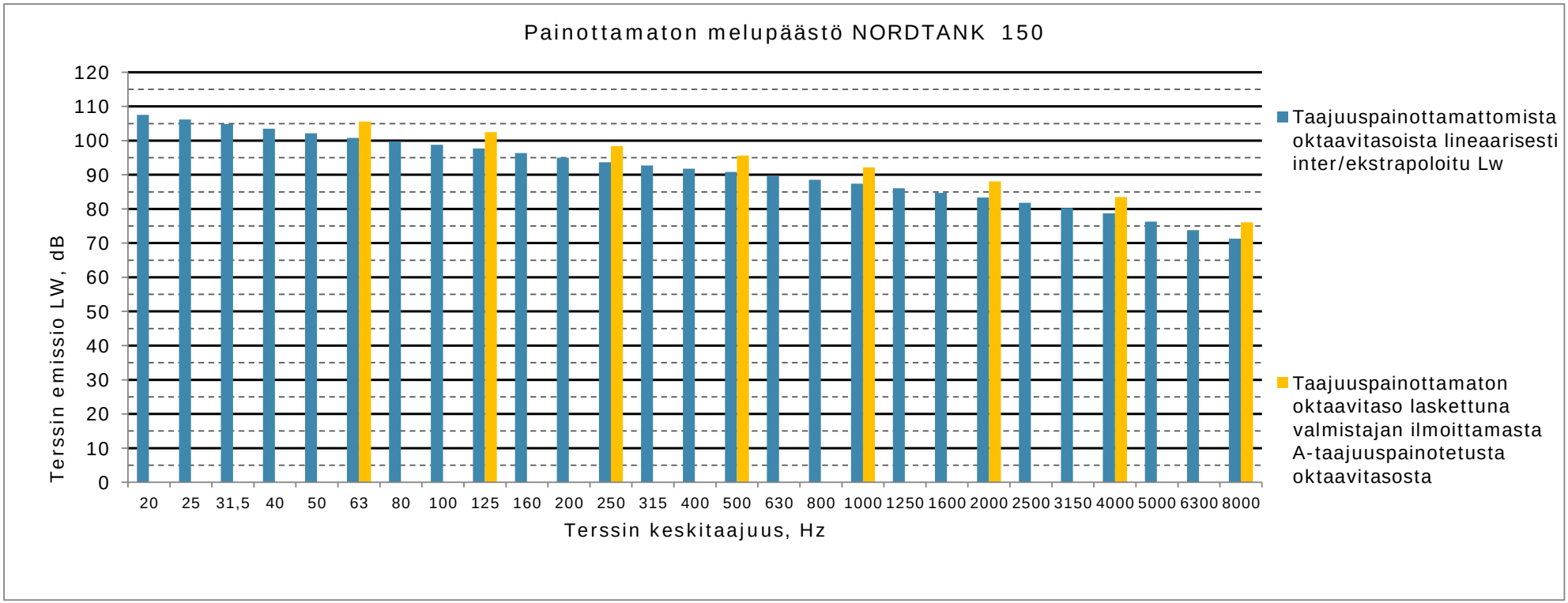

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

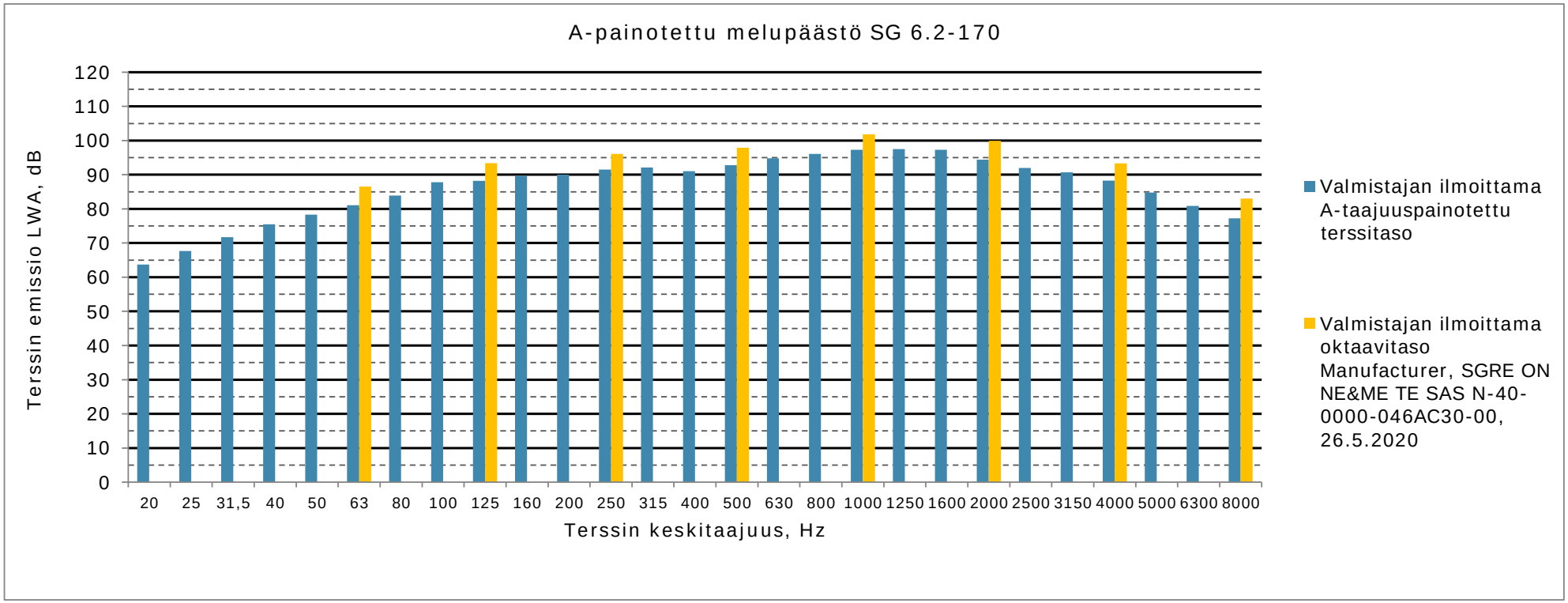

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

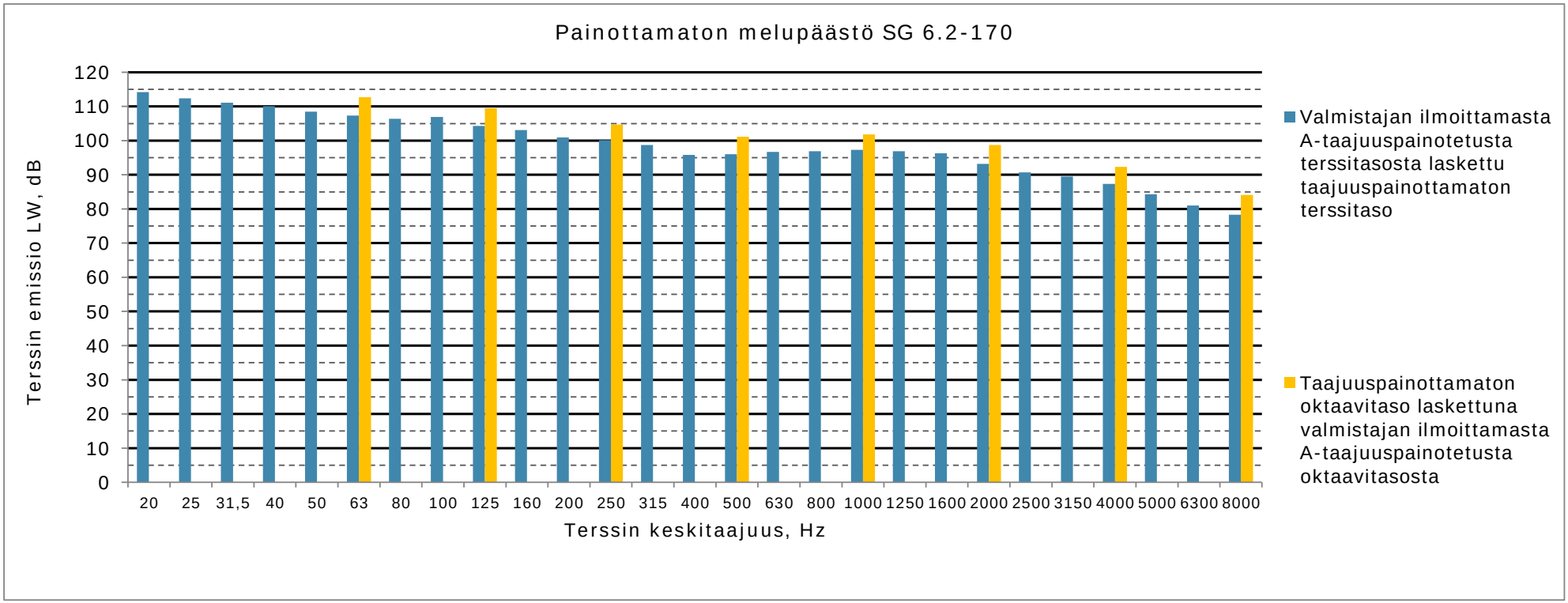

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

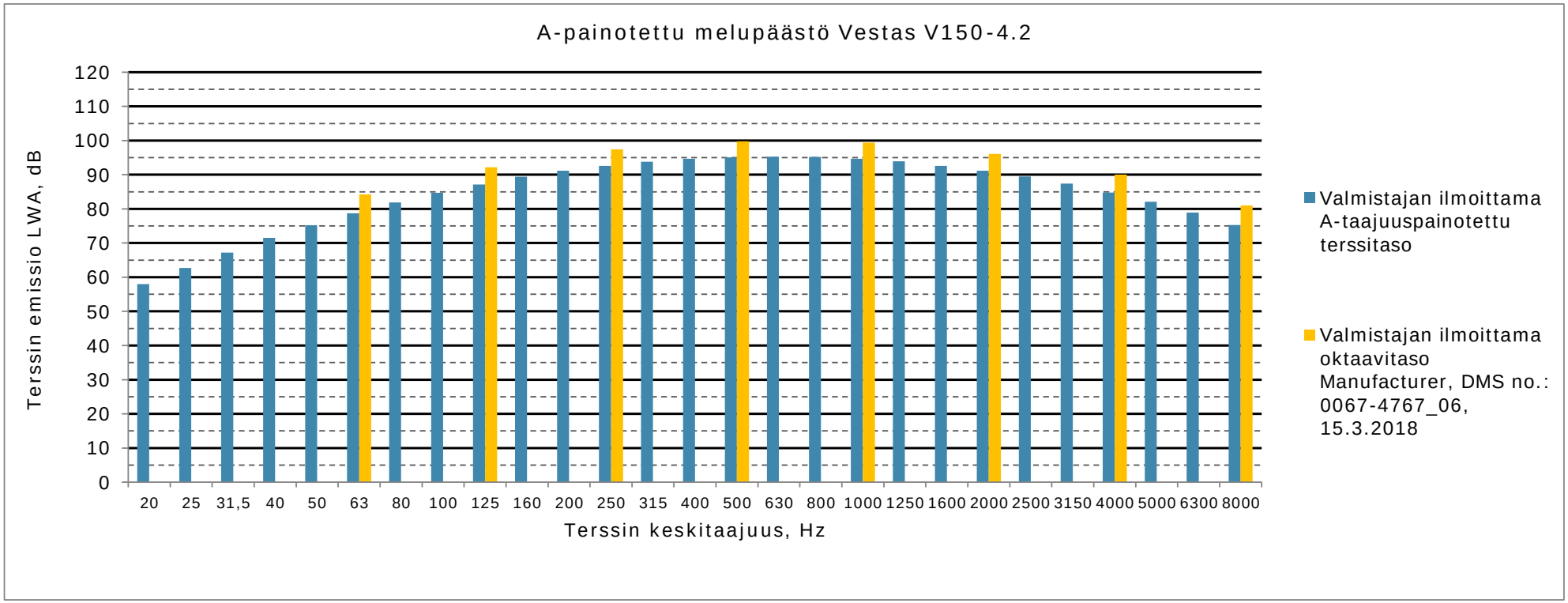

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

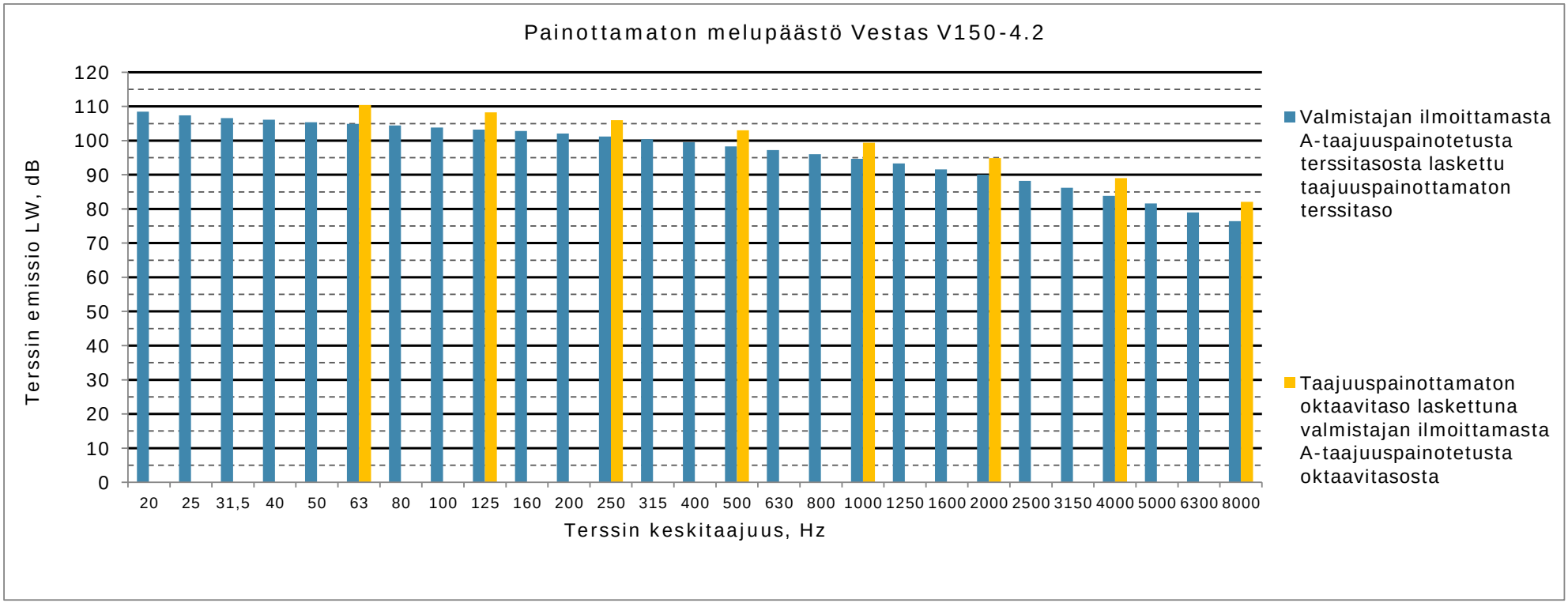

A-painotettu melupäästö NORDTANK 150
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Generic data, Ramboll memo , 1.4.1989

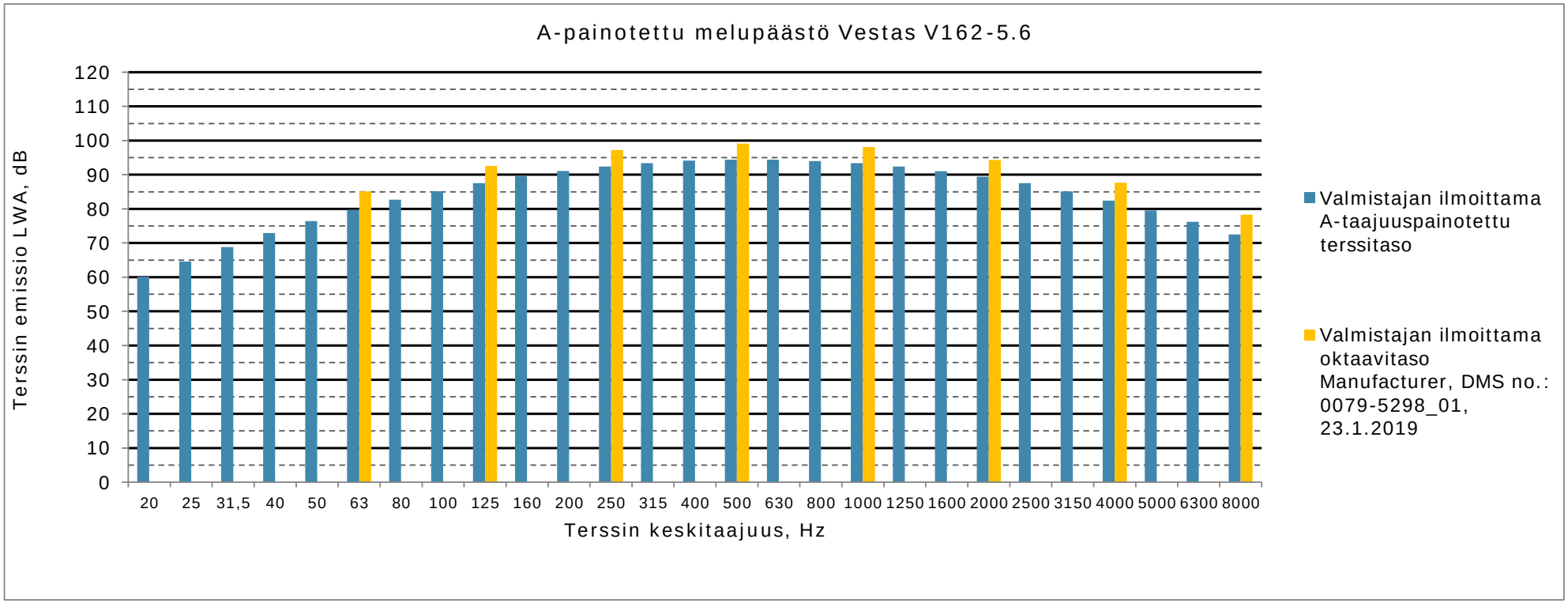

Painottamaton melupäästö NORDTANK 150
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

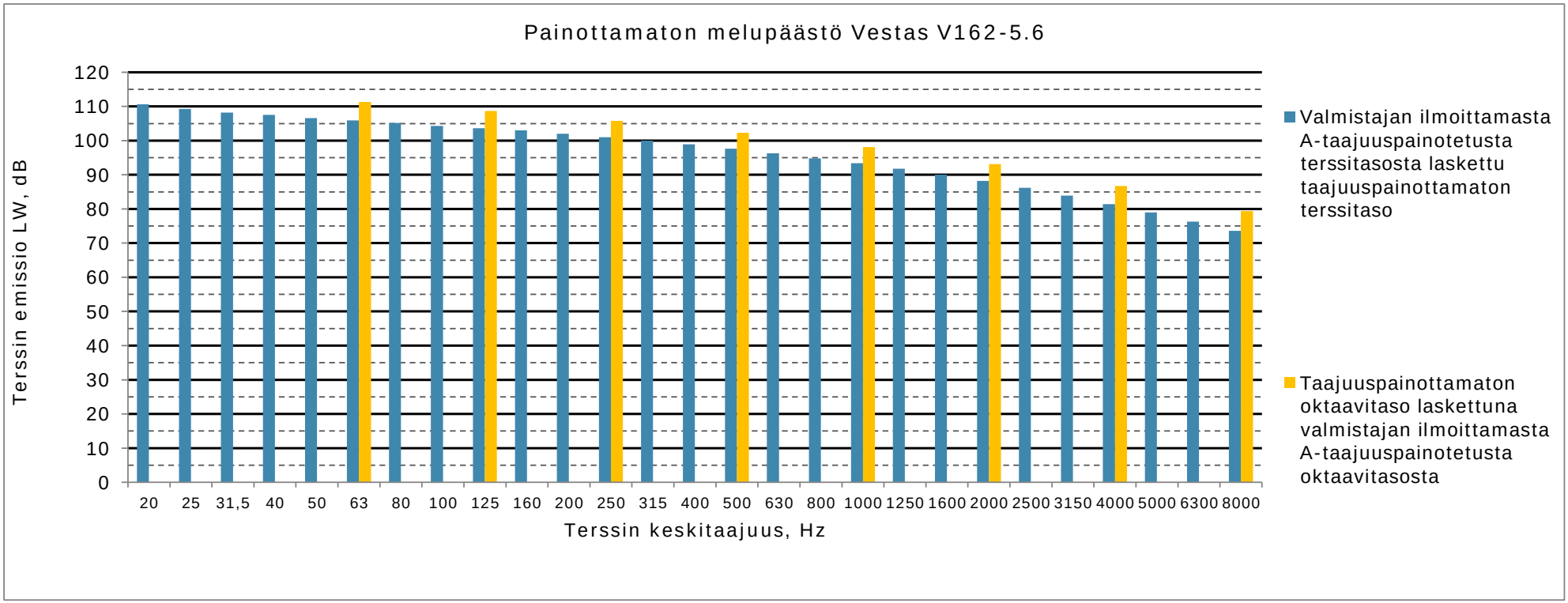

A-painotettu melupäästö SG 6.2-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

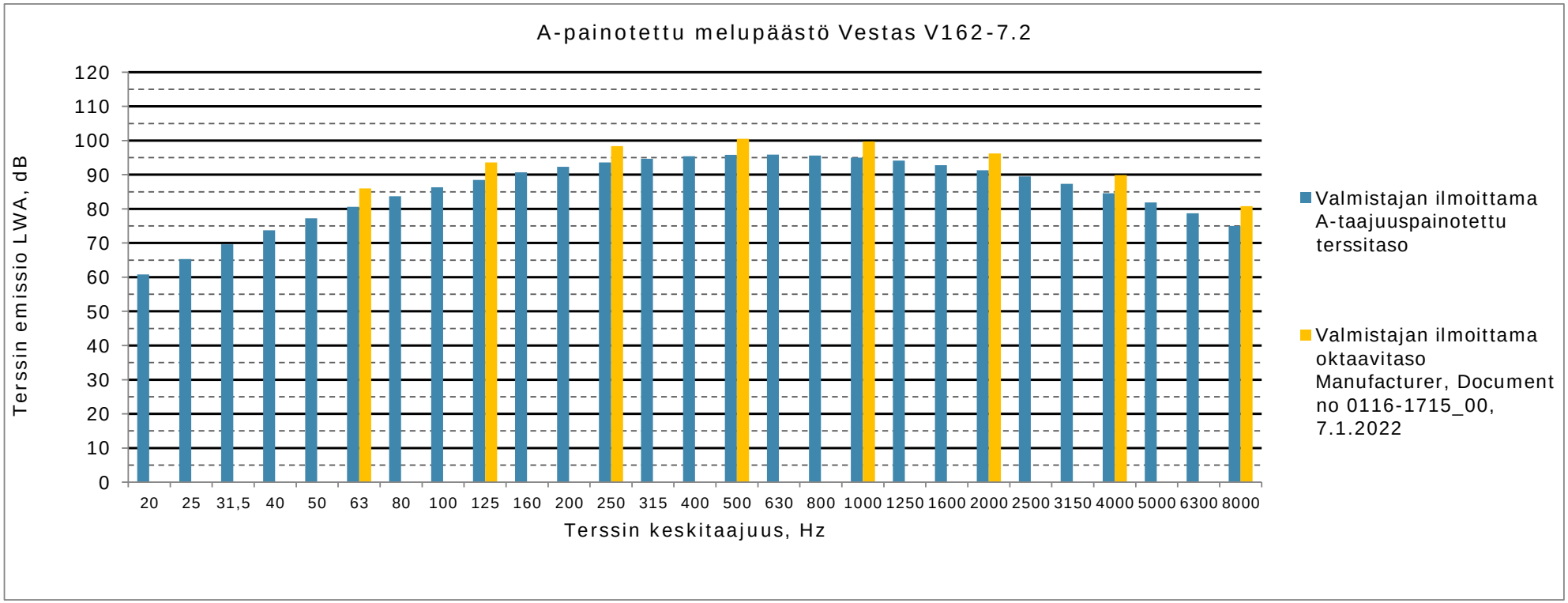

Painottamaton melupäästö SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

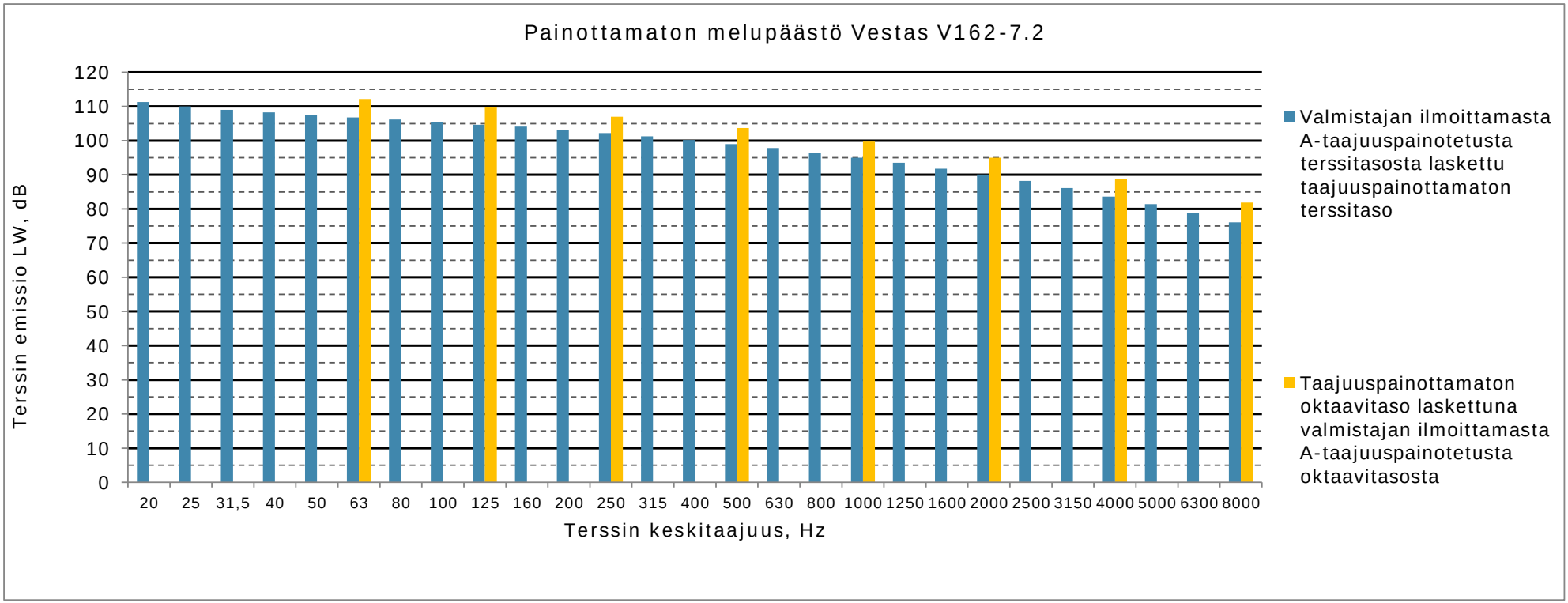

A-painotettu melupäästö Vestas V150-4.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0067-4767_06, 15.3.2018

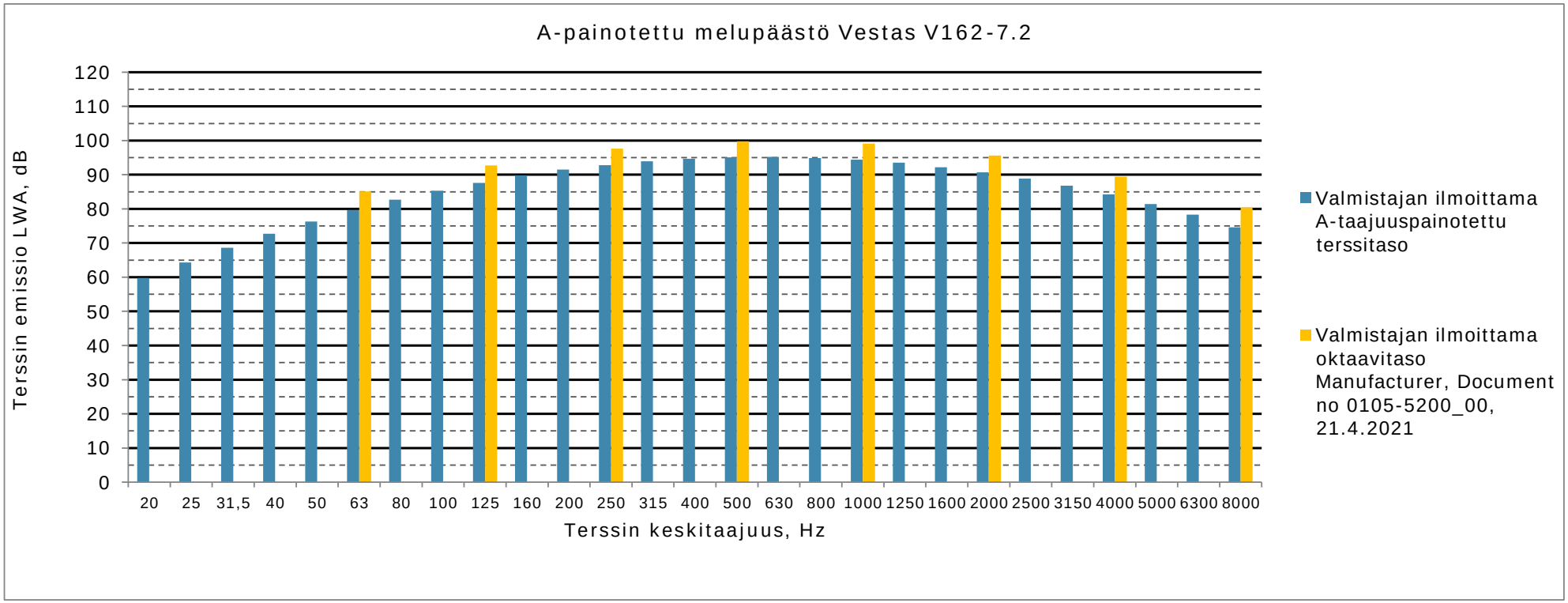

Painottamaton melupäästö Vestas V150-4.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

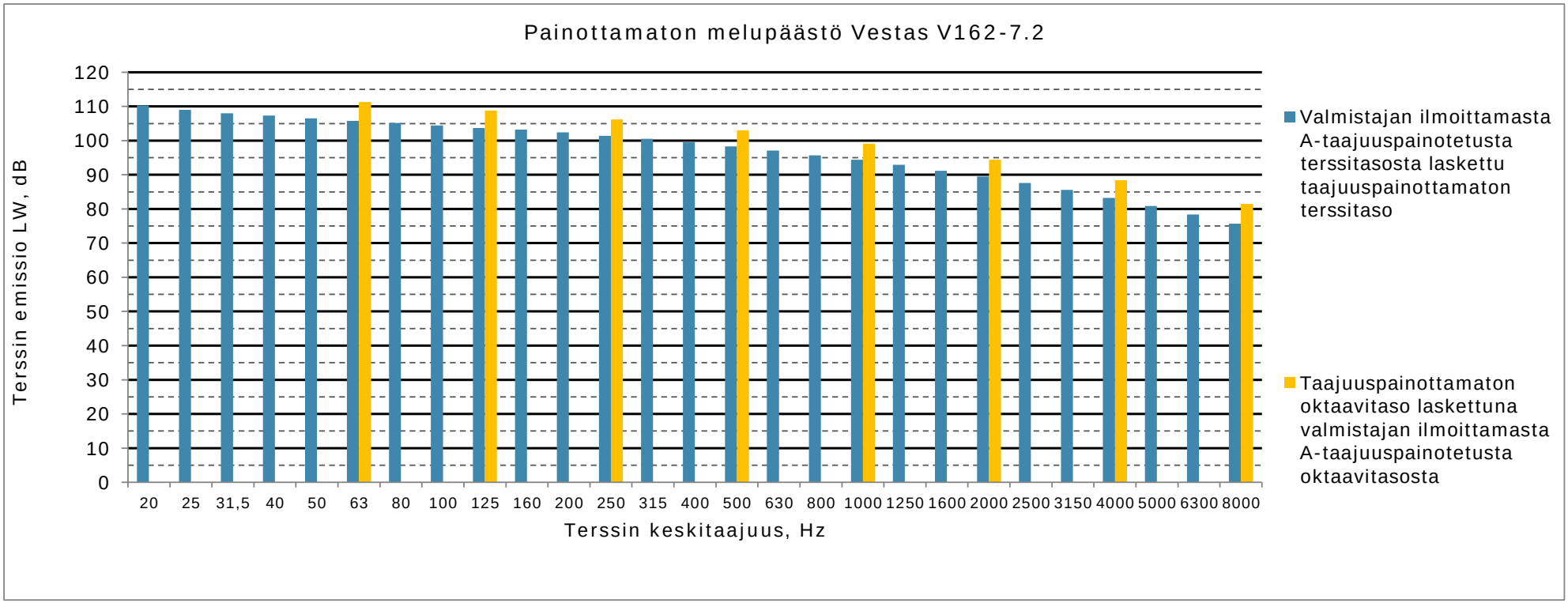

A-painotettu melupäästö Vestas V162-5.6
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0079-5298_01, 23.1.2019

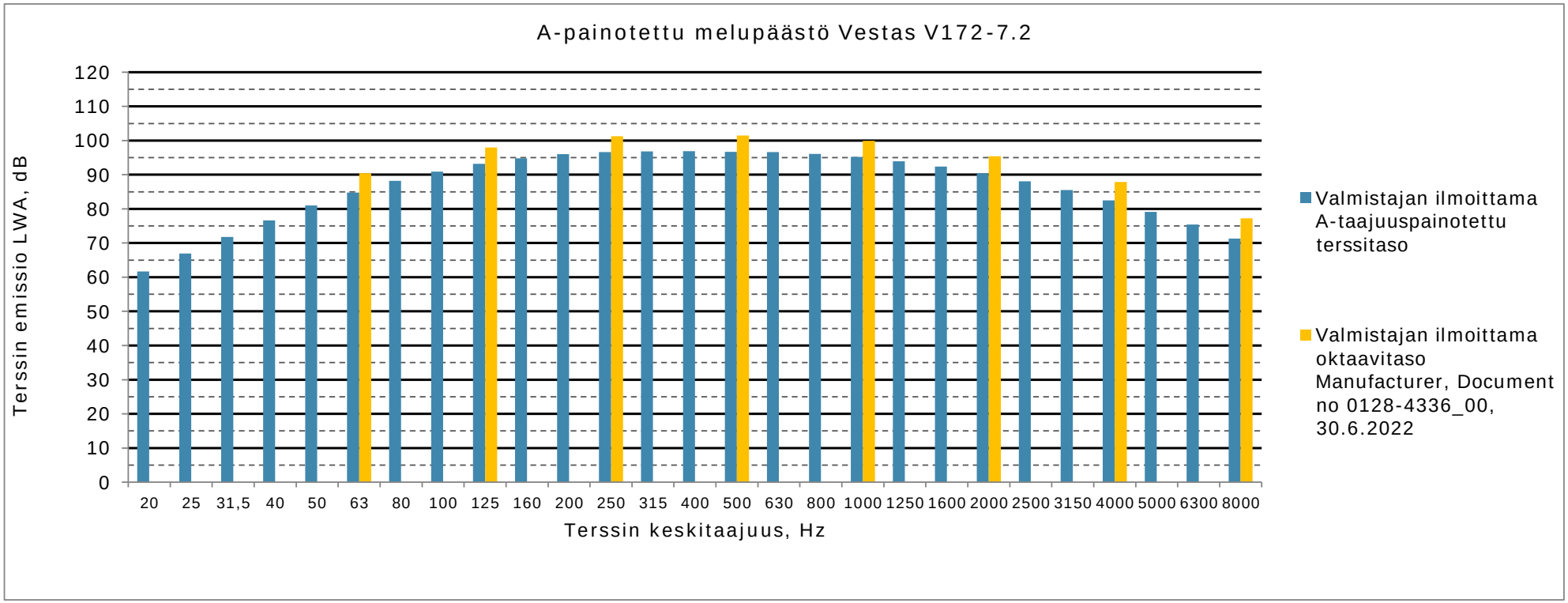

Painottamaton melupäästö Vestas V162-5.6
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

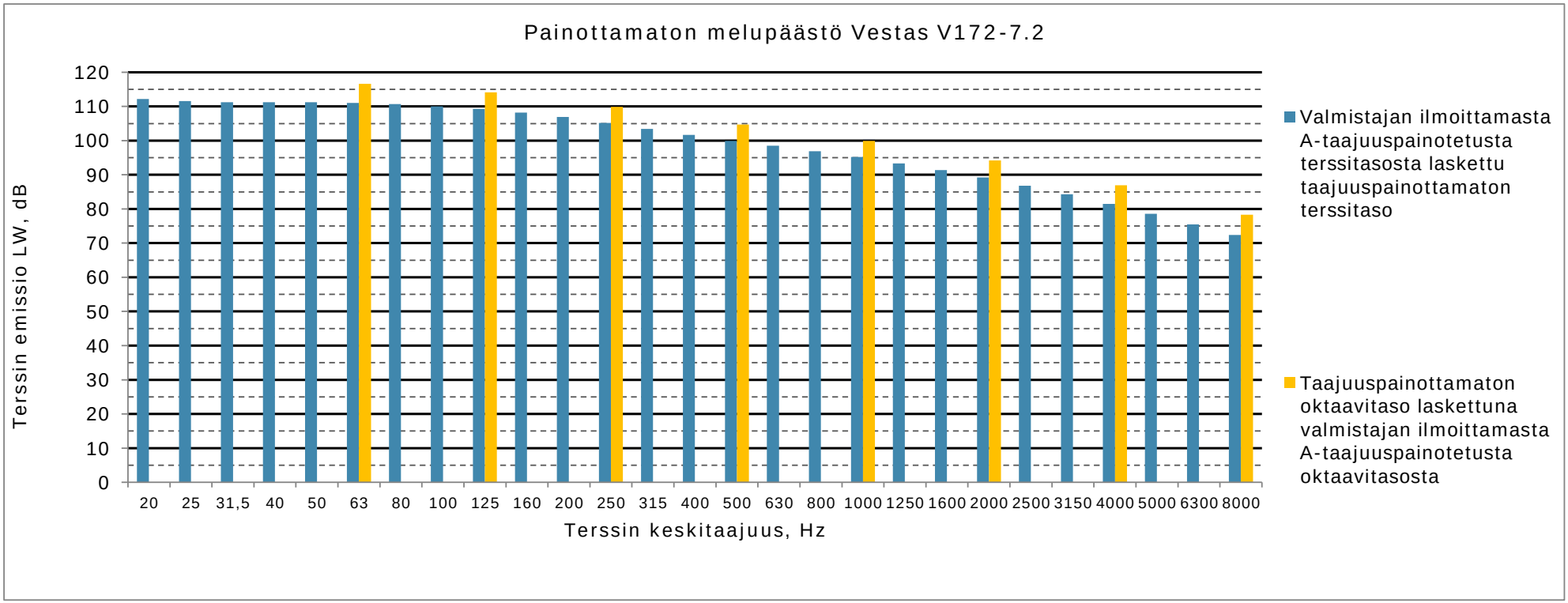

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0116-1715_00, 7.1.2022

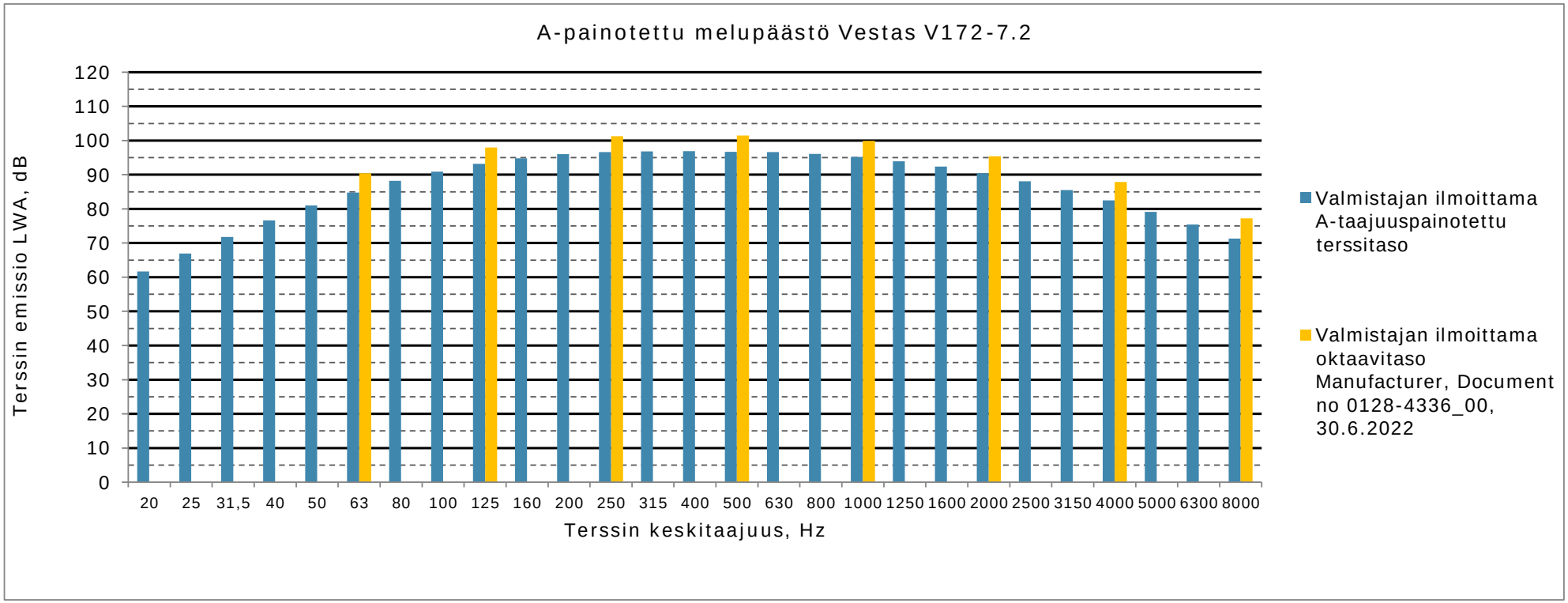

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

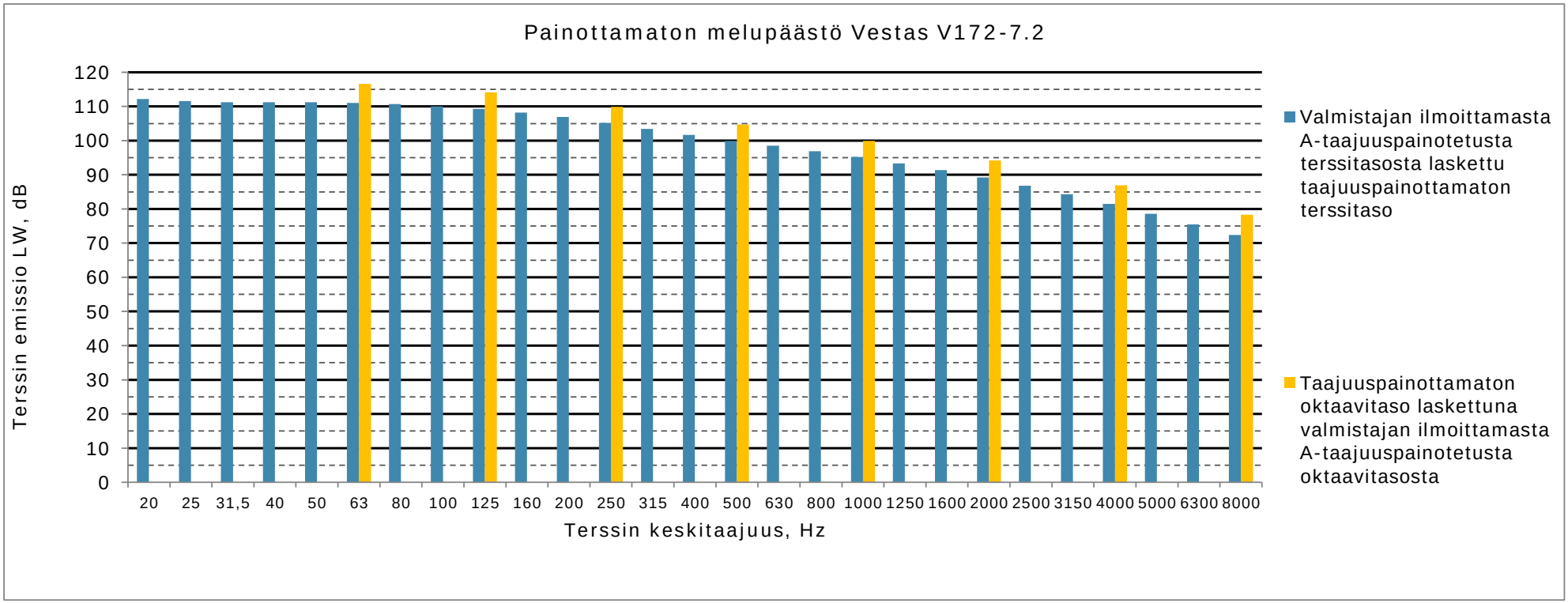

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0105-5200_00, 21.4.2021

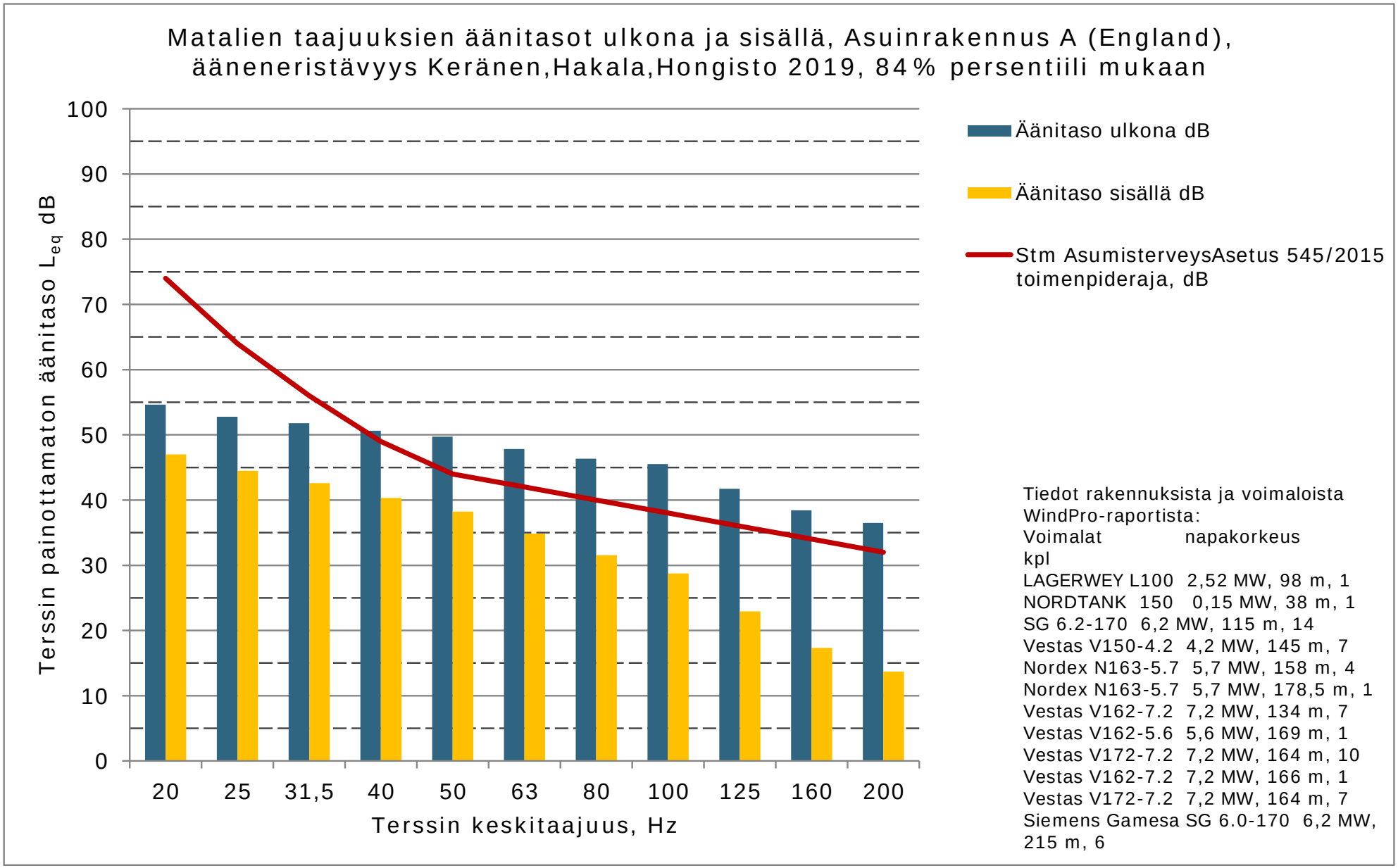

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022

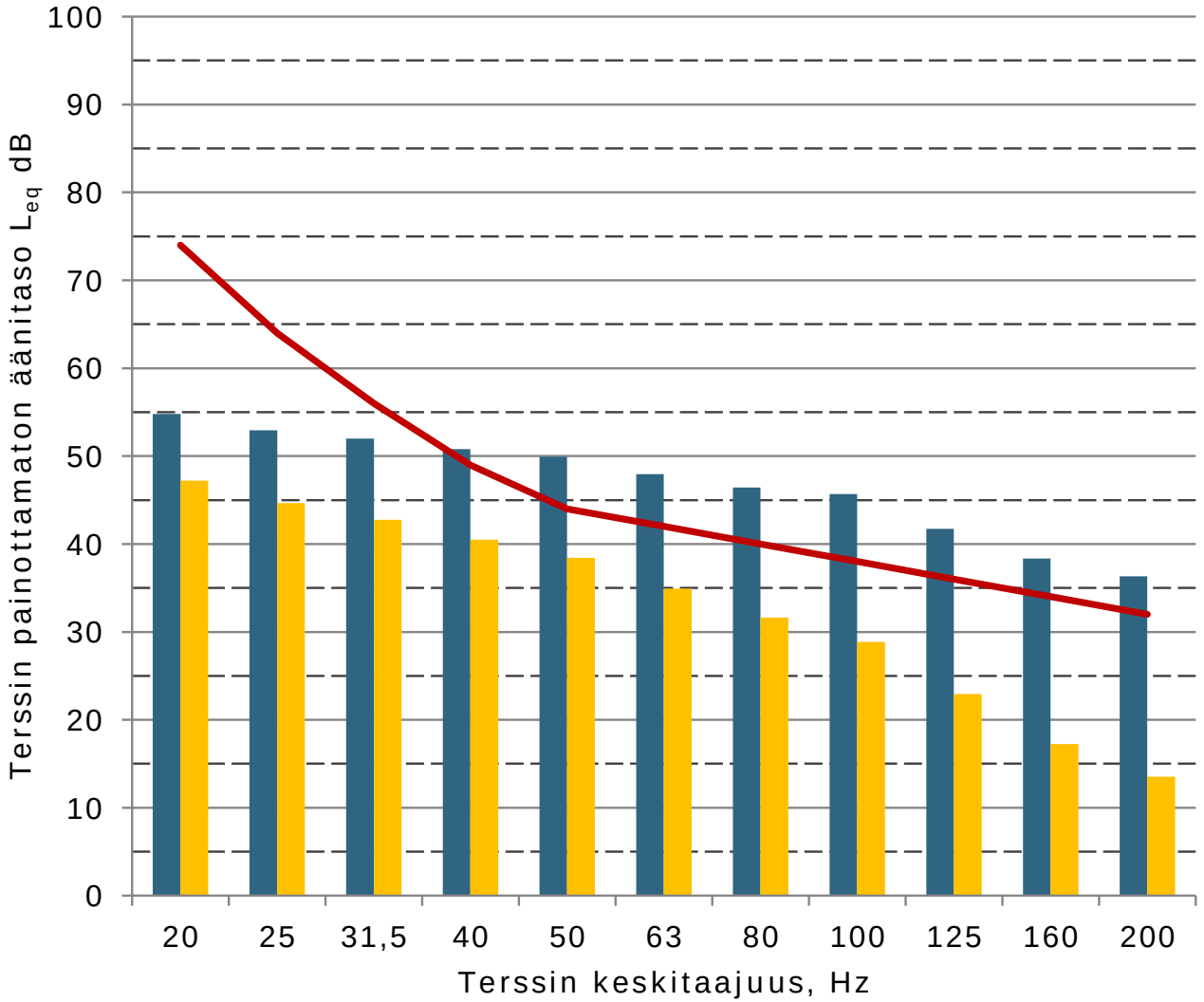

Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta



Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.0-170	6,2 MW, 215 m,	6

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B (Renlund), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan



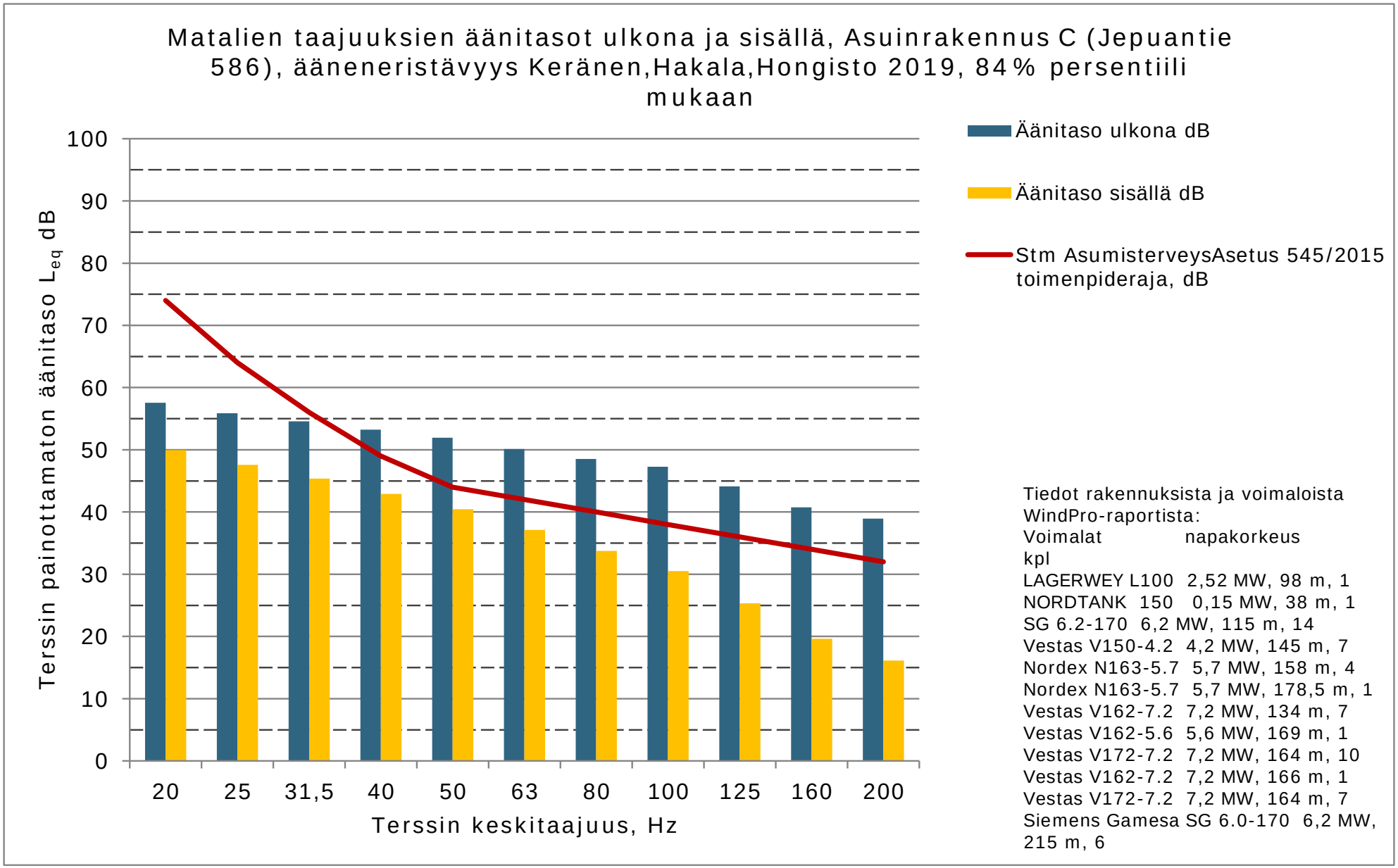
Äänitaso ulkona dB

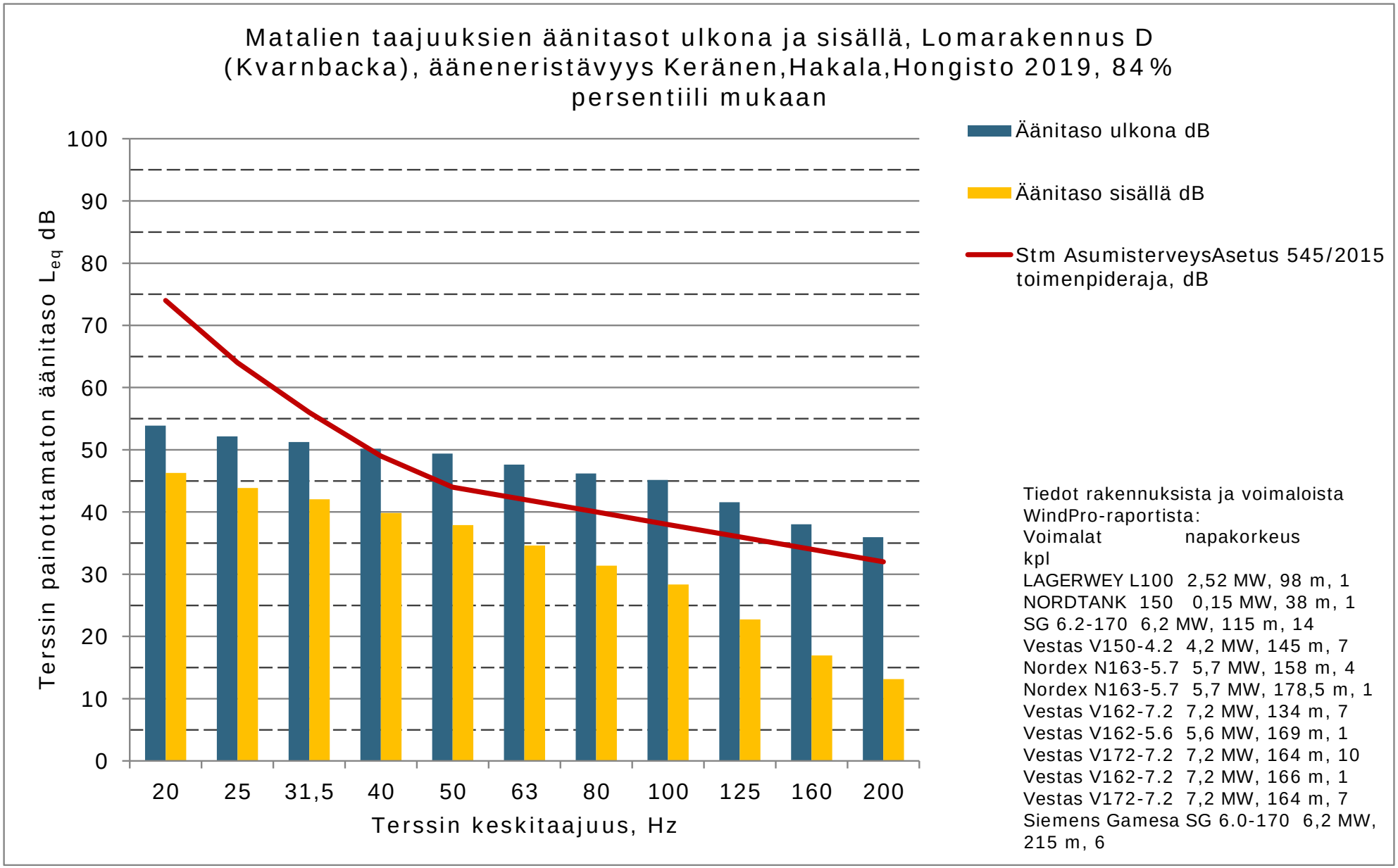
Äänitaso sisällä dB

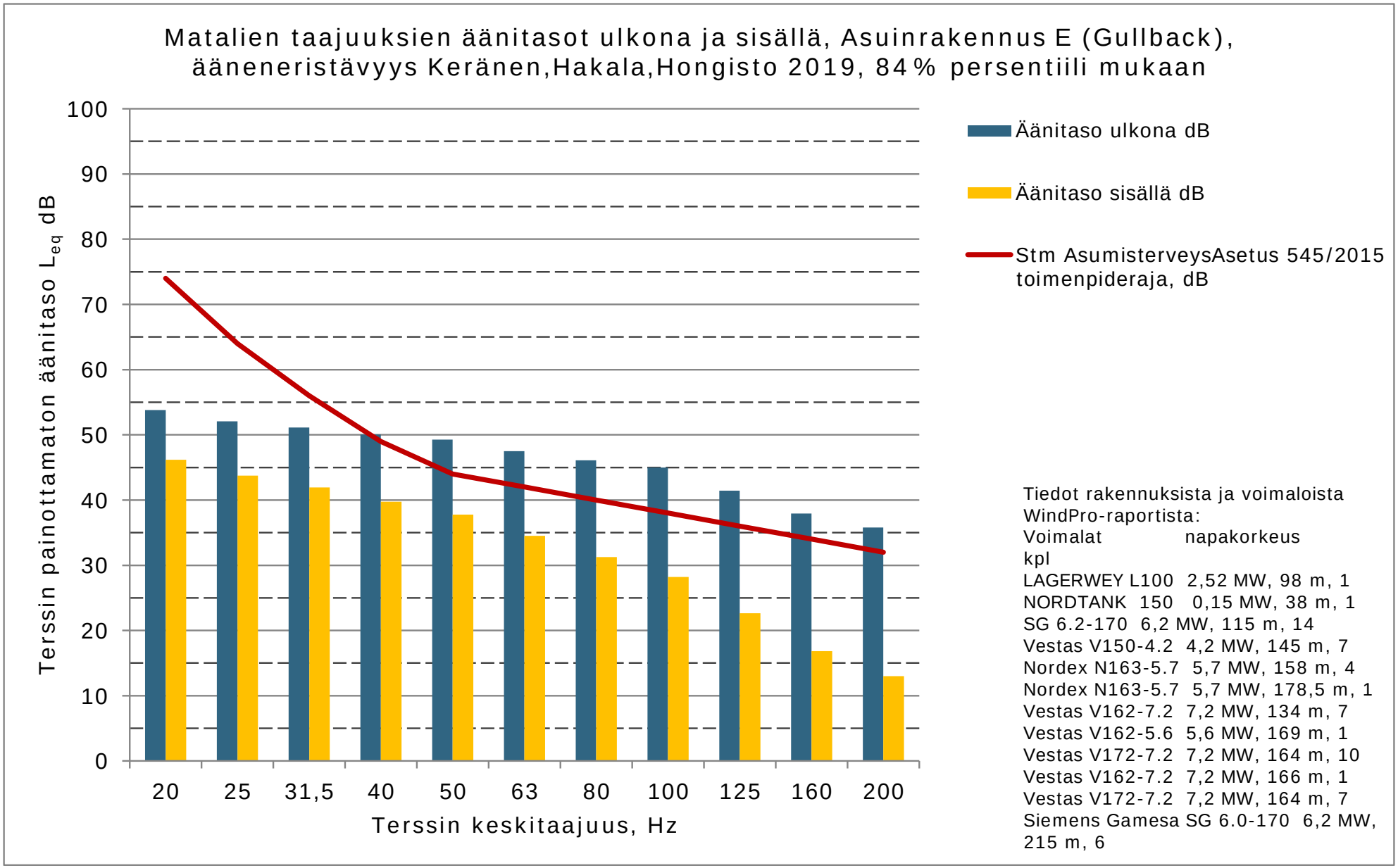
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

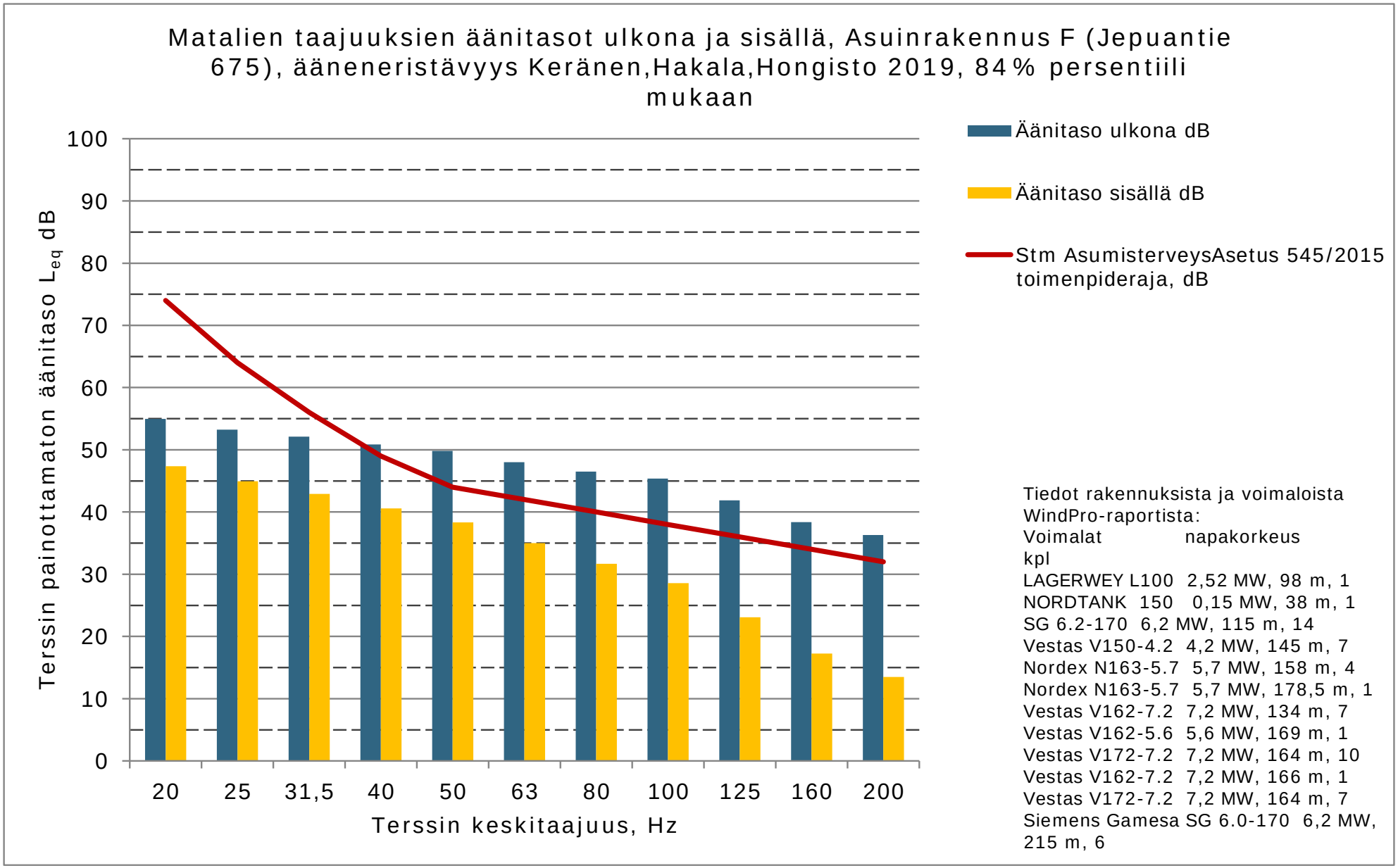
Tiedot rakennuksista ja voimaloista WindPro-raportista:

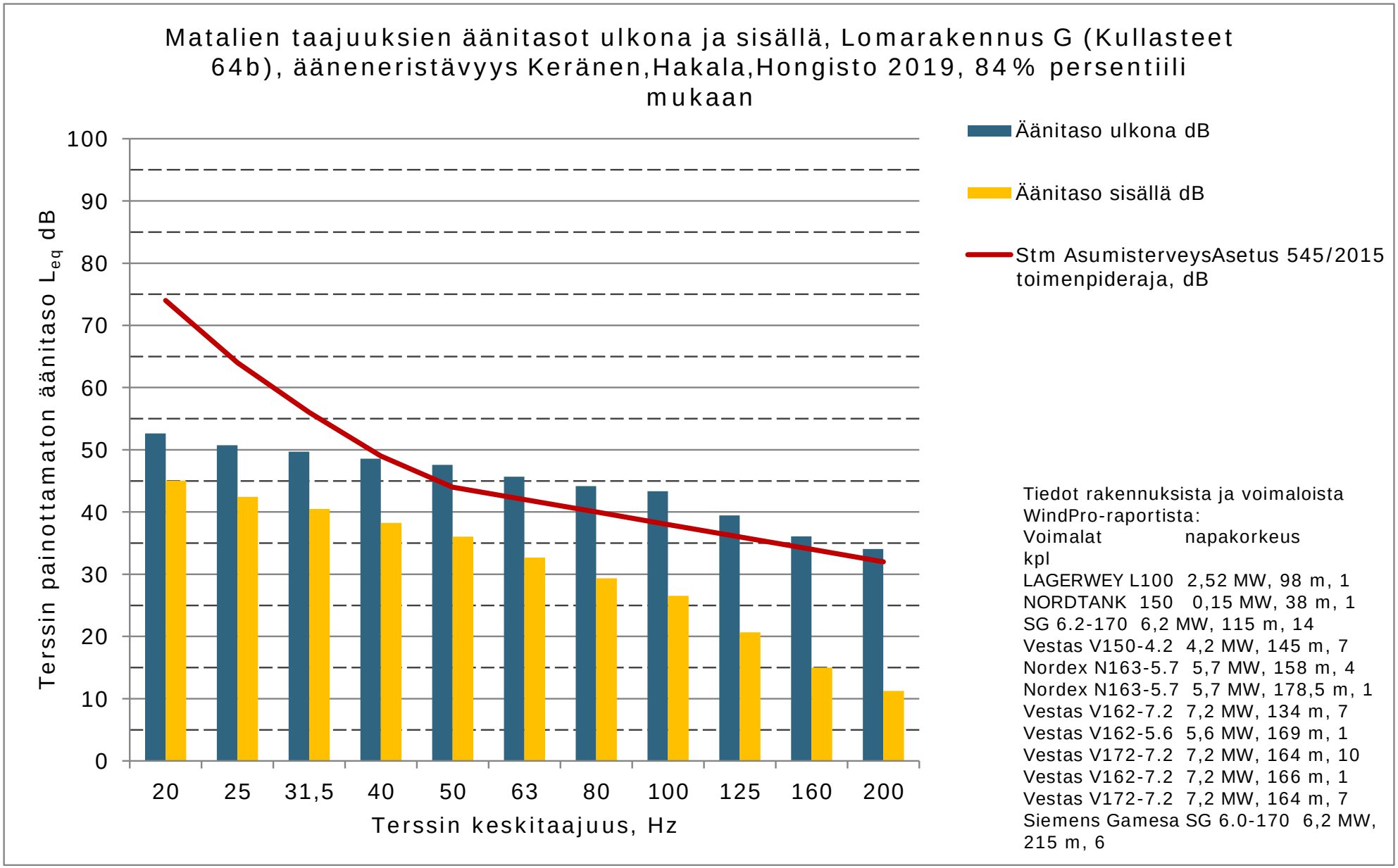
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.0-170	6,2 MW, 215 m,	6

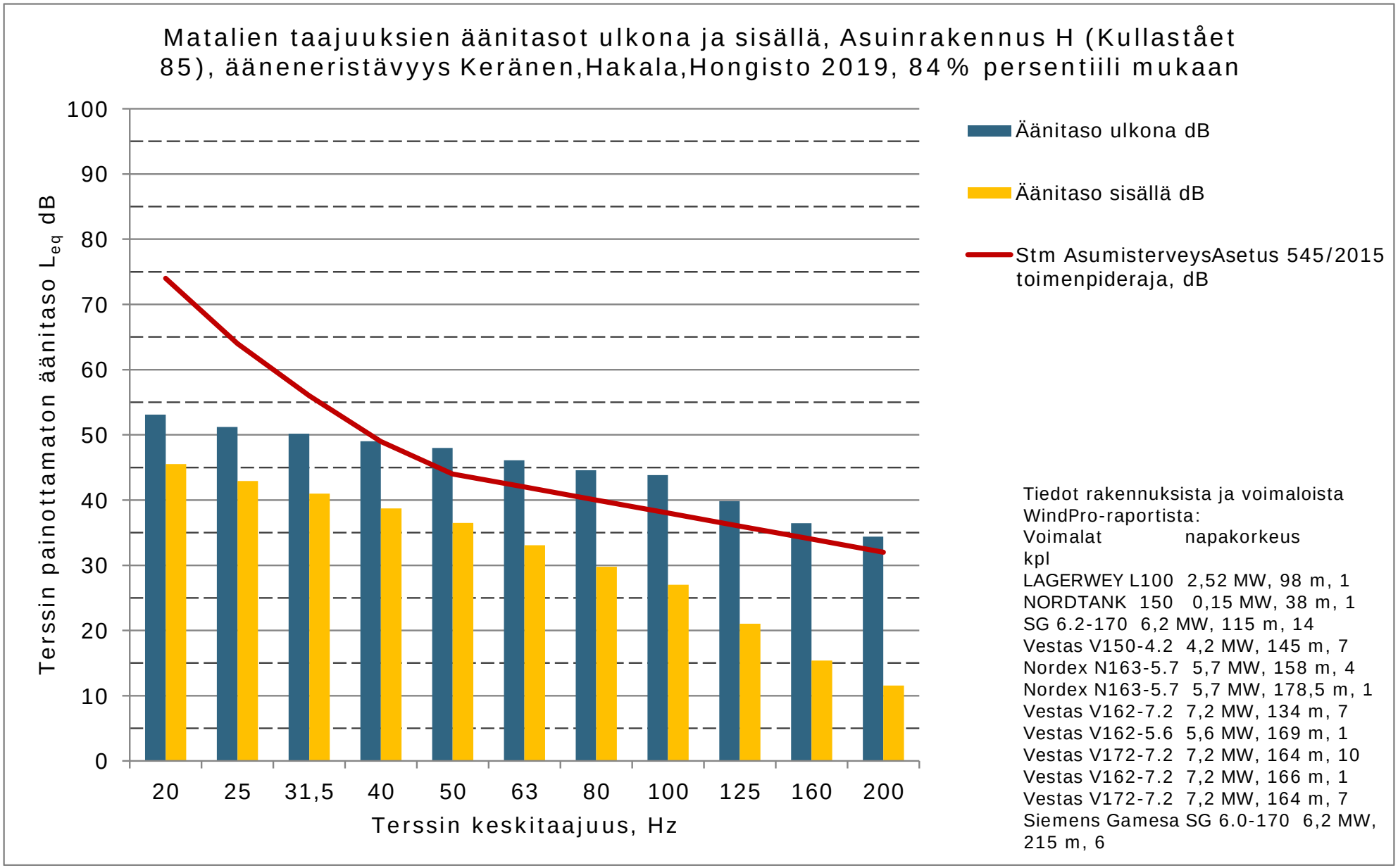

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Jepuantie 586), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

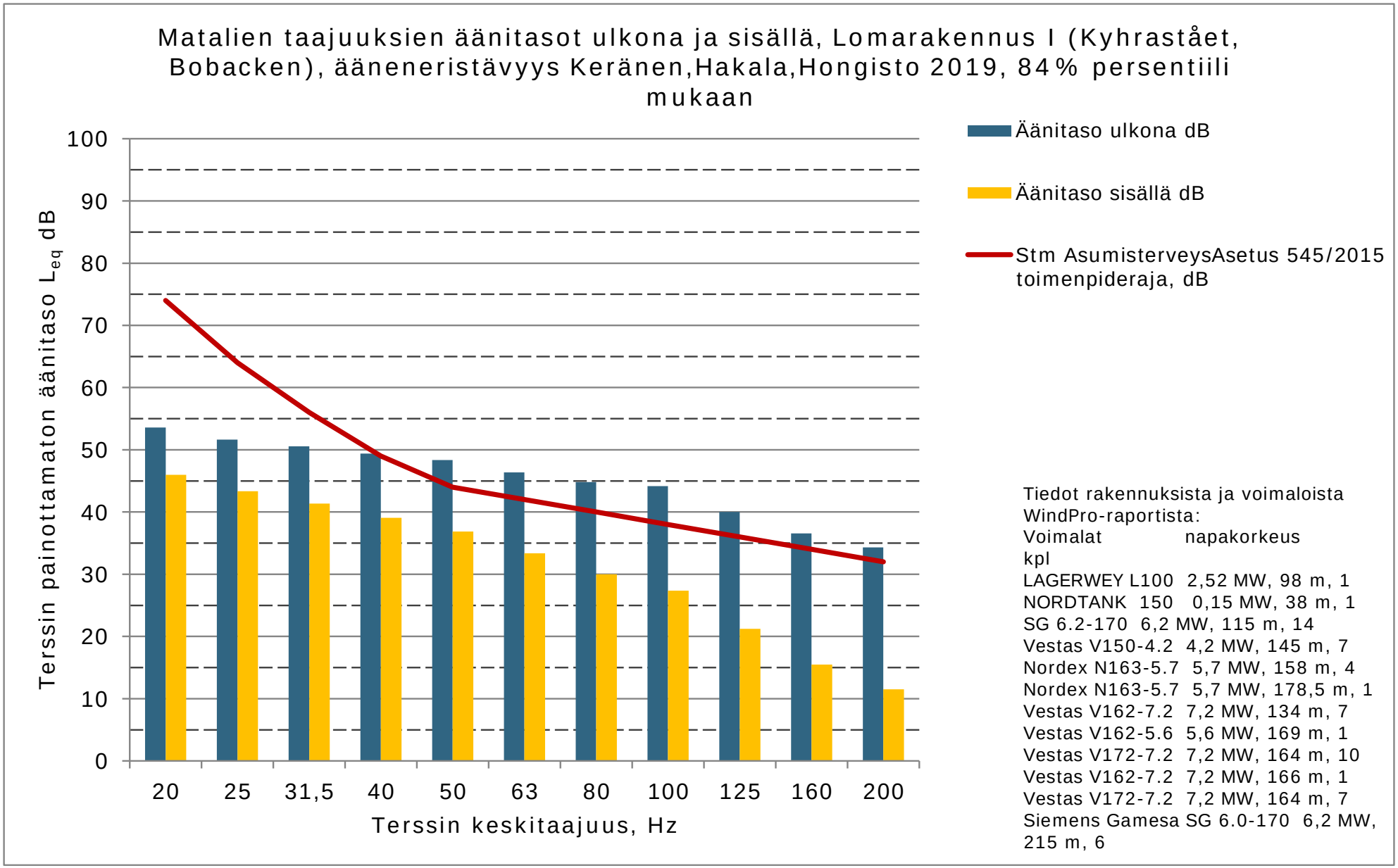

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D (Kvarnbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Gullback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

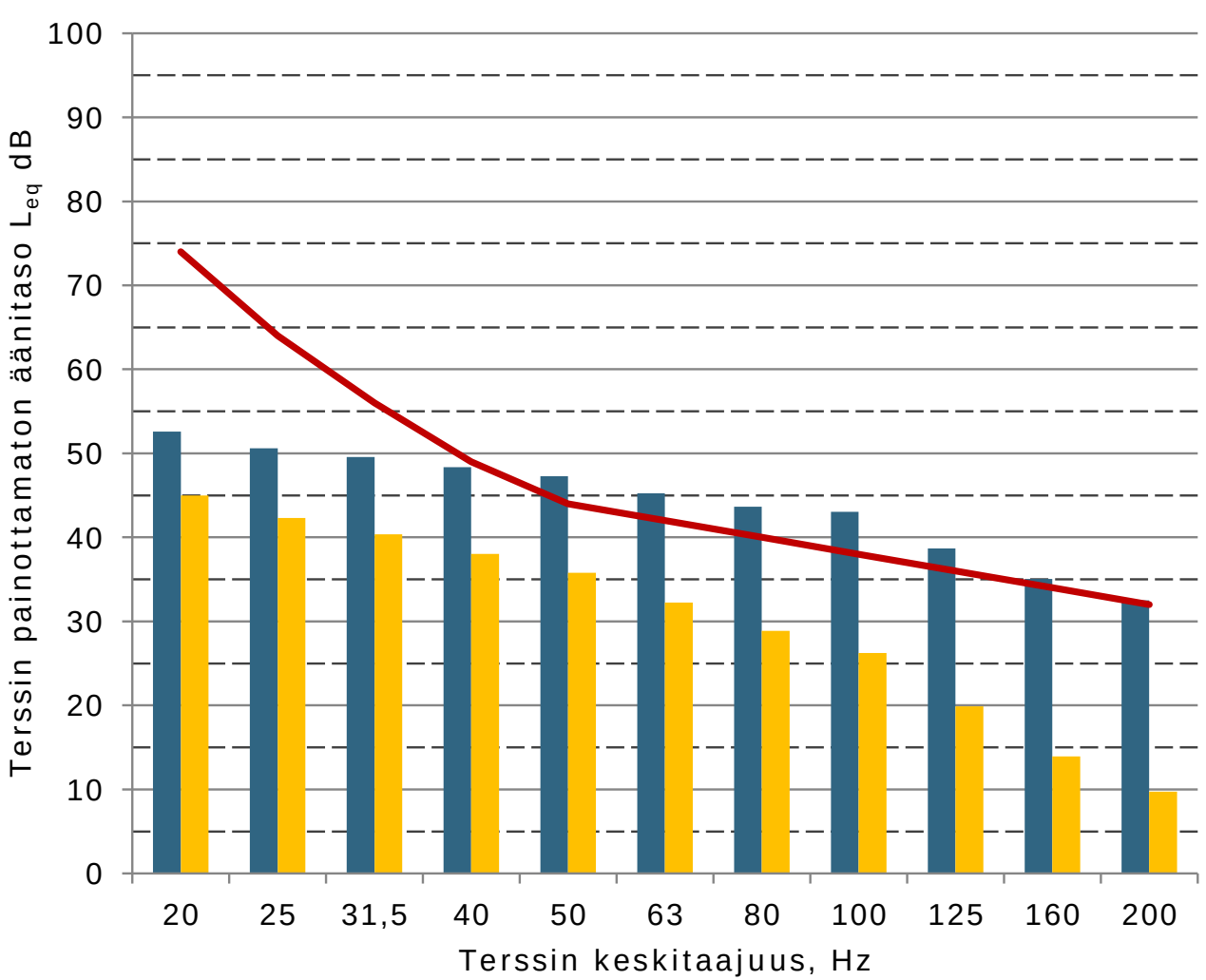

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Jepuantie 675), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

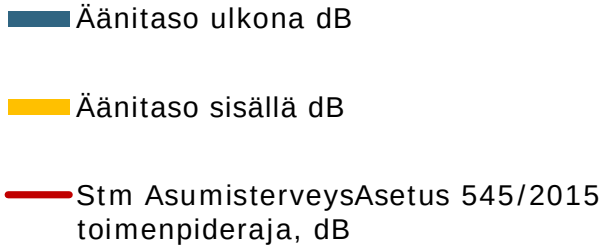

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Kullasteet 64b), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Kullastået 85), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Kyhrastået, Bobacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

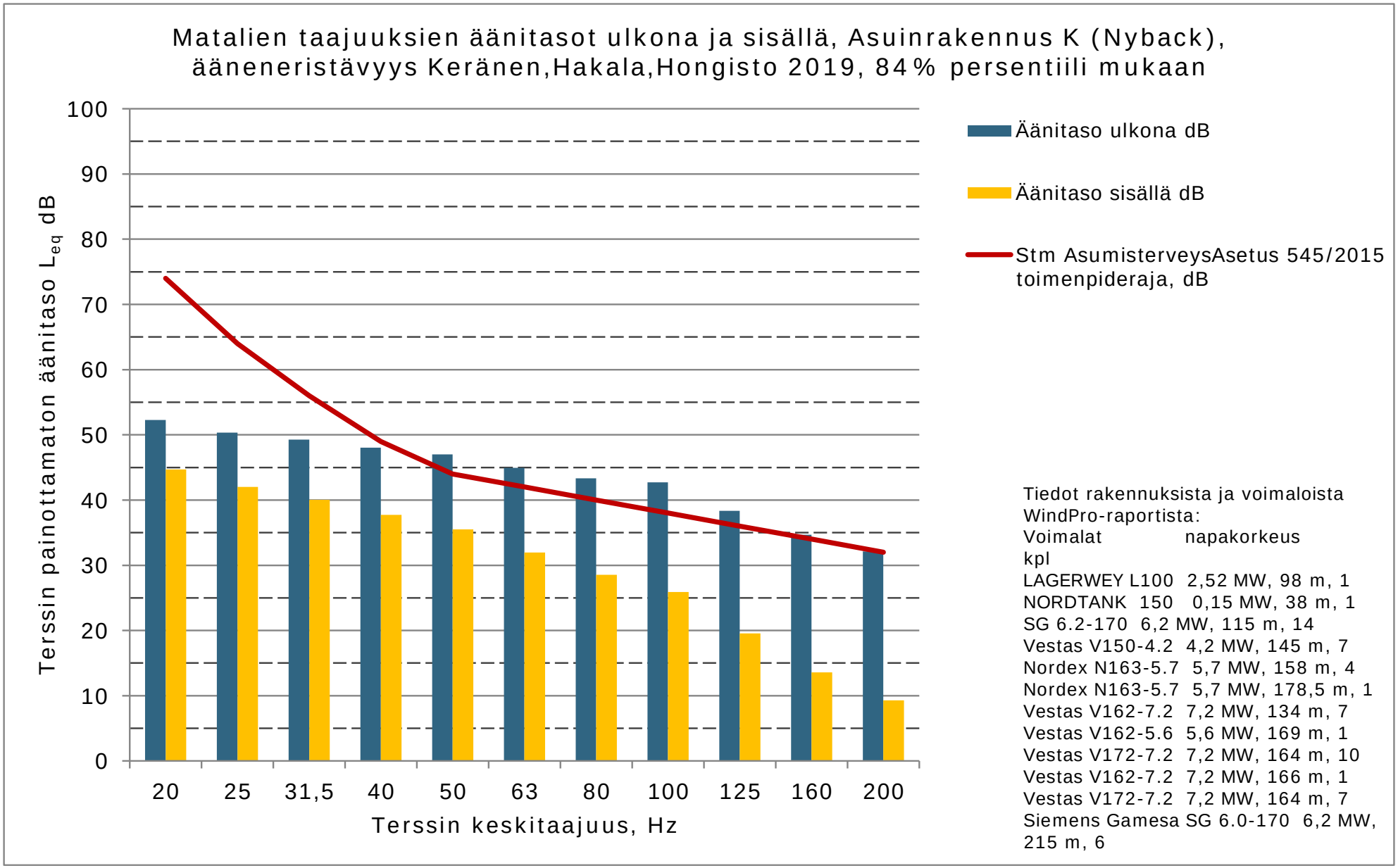
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Hagabacktået 71), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan



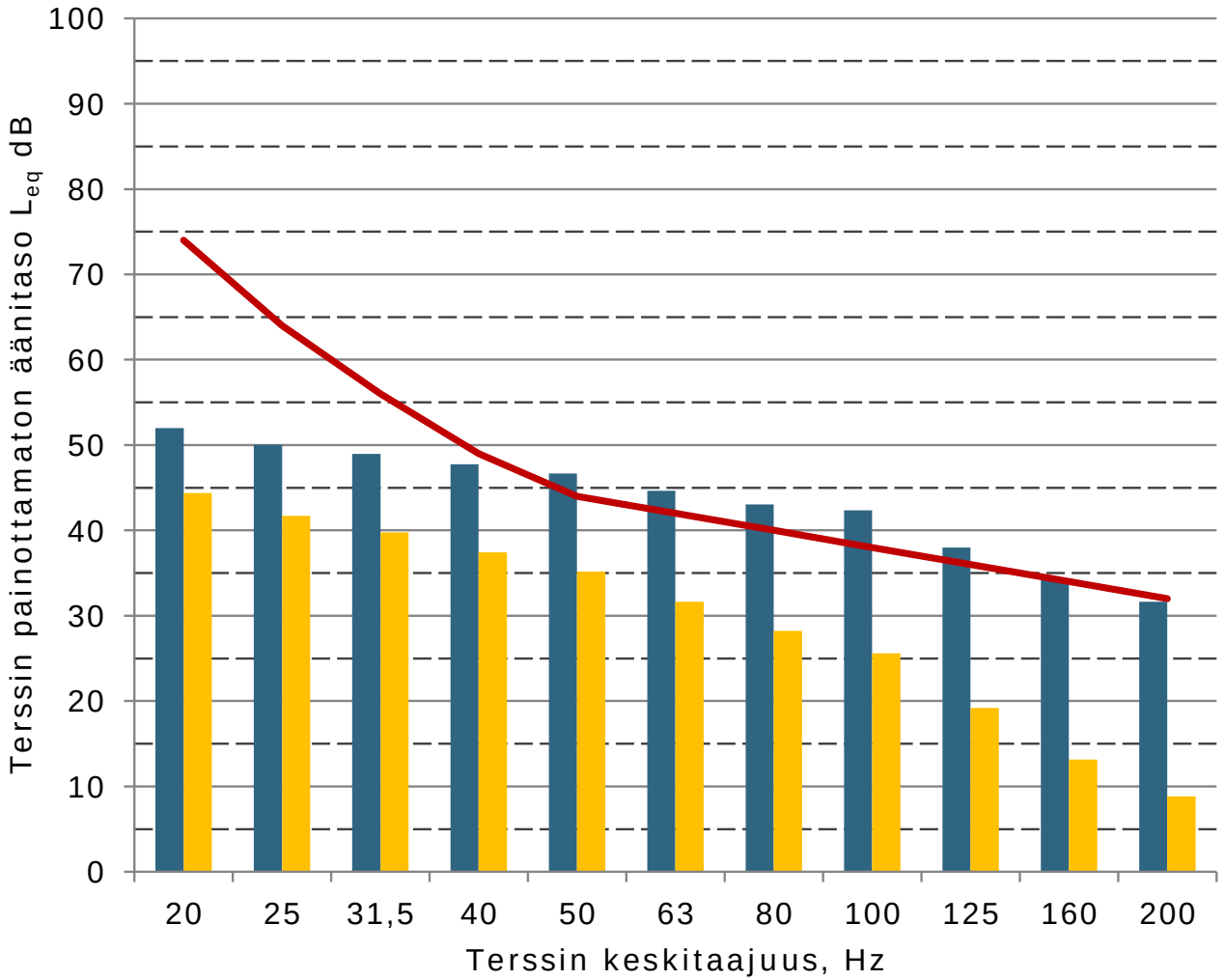


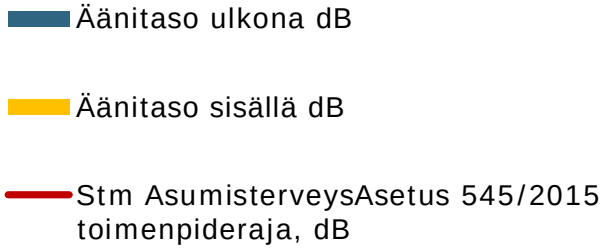
Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.0-170	6,2 MW, 215 m,	6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Nyback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

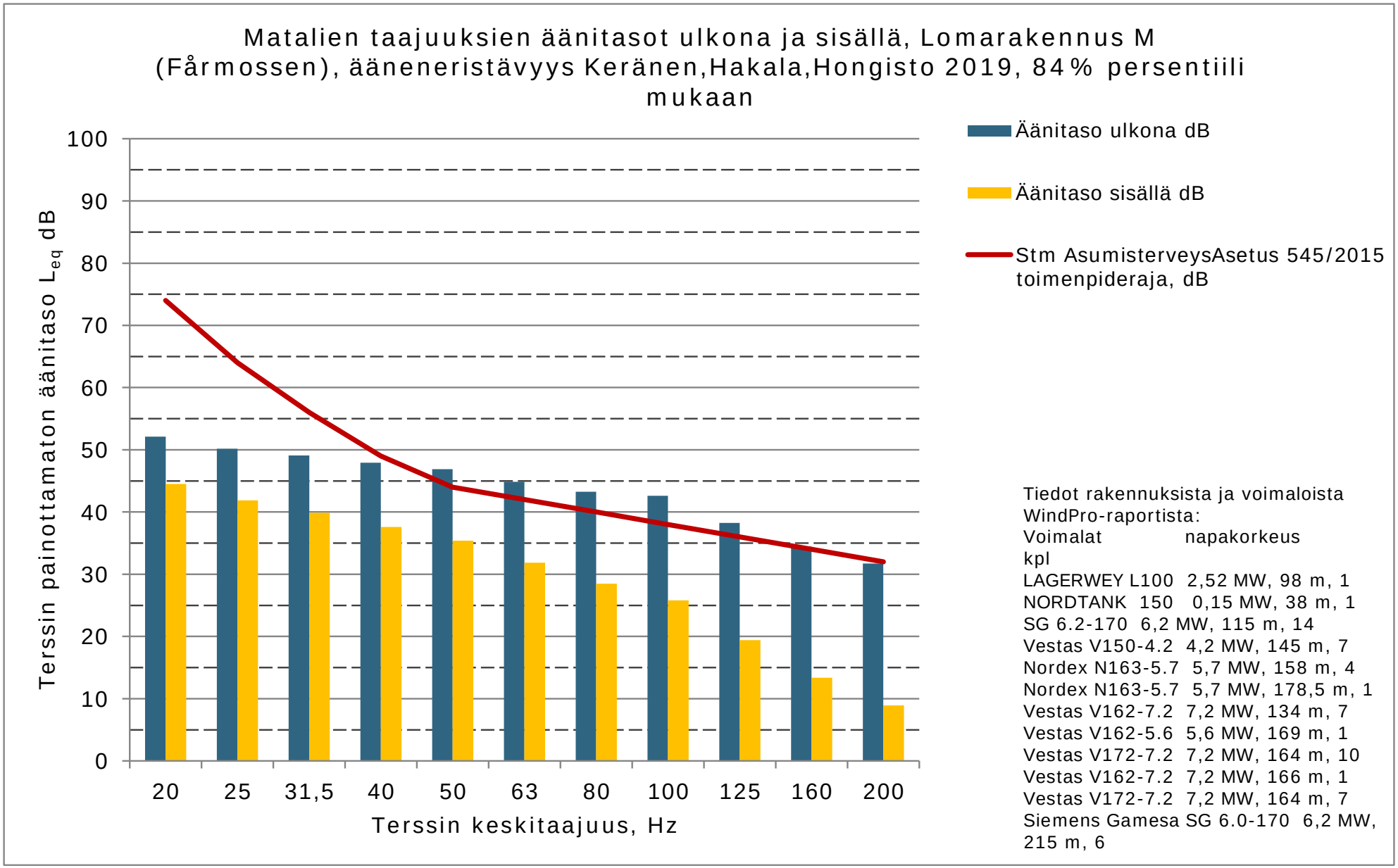
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Kimo Skogsbilvdg 55), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

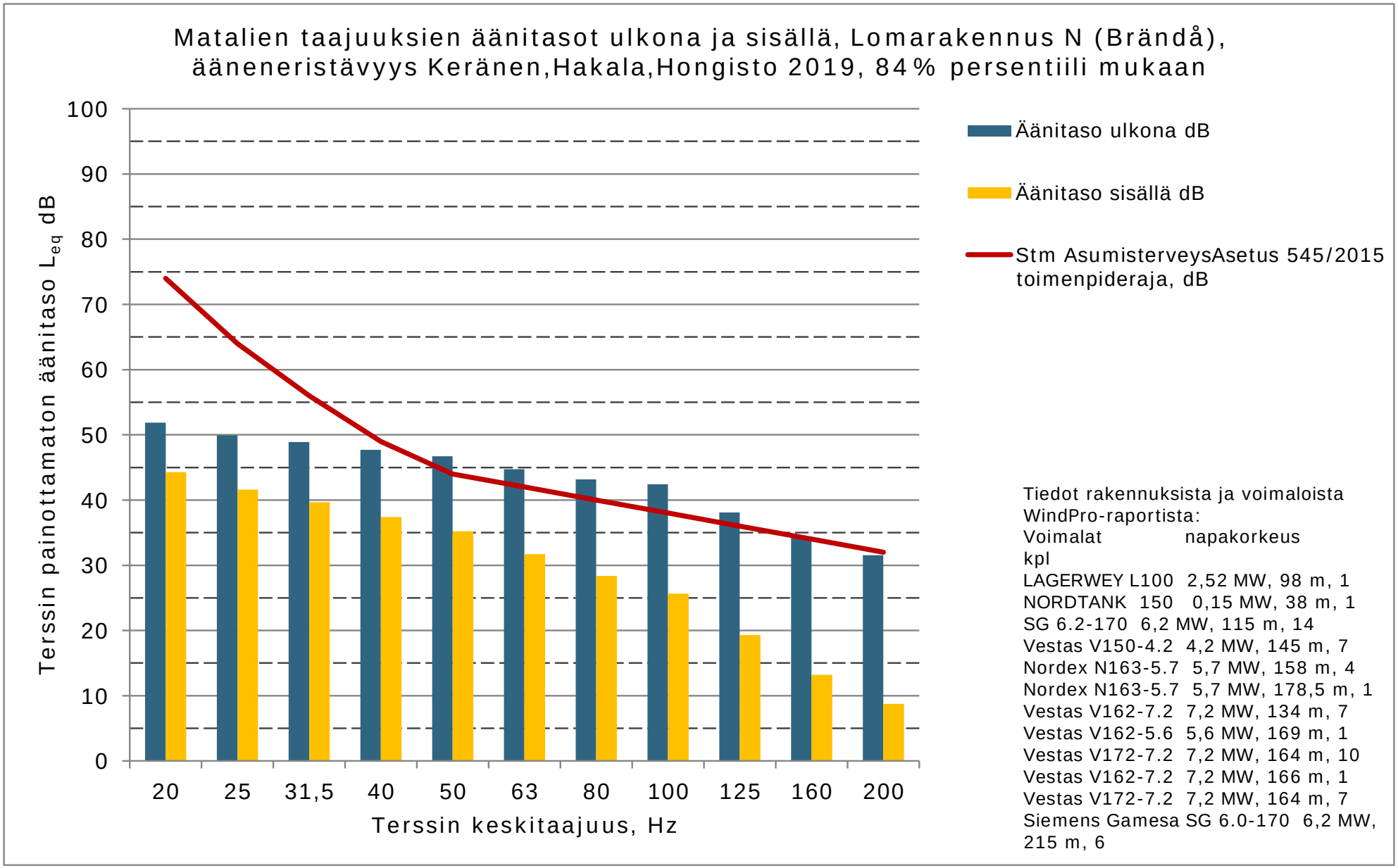




Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.0-170	6,2 MW, 215 m,	6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus M (Fårmossen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Brändå), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.0-170 6,2 MW, 215 m, 6

Bilaga 7. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, no forest” i** nuläget.

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Calculated:
17.9.2024 11.09/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

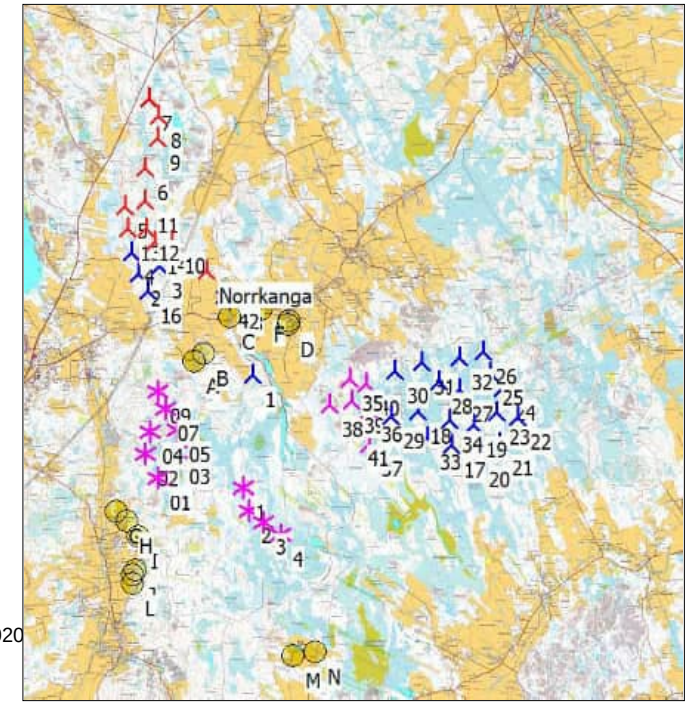
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
755	685	453	387	472	722	1 037	1 307	901	638	515	535	8 406

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
43	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:20
B	Asuinrakennus B (Renlund)	5:36
C	Asuinrakennus C (Jepuantie 586)	2:06
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59
F	Asuinrakennus F (Jepuantie 675)	8:12
G	Lomarakennus G (Kullastået 64b)	6:34
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	0:00
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

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17.9.2024 11.09/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	6:34
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:18
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:15
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:34
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
43	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

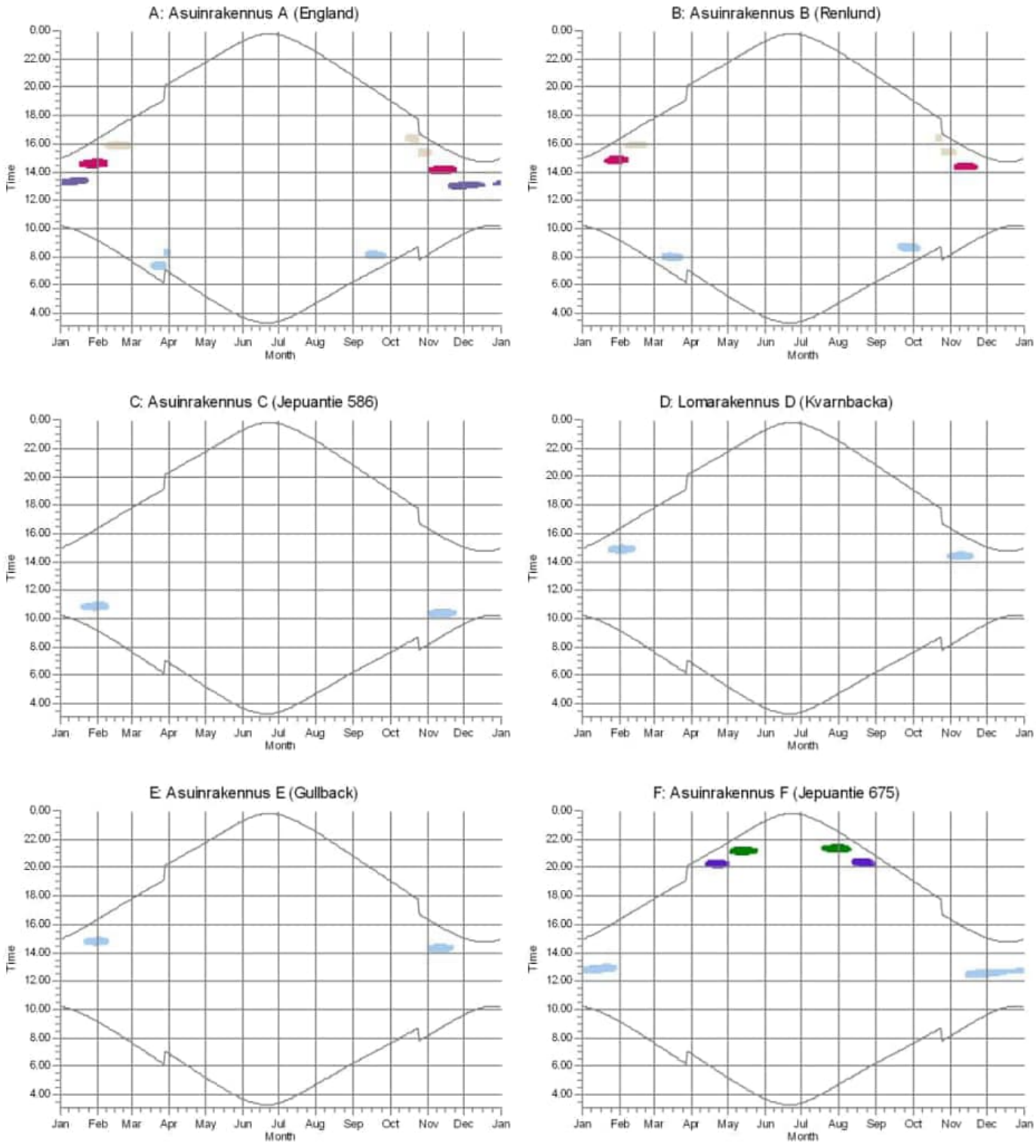
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
17.9.2024 11.09/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917



WTGs

Norrkanga: Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)
1: NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)
42: LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)
43: NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)
05: VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)
09: VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)
07: VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)

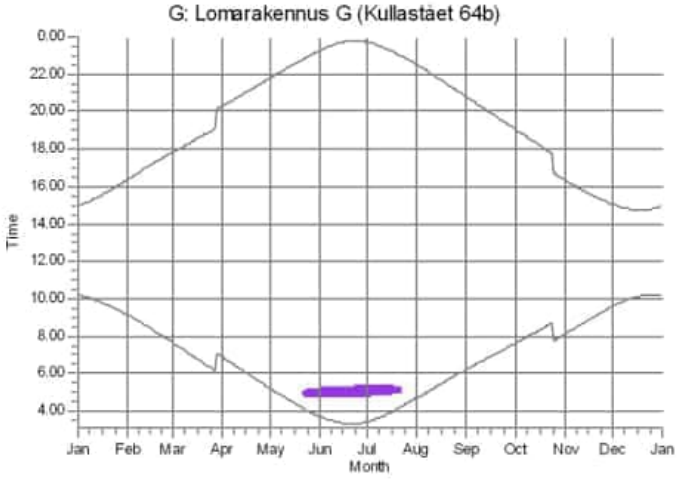
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Calculated:
17.9.2024 11.09/3.6.377

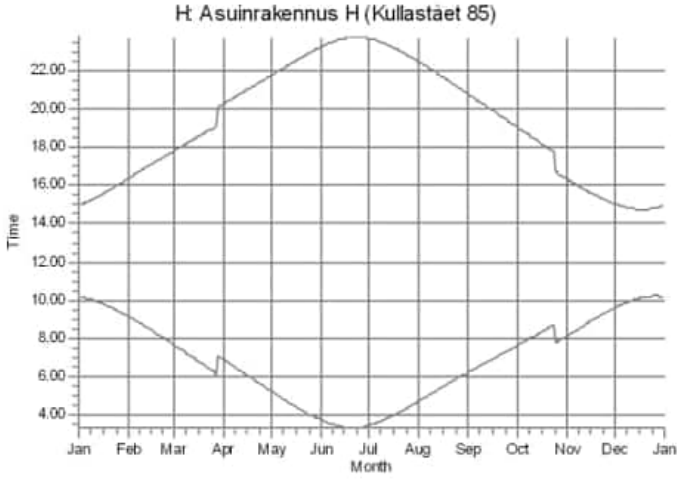
SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917

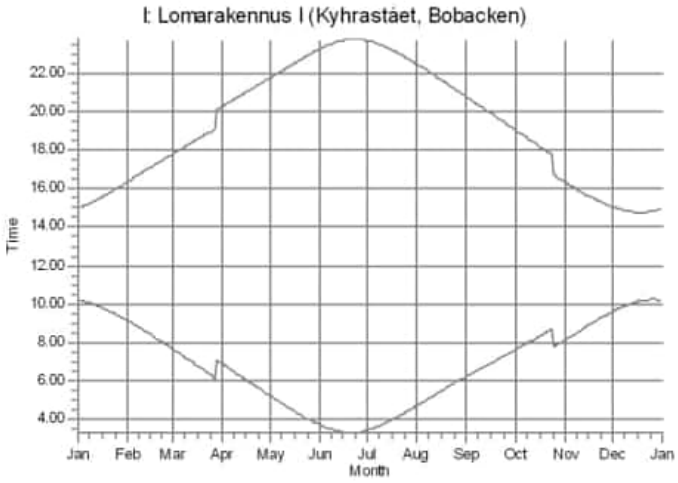
G: Lomarakennus G (Kullastäet 64b)



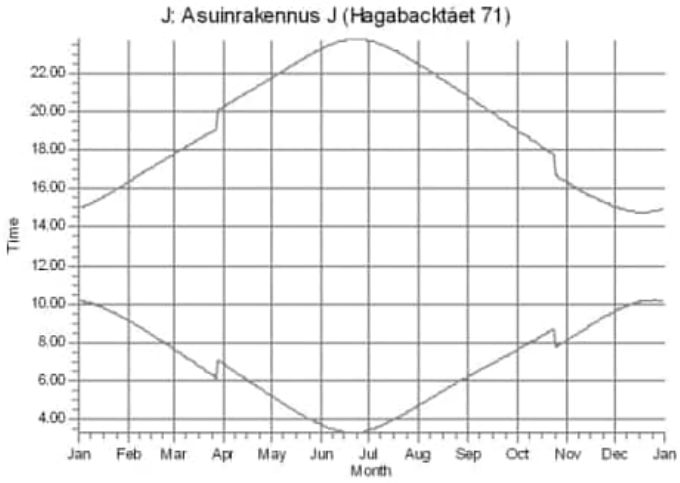
H: Asuinrakennus H (Kullastäet 85)



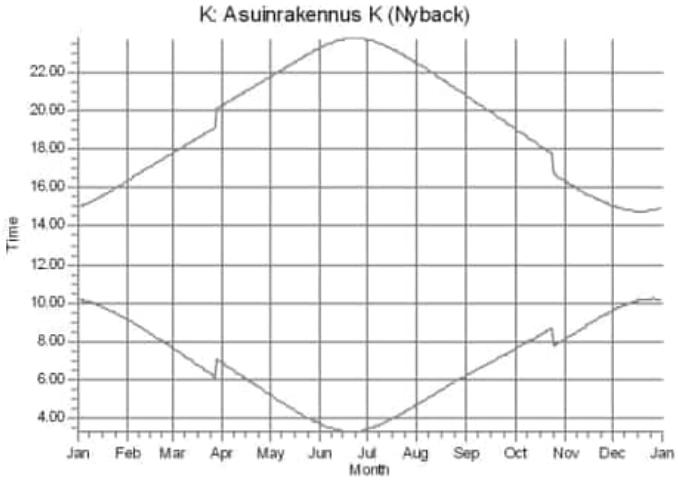
I: Lomarakennus I (Kyhrastäet, Bobacken)



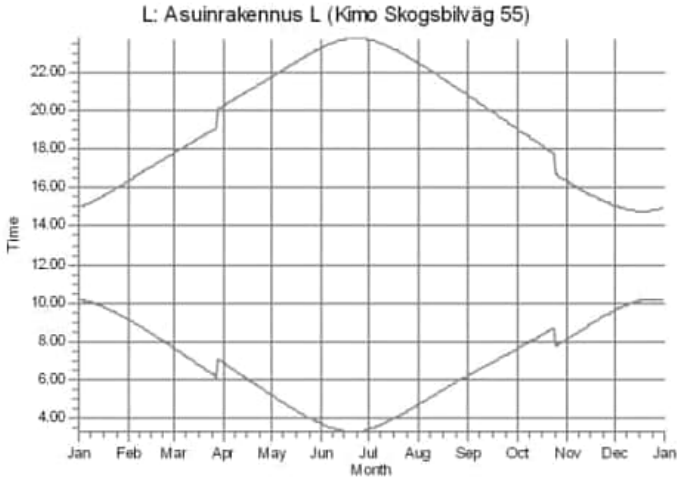
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



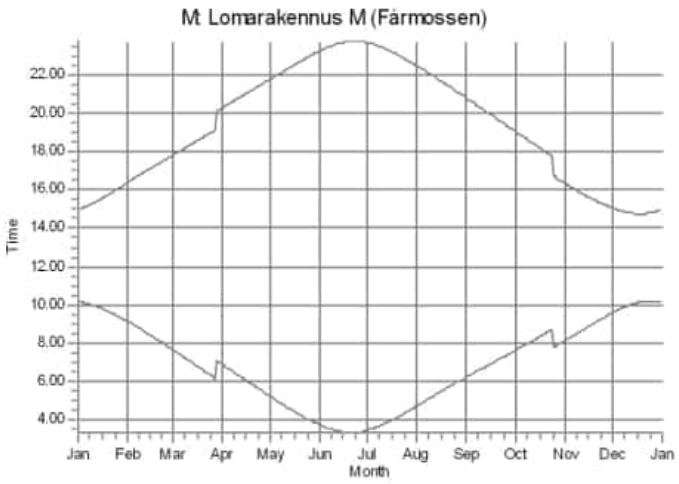
WTGs

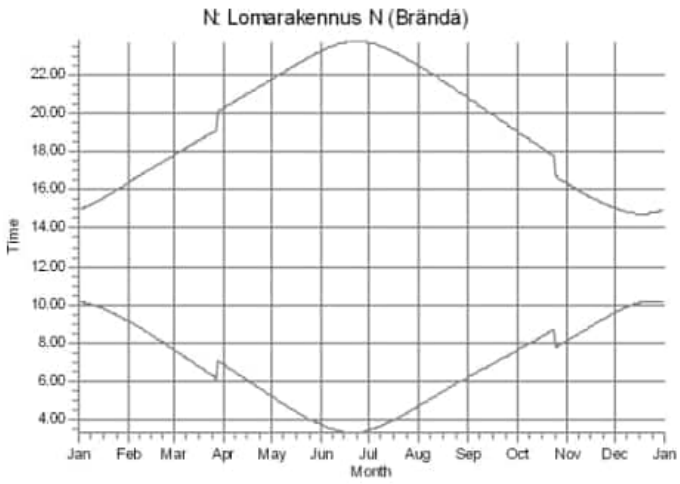
01: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (6)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917



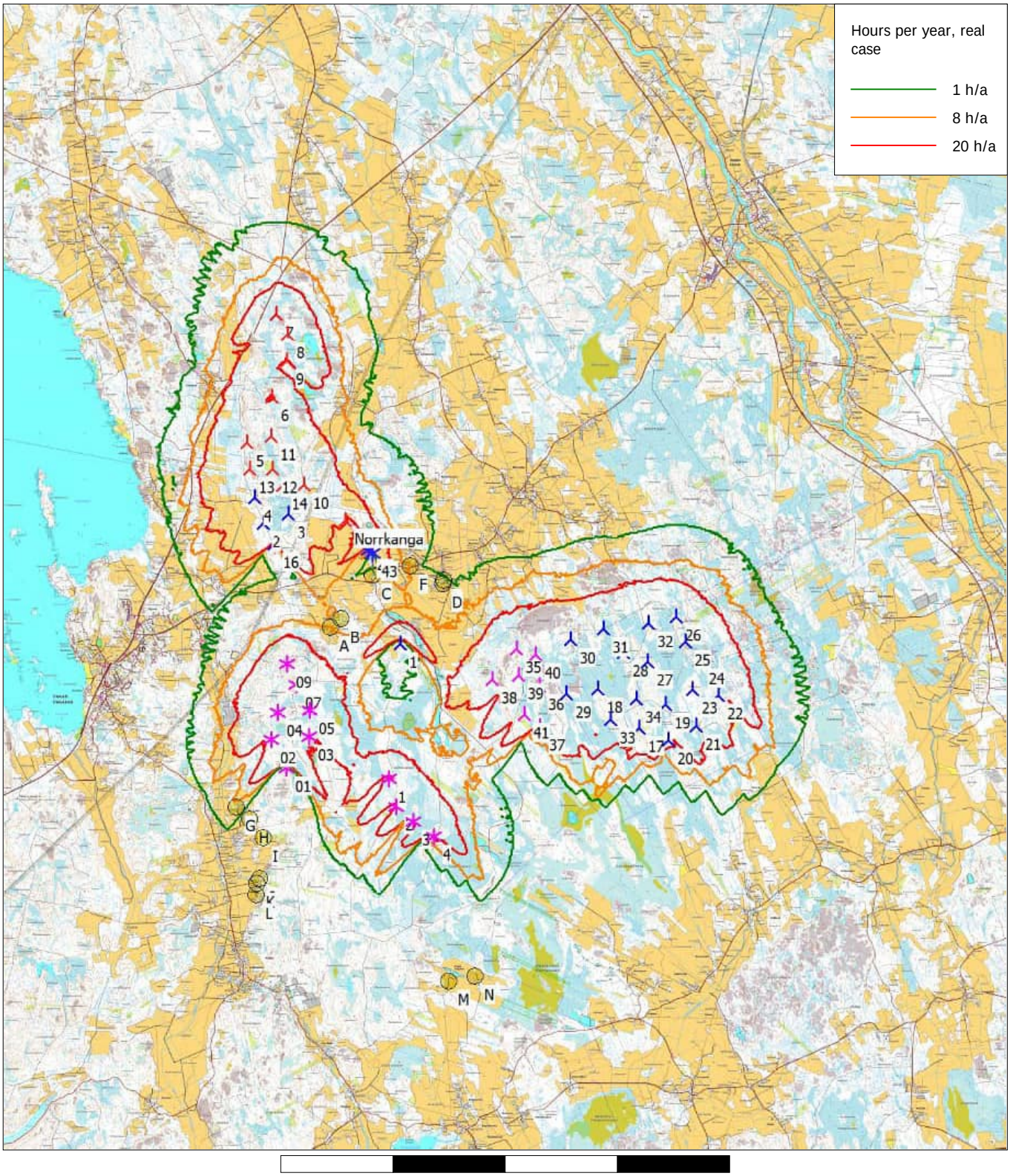


WTGs

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SHADOW - Map

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 8. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, no forest”** (ALT1).

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Calculated:
17.9.2024 13.01/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

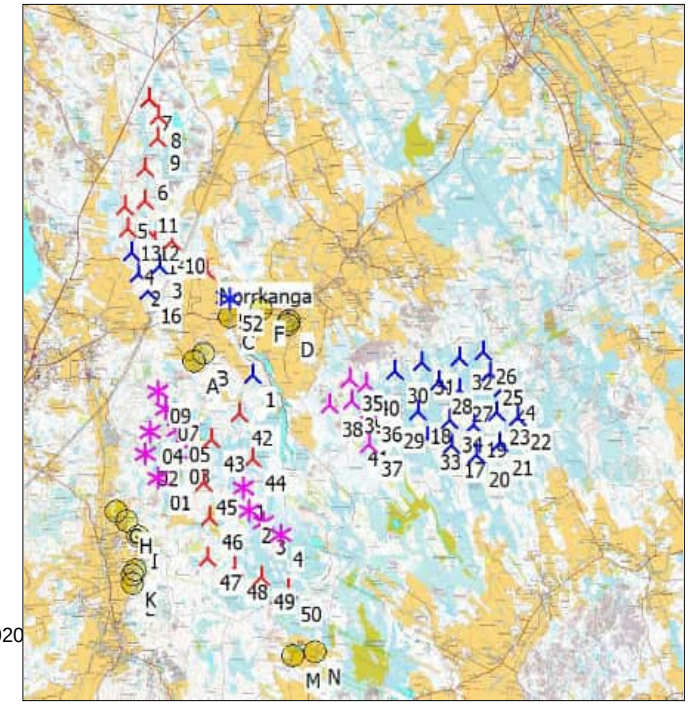
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
757	686	454	387	473	724	1 040	1 310	904	639	516	536	8 427

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 914	7 026 560	28,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	275 031	7 026 054	29,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
49	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
51	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
52	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	11:11
B	Asuinrakennus B (Renlund)	7:27
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59

To be continued on next page...

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17.9.2024 13.01/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
F	Asuinrakennus F (Jepuantie 675)	8:13
G	Lomarakennus G (Kullastået 64b)	6:35
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	1:38
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	6:35
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:36
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (249)	3:39
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (250)	0:00
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (251)	0:00

To be continued on next page...

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17.9.2024 13.01/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

No.	Name	Expected [h/year]
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (252)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)	1:53
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)	2:53
48	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (255)	0:00
49	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (256)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (257)	0:00
51	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
52	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

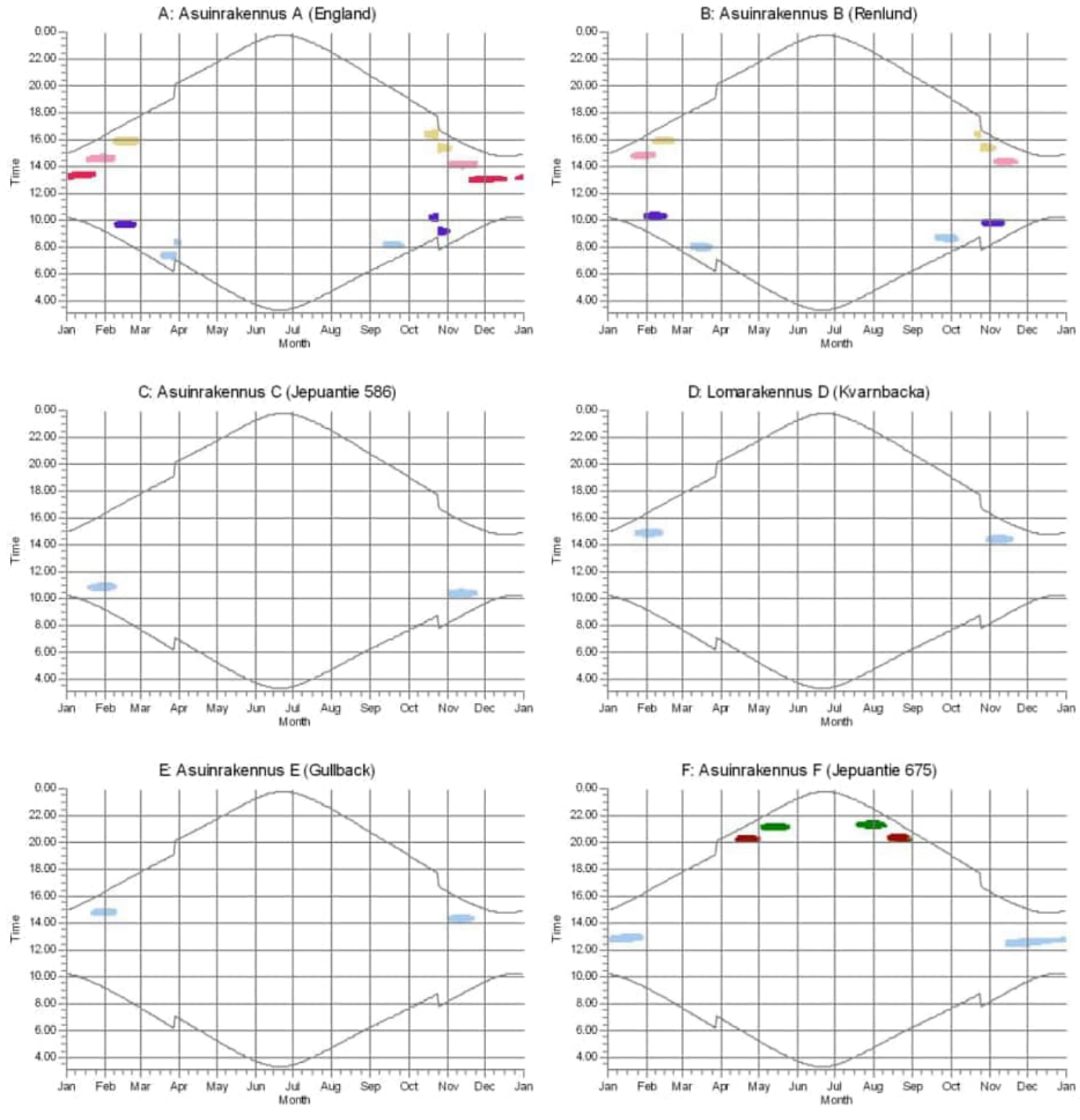
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest



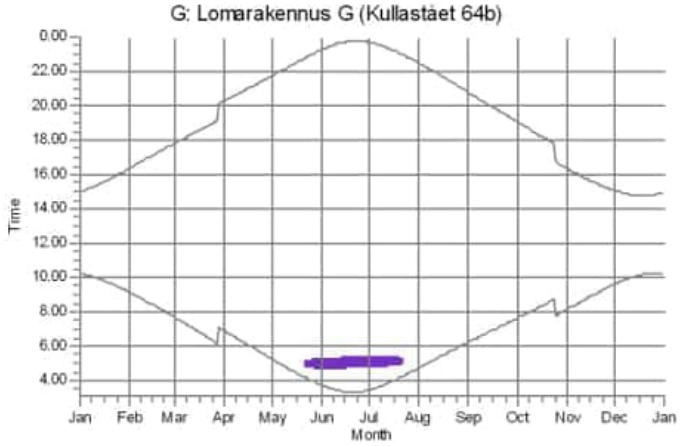
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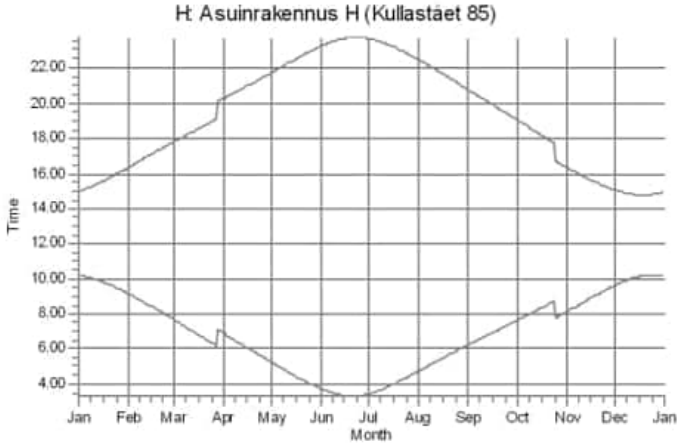
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest

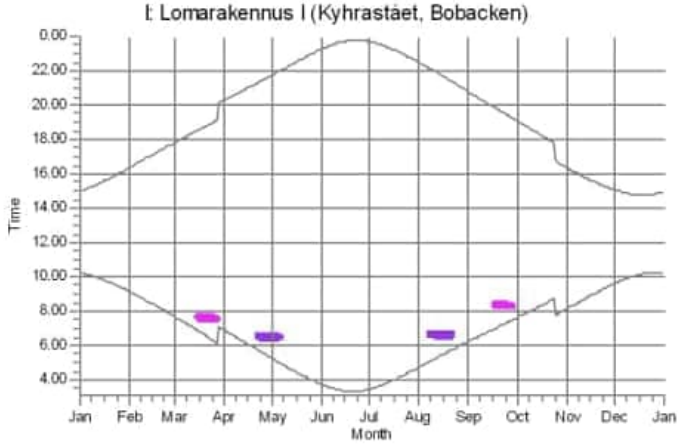
G: Lomarakennus G (Kullastäet 64b)



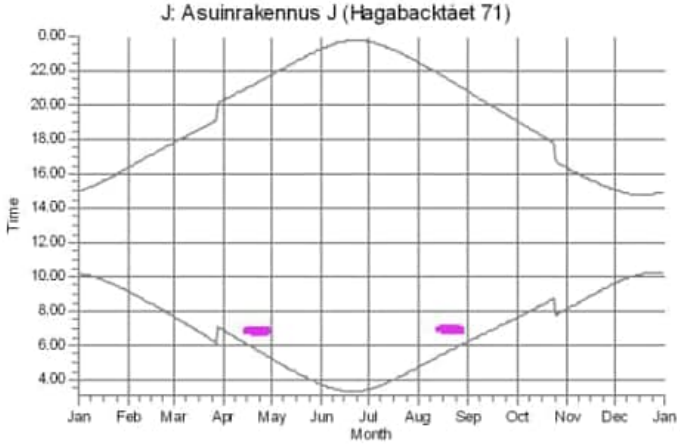
H: Asuinrakennus H (Kullastäet 85)



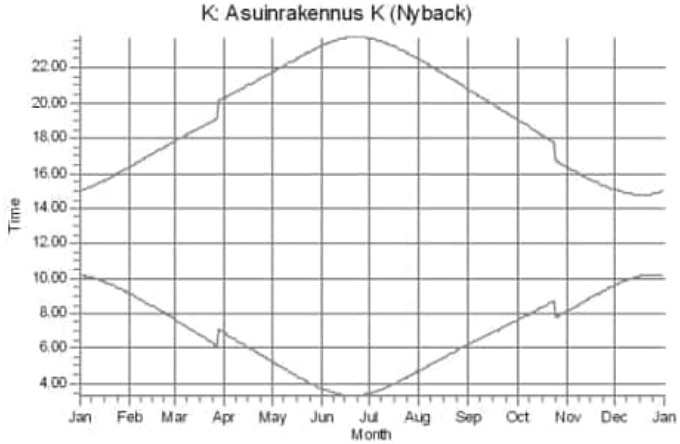
I: Lomarakennus I (Kyhrastäet, Bobacken)



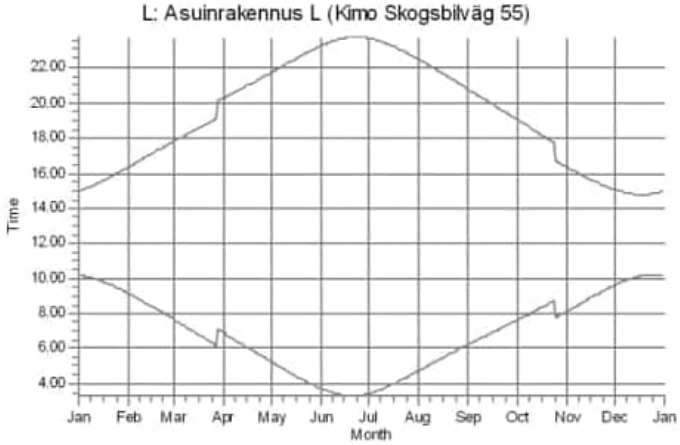
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



WTGs

46: Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)

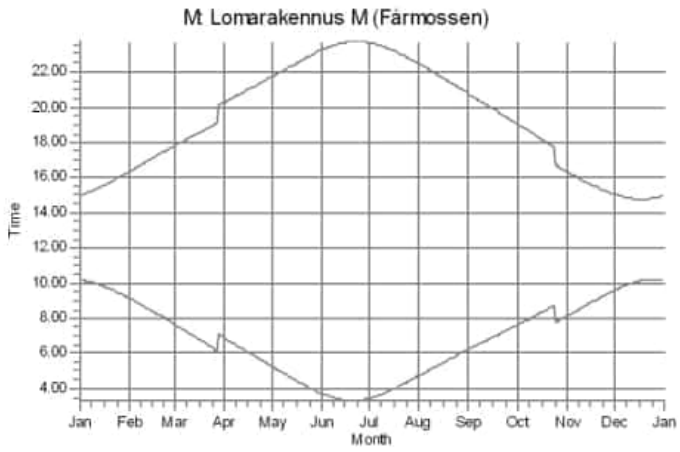
47: Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)

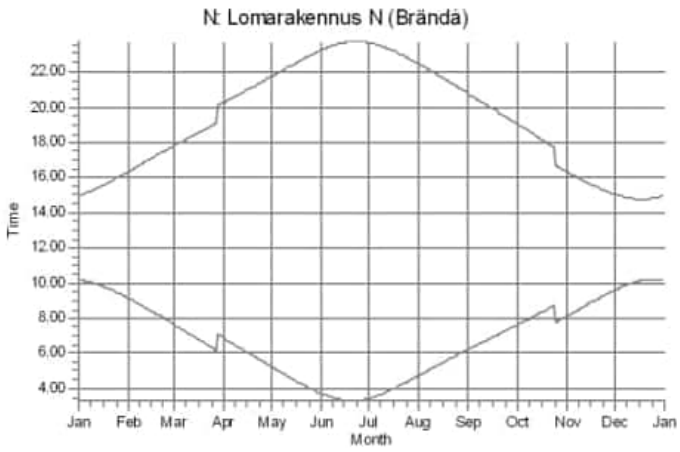
01: VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest





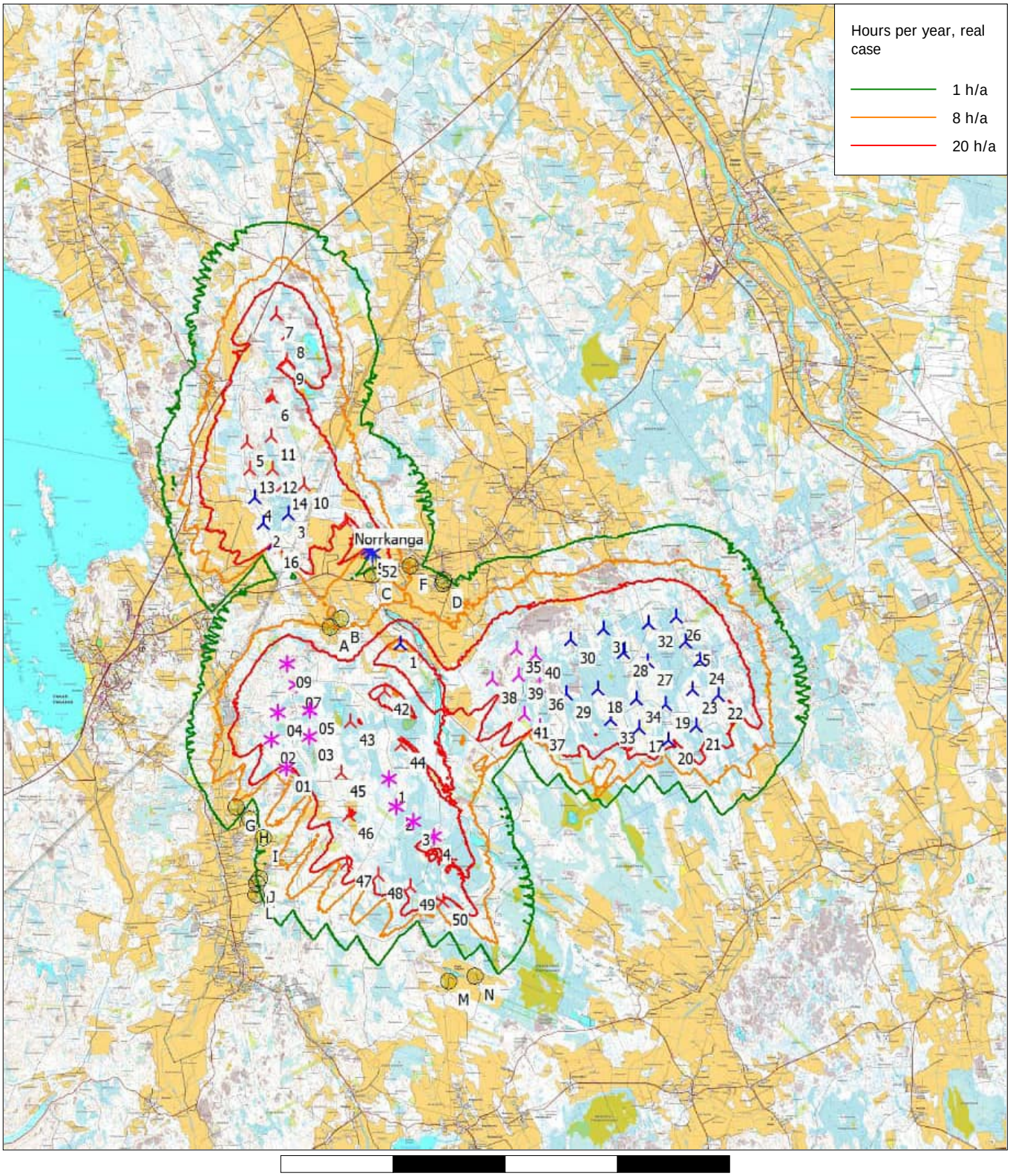
WTGs

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SHADOW - Map

Calculation: Vargitmossen_VE1+rak_luvalliset_YV_hankkeet_20240917_No forest



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 9. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, no forest”** (ALT2).

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17.9.2024 13.35/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

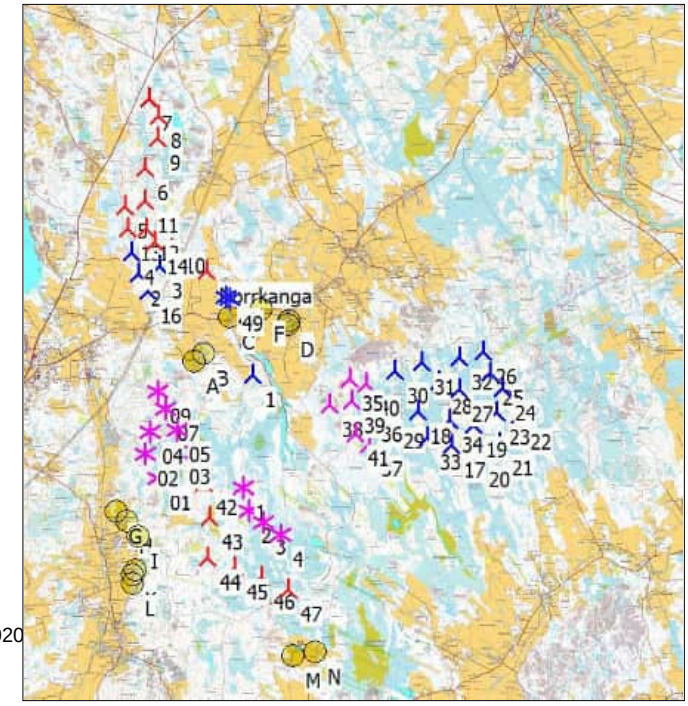
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
756	686	454	387	473	723	1 039	1 309	903	639	516	536	8 421

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000

New WTG Existing WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
49	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:21
B	Asuinrakennus B (Renlund)	5:36
C	Asuinrakennus C (Jepuantie 586)	2:06
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59
F	Asuinrakennus F (Jepuantie 675)	8:13
G	Lomarakennus G (Kullastået 64b)	6:35
H	Asuinrakennus H (Kullastået 85)	0:00

To be continued on next page...

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17.9.2024 13.35/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	1:38
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	6:35
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:35
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (243)	0:00
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (244)	1:53
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (245)	2:53
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (246)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (247)	0:00
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (248)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest

...continued from previous page

No.	Name	Expected [h/year]
48	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
49	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

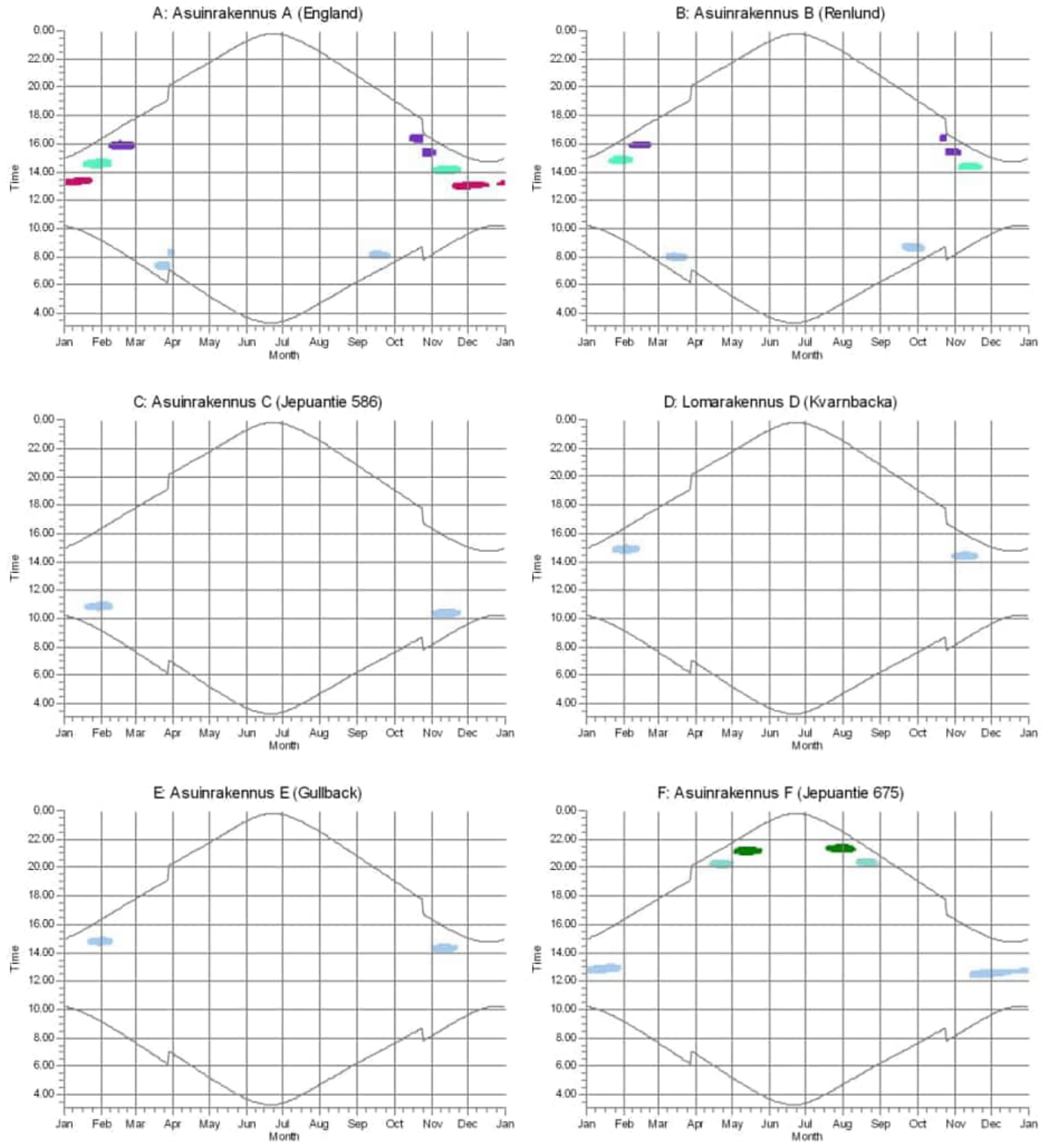
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
17.9.2024 13.35/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest



WTGs

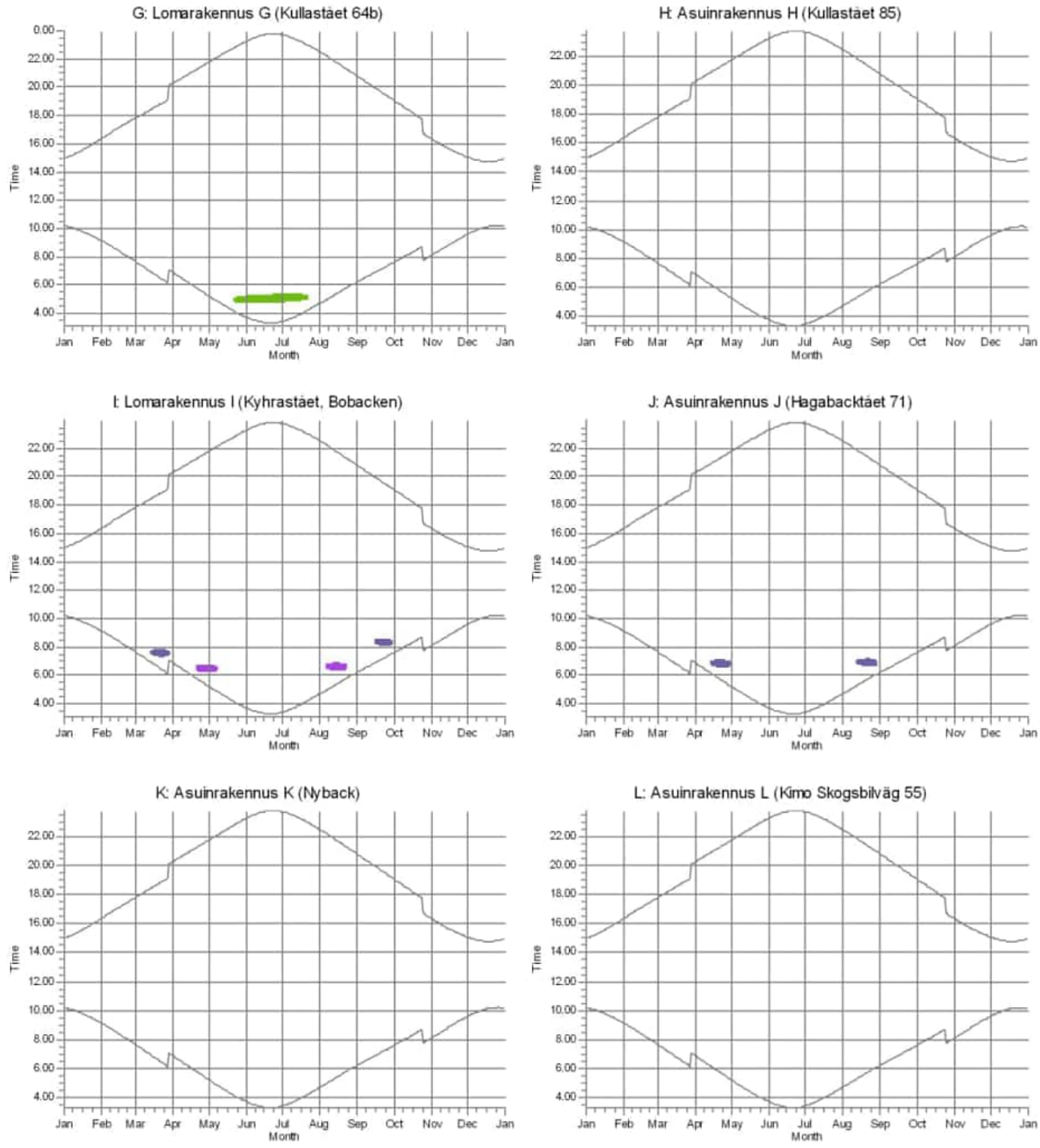
Norrkanga: Norrkanga VESTAS V162-5.6 5600 162.0 IO! hub: 169,0 m (TOT: 250,0 m) (1)
1: NORDEX N163/5.7 5700 163.0 IO! hub: 178,5 m (TOT: 260,0 m) (107)
48: LAGERWEY L100-2.5MW 2520 100.0 IO! hub: 98,0 m (TOT: 148,0 m) (1)
49: NORDTANK 150 24.6 IO! hub: 38,0 m (TOT: 50,3 m) (3)
05: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (4)
09: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (9)
07: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (10)

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Calculated:
17.9.2024 13.35/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest

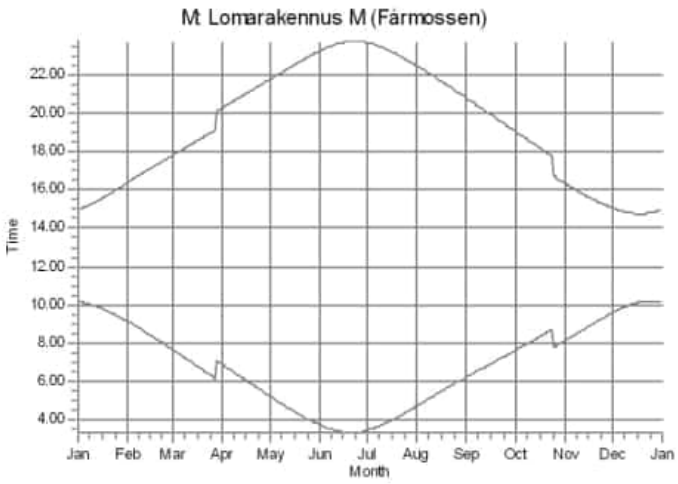


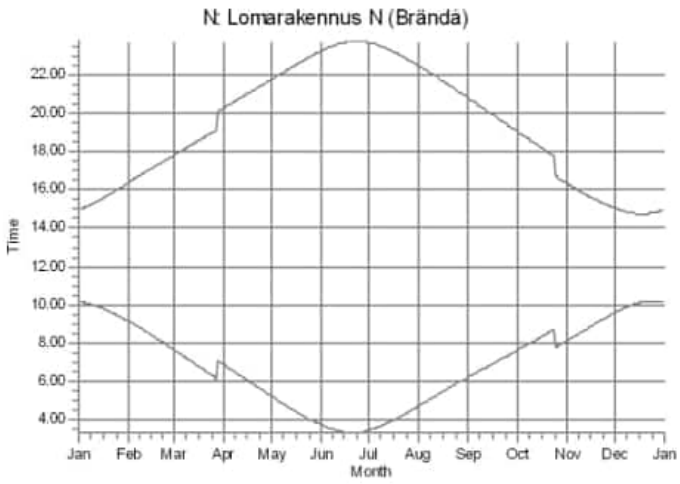
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Calculated:
17.9.2024 13.35/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest





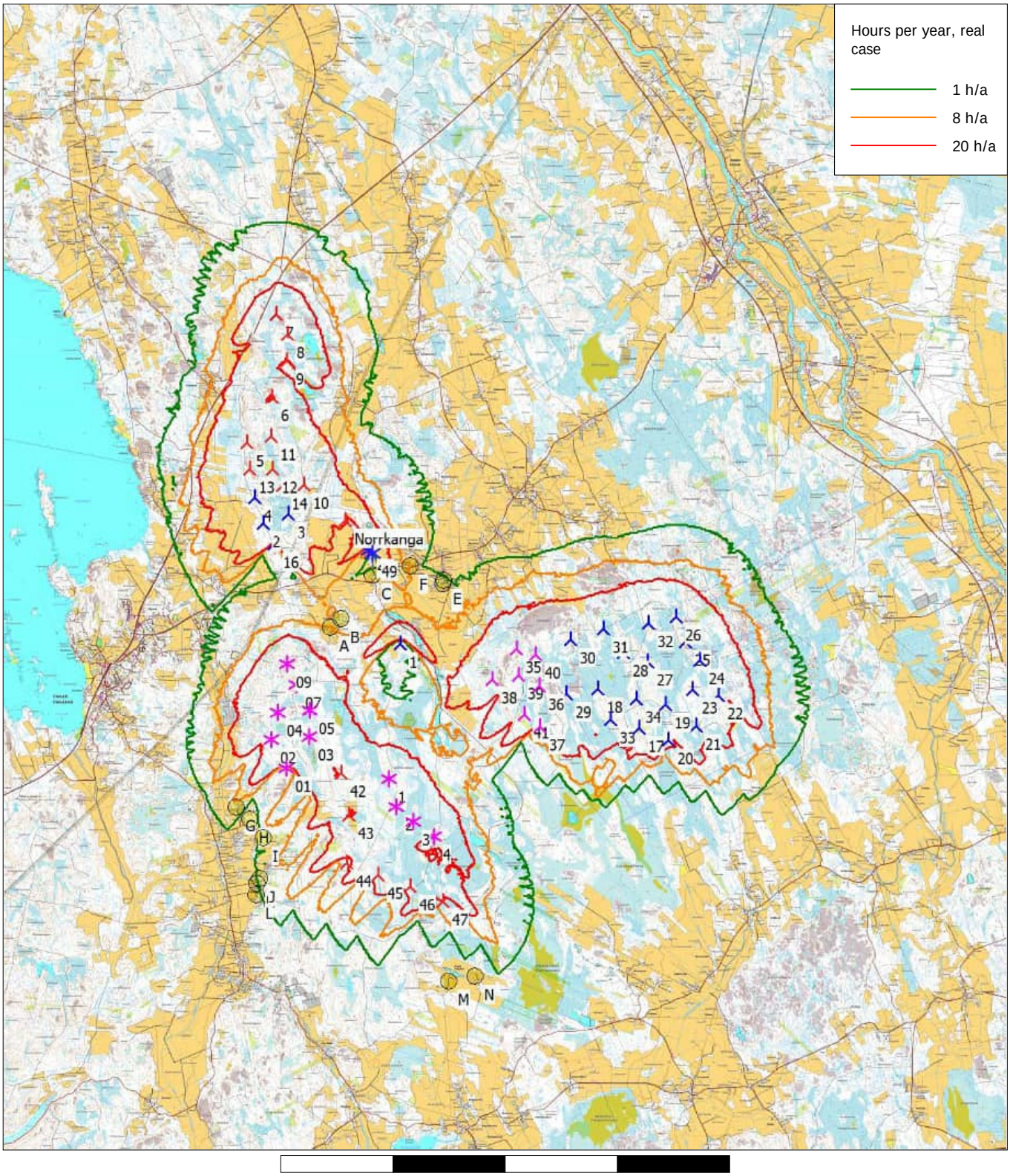
WTGs

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Calculated:
17.9.2024 13.35/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE2+rak_luvalliset_YV_hankkeet_20240917_No forest



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 10. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, luke forest” i nuläget.**

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Calculated:
17.9.2024 16.06/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

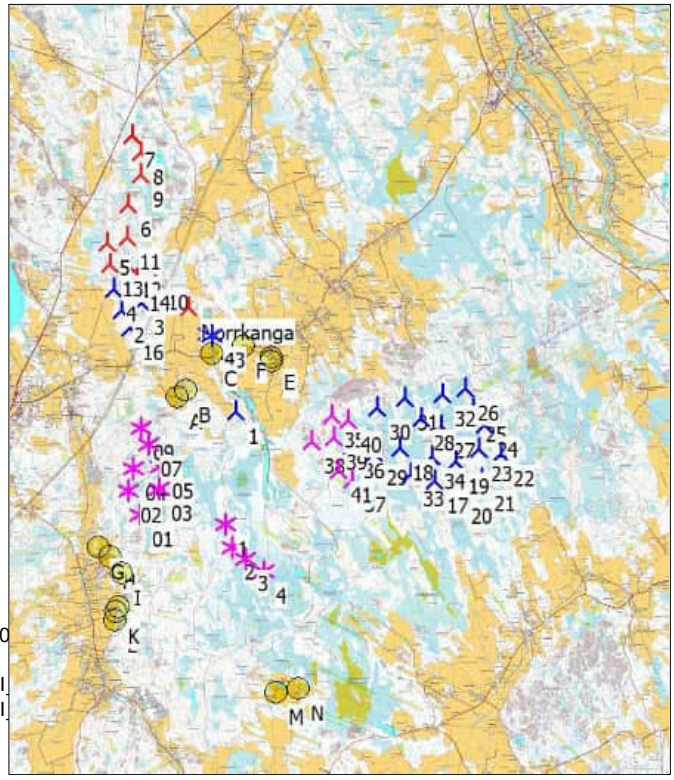
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
755	685	453	387	472	722	1 037	1 307	901	638	515	535	8 406

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000
New WTG Existing WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
43	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:20
B	Asuinrakennus B (Renlund)	5:36
C	Asuinrakennus C (Jepuantie 586)	2:06
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59
F	Asuinrakennus F (Jepuantie 675)	8:12
G	Lomarakennus G (Kullastået 64b)	0:00
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	0:00
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	0:00
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:18
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:15
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:34
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
43	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

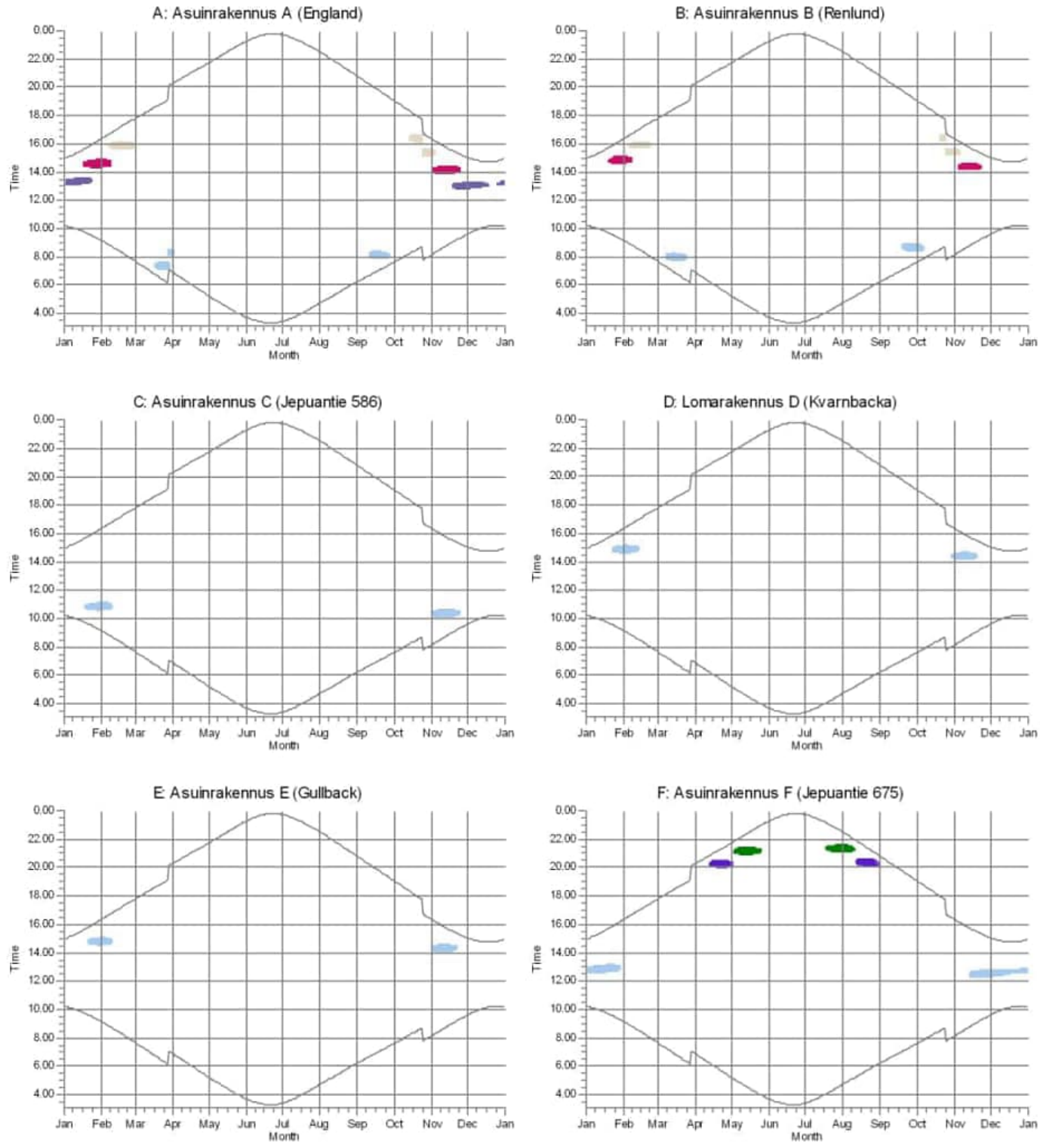
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
17.9.2024 16.06/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest



WTGs

Norrkanga: Norrkanga VESTAS V162-5.6 5600 162.0 IO! hub: 169,0 m (TOT: 250,0 m) (1)
1: NORDEX N163/5.7 5700 163.0 IO! hub: 178,5 m (TOT: 260,0 m) (107)
42: LAGERWEY L100-2.5MW 2520 100.0 IO! hub: 98,0 m (TOT: 148,0 m) (1)
43: NORDTANK 150 24.6 IO! hub: 38,0 m (TOT: 50,3 m) (3)
05: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (4)
09: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (9)
07: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (10)

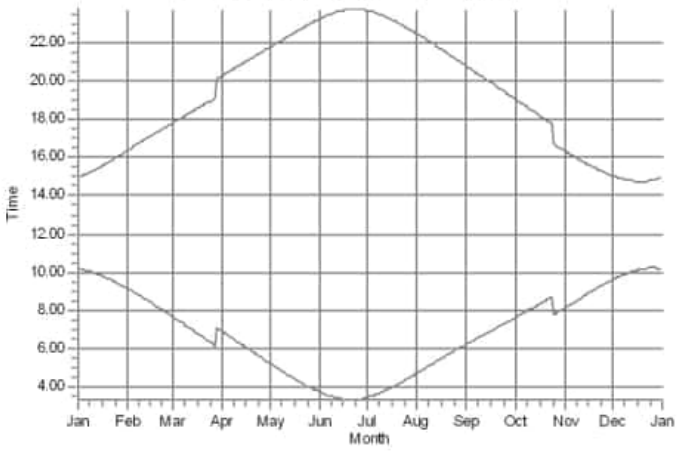
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Calculated:
17.9.2024 16.06/3.6.377

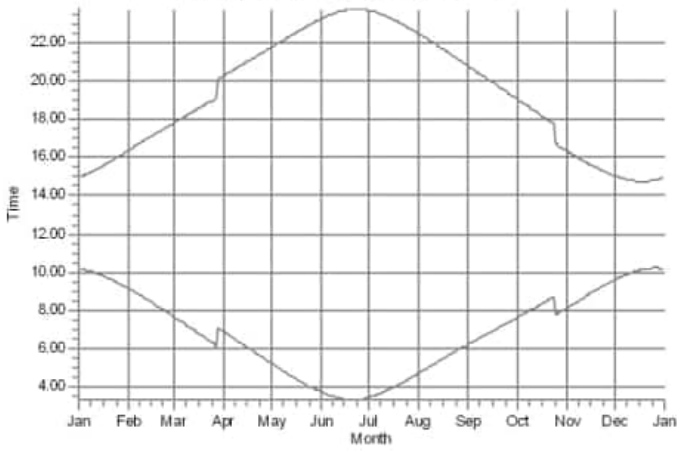
SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest

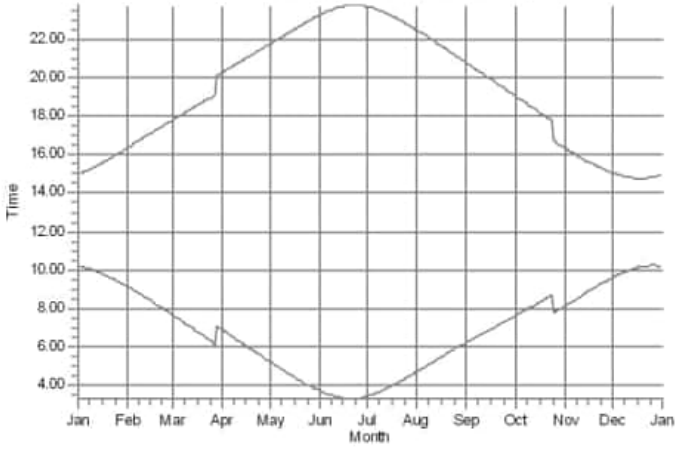
G: Lomarakennus G (Kullastäet 64b)



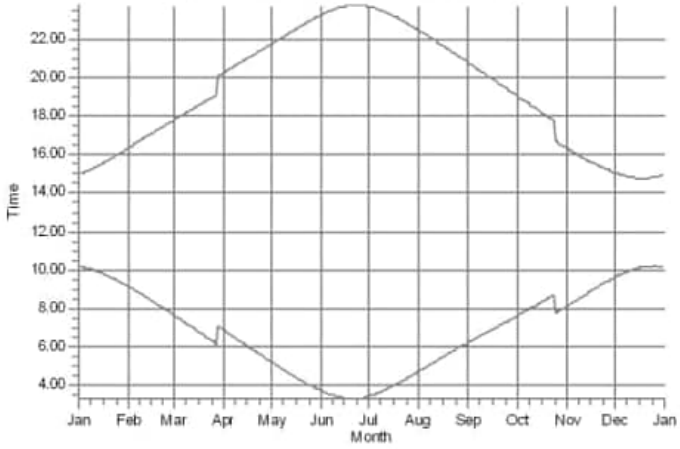
H: Asuinrakennus H (Kullastäet 85)



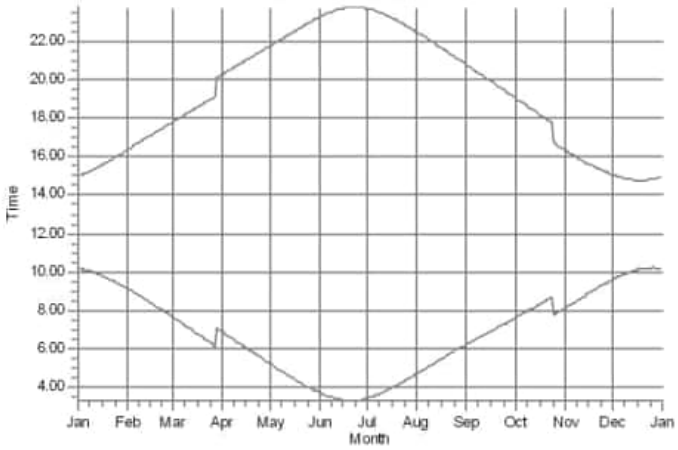
I: Lomarakennus I (Kyhrastäet, Bobacken)



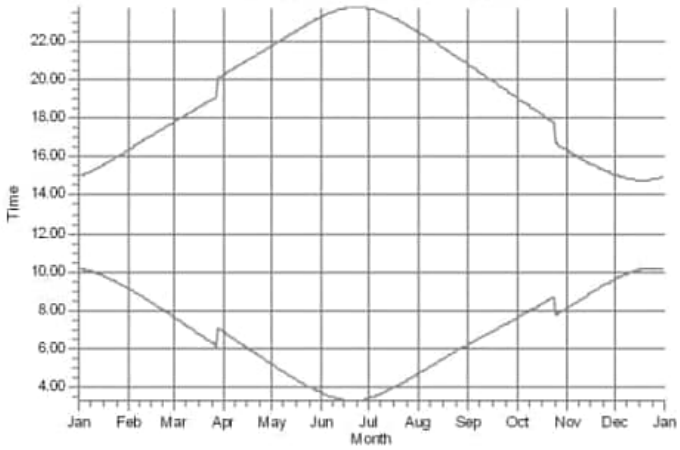
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



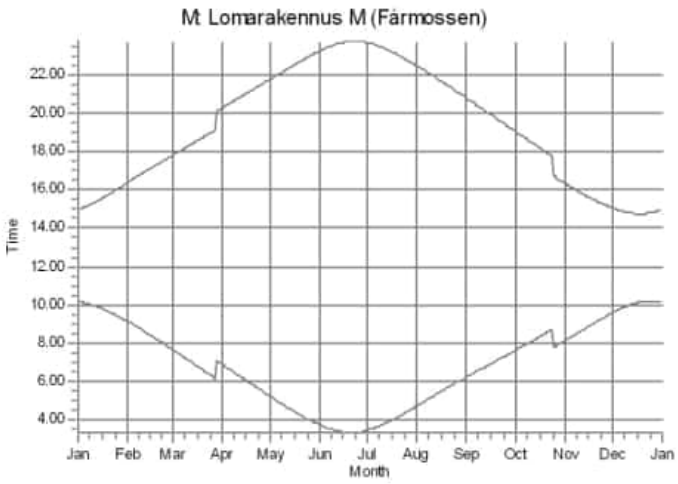
WTGs

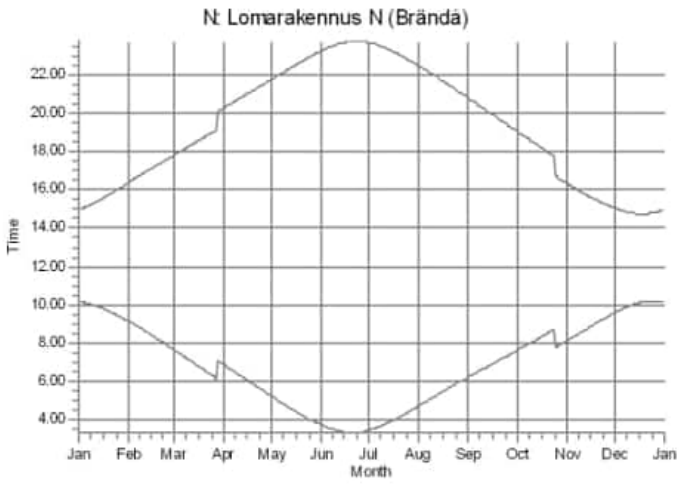
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Calculated:
17.9.2024 16.06/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest





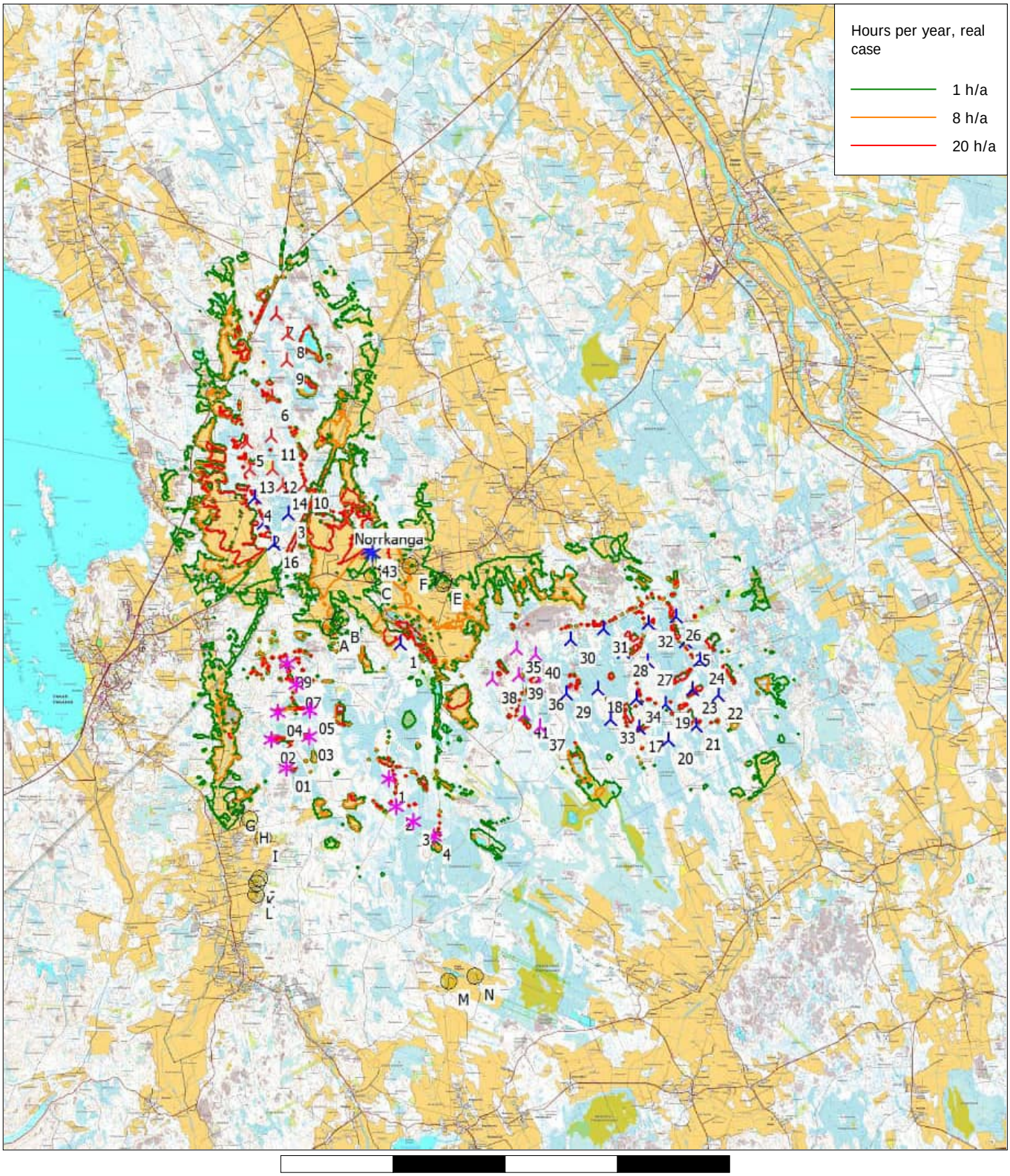
WTGs

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Calculated:
17.9.2024 16.06/3.6.377

SHADOW - Map

Calculation: Vargitmossen_Nykytila_rak_luvalliset_20240917_Luke forest



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 11. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, luke forest” (ALT1).**

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Calculated:
18.9.2024 10.05/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

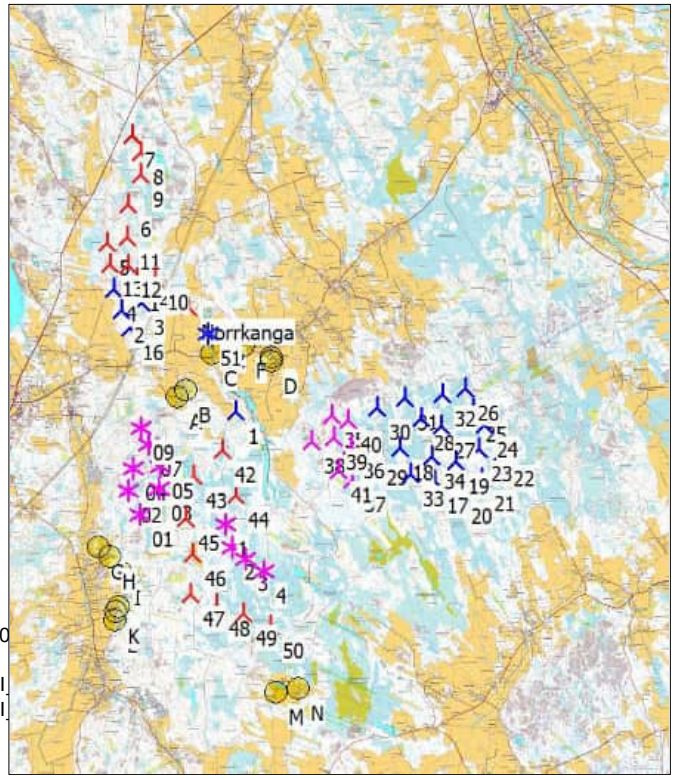
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
757	686	454	387	473	724	1 040	1 310	904	639	516	536	8 427

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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Calculated:
18.9.2024 10.05/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 914	7 026 560	28,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	275 031	7 026 054	29,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
49	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
51	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
52	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	11:11
B	Asuinrakennus B (Renlund)	7:27

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59
F	Asuinrakennus F (Jepuantie 675)	8:13
G	Lomarakennus G (Kullastået 64b)	0:00
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	0:00
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:36
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest

...continued from previous page

No.	Name	Expected [h/year]
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (249)	3:39
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (250)	0:00
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (251)	0:00
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (252)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)	1:53
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)	1:14
48	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (255)	0:00
49	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (256)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (257)	0:00
51	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
52	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

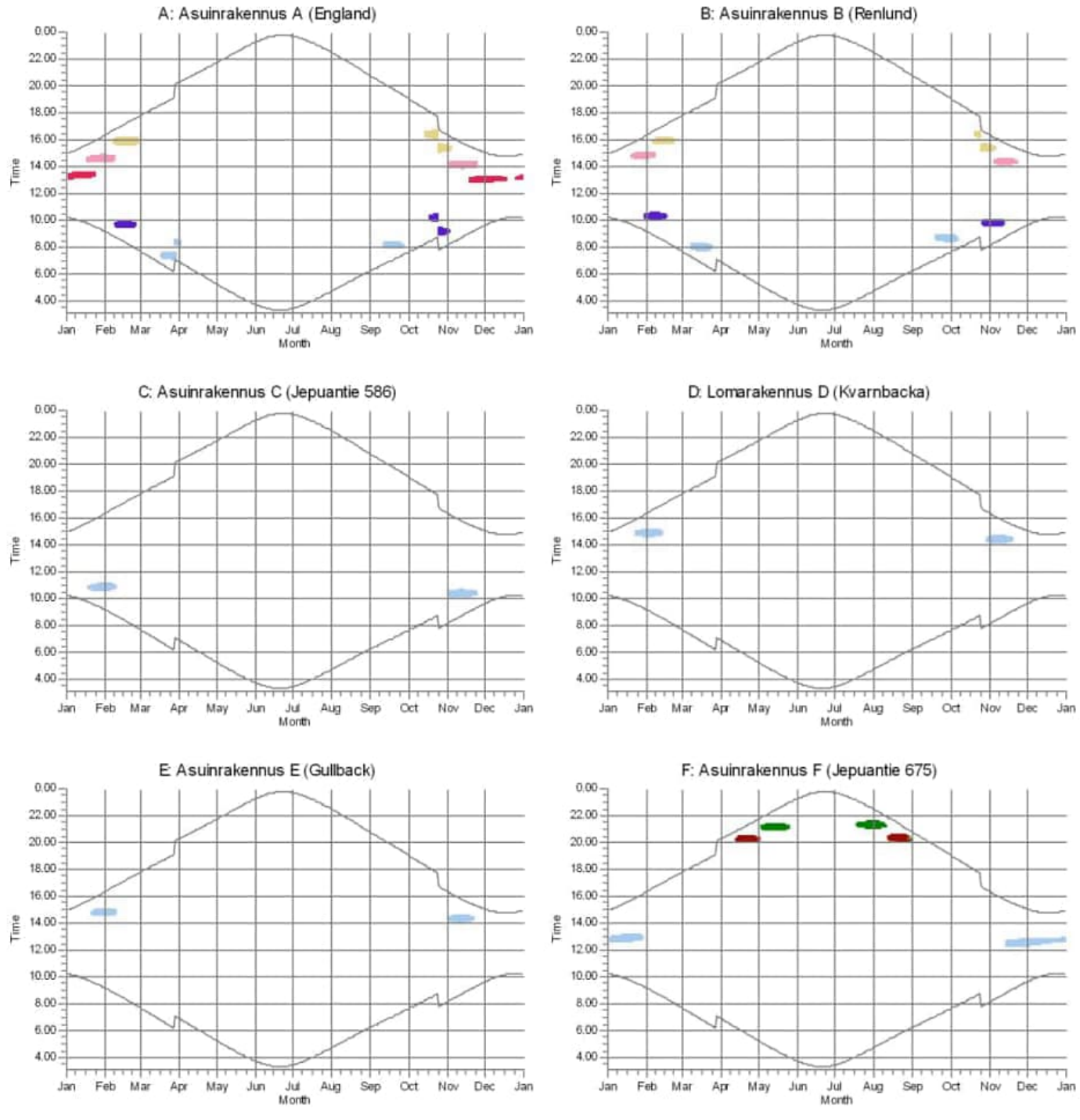
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
18.9.2024 10.05/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest



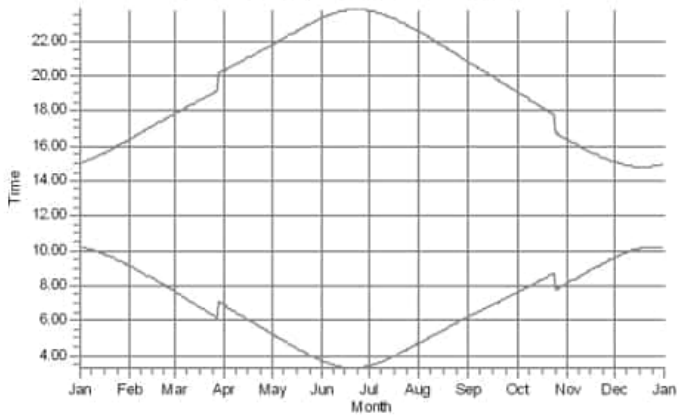
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Calculated:
18.9.2024 10.05/3.6.377

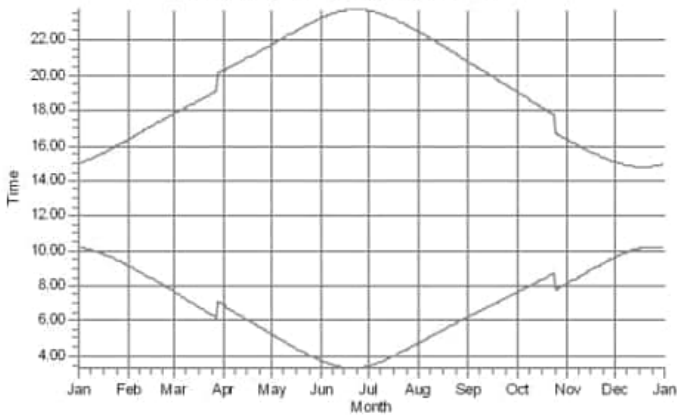
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest

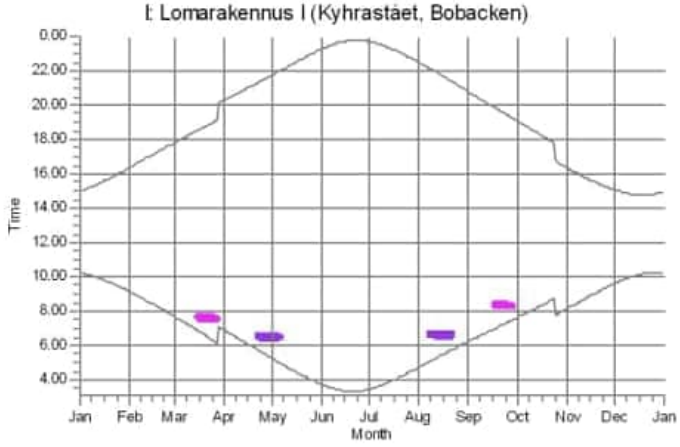
G: Lomarakennus G (Kullastäet 64b)



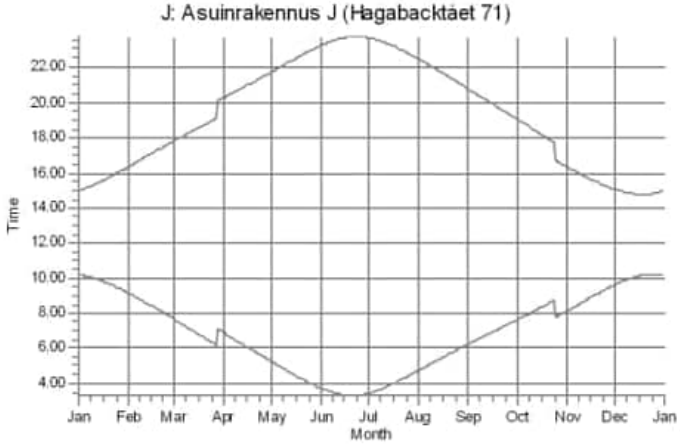
H: Asuinrakennus H (Kullastäet 85)



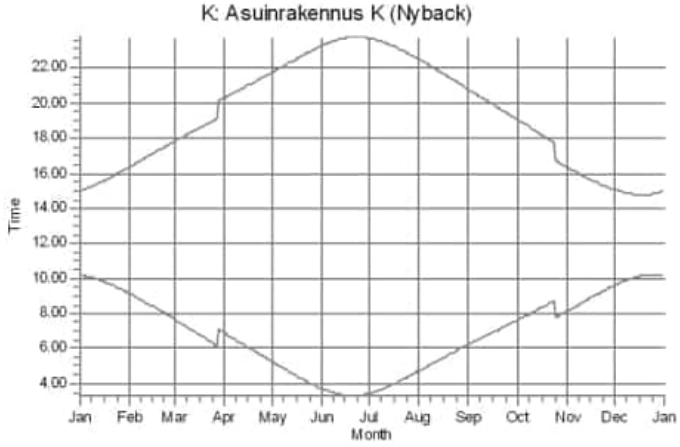
I: Lomarakennus I (Kyhrastäet, Bobacken)



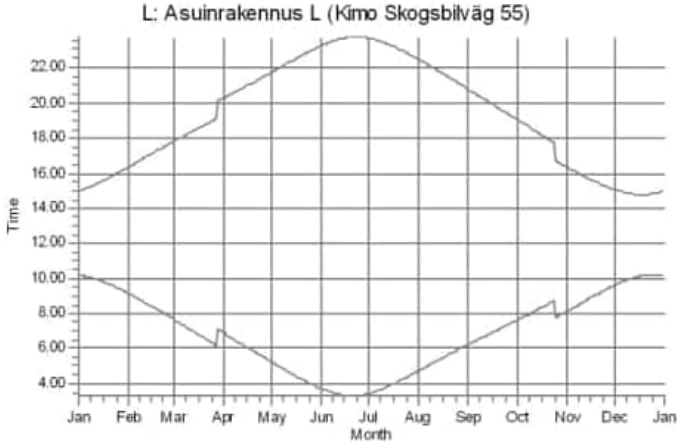
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



WTGs

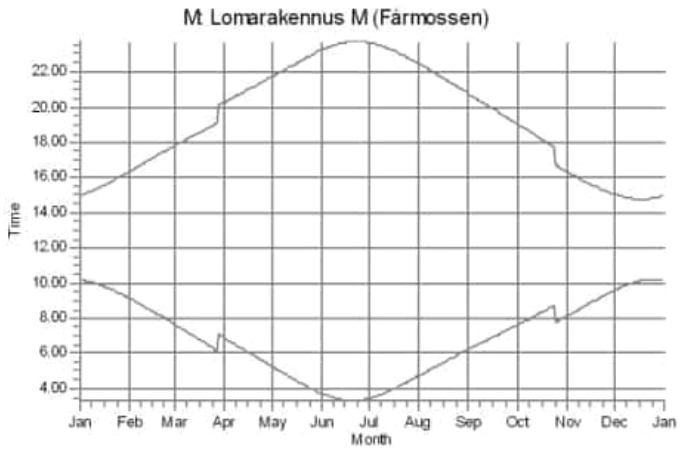
46: Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)

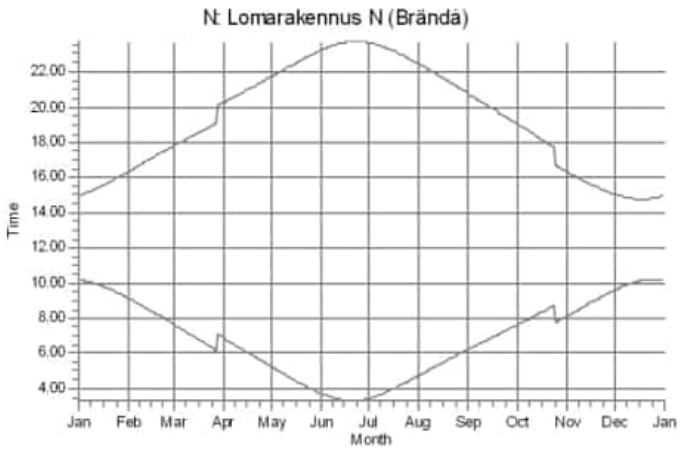
47: Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest





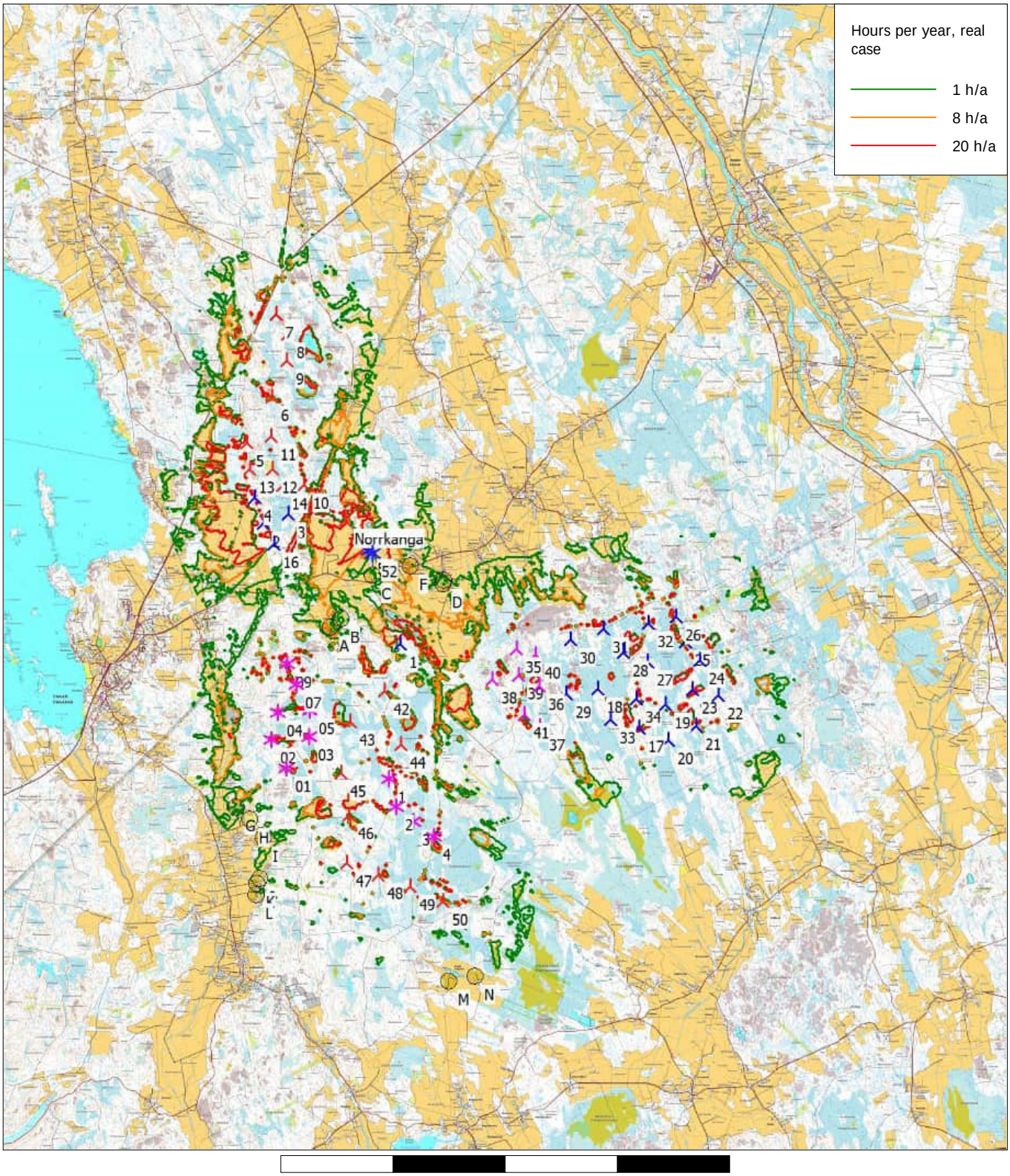
WTGs

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Calculated:
18.9.2024 10.05/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE1_rak_luvalliset_20240918_Luke forest



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 12. Vargitmossens vindkraftsprojekt **– skuggmodelleringens resultat ”real case, luke forest” (ALT2).**

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18.9.2024 11.31/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

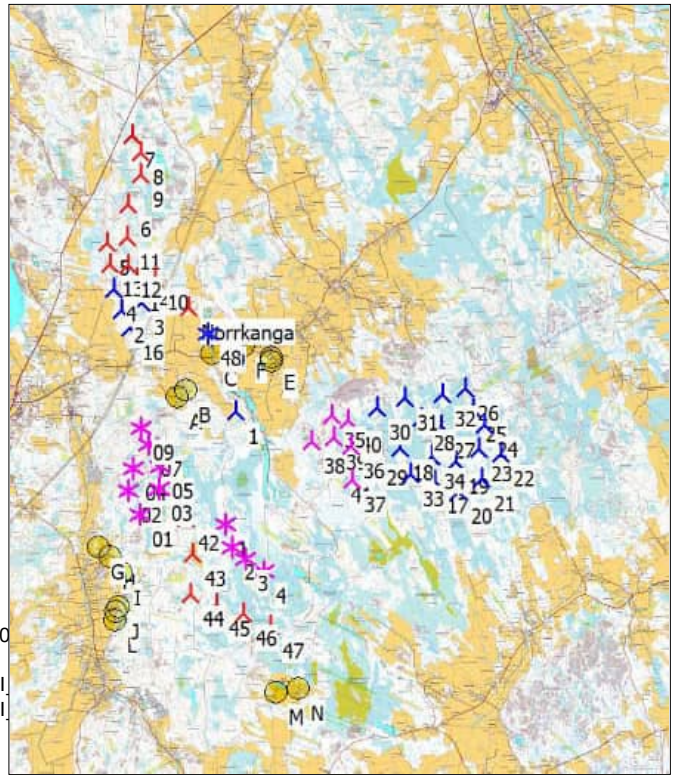
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
756	686	454	387	473	723	1 039	1 309	903	639	516	536	8 421

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 42...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 72...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
29	278 725	7 027 182	49,9	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 62...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
40	278 041	7 028 049	43,8	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 72...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
49	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:21
B	Asuinrakennus B (Renlund)	5:36
C	Asuinrakennus C (Jepuantie 586)	2:06
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	1:59

To be continued on next page...

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18.9.2024 11.31/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
F	Asuinrakennus F (Jepuantie 675)	8:13
G	Lomarakennus G (Kullastået 64b)	0:00
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	0:00
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:35
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (243)	0:00
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (244)	1:53
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (245)	1:14

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest

...continued from previous page

No.	Name	Expected [h/year]
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (246)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (247)	0:00
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (248)	0:00
48	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
49	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

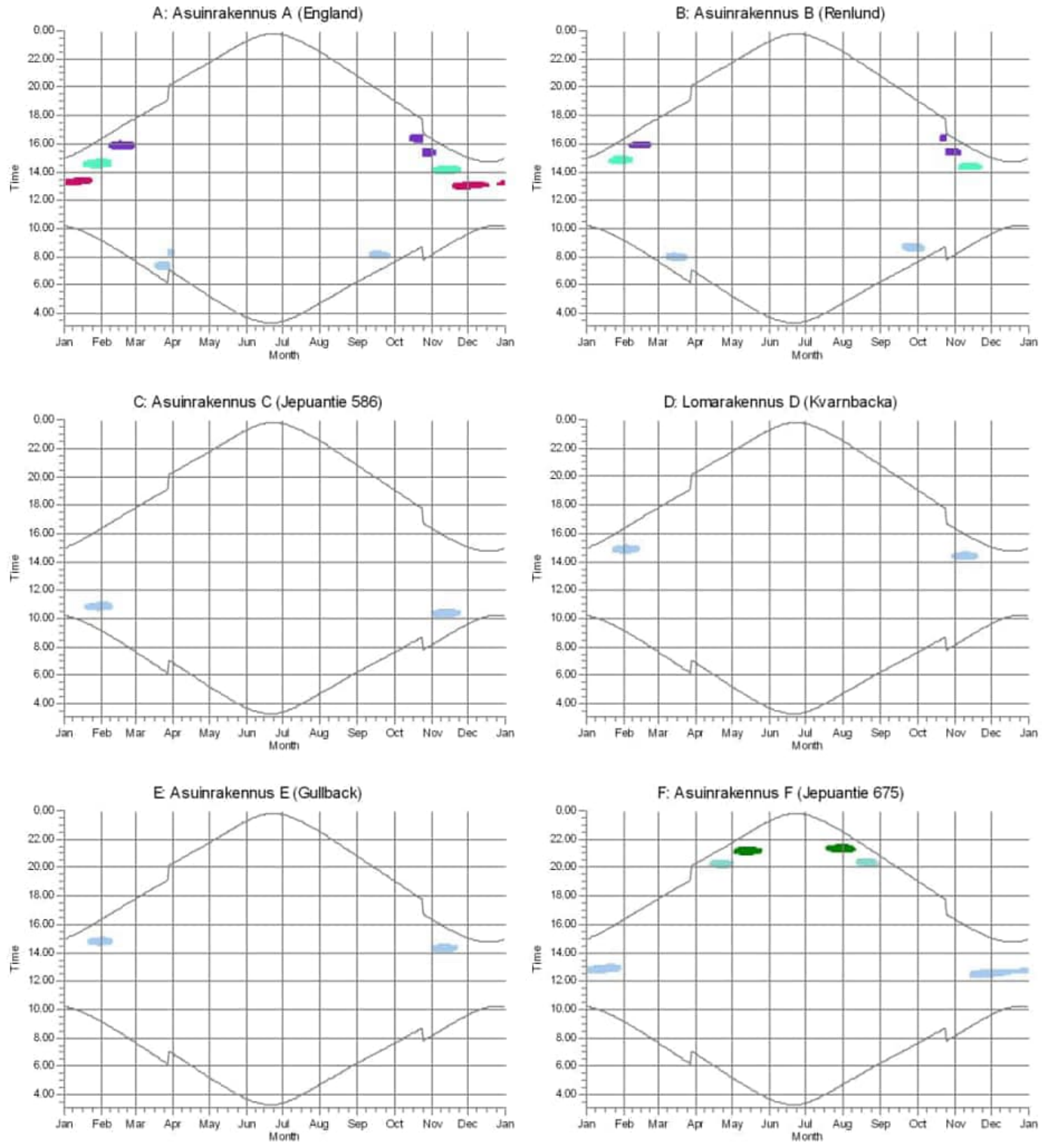
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
18.9.2024 11.31/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest



WTGs

Nornkanga: Nornkanga VESTAS V162-5.6 5600 162.0 IO! hub: 169,0 m (TOT: 250,0 m) (1)
1: NORDEX N163/5.7 5700 163.0 IO! hub: 178,5 m (TOT: 260,0 m) (107)
48: LAGERWEY L100-2.5MW 2520 100.0 IO! hub: 98,0 m (TOT: 148,0 m) (1)
49: NORDTANK 150 24.6 IO! hub: 38,0 m (TOT: 50,3 m) (3)
05: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (4)
09: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (9)
07: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (10)

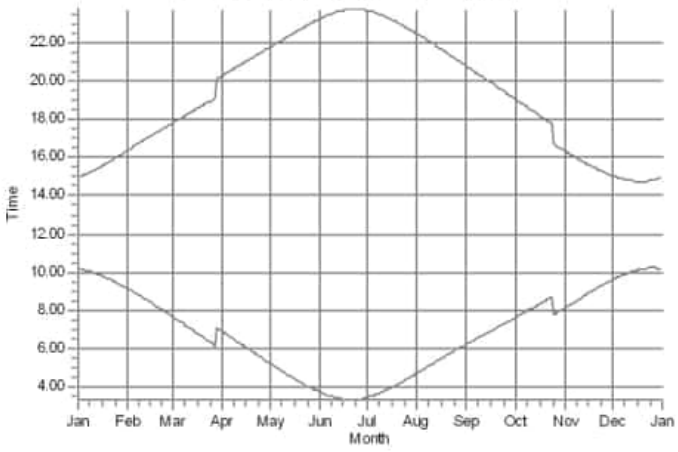
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18.9.2024 11.31/3.6.377

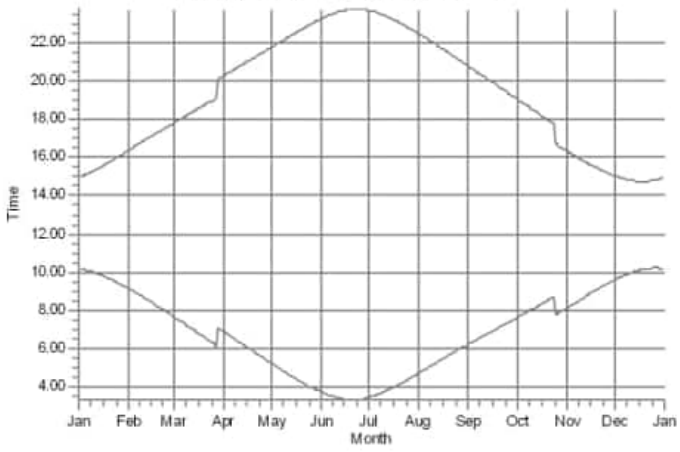
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest

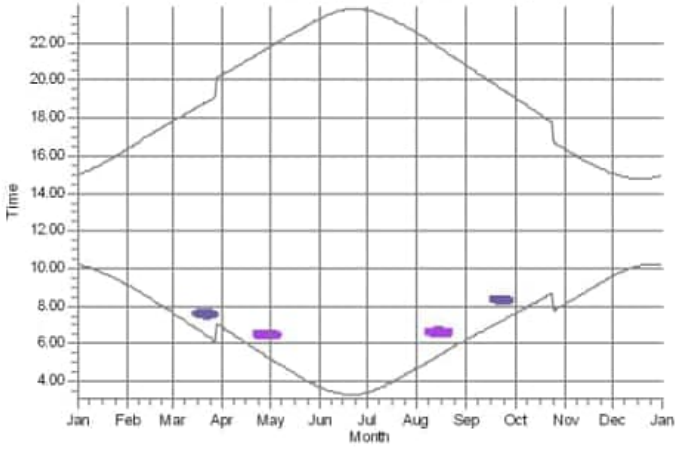
G: Lomarakennus G (Kullastäet 64b)



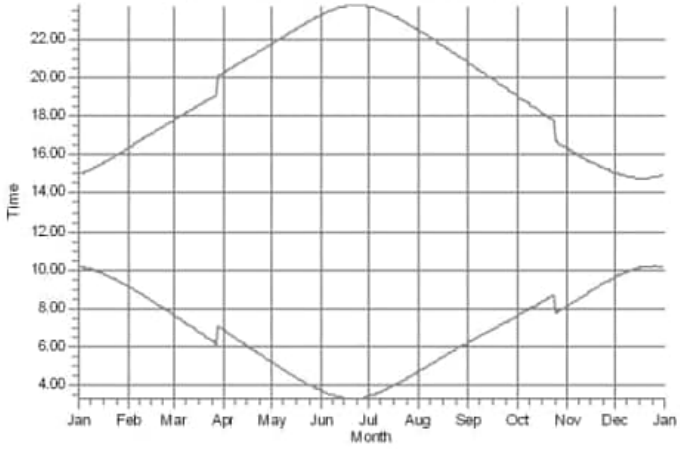
H: Asuinrakennus H (Kullastäet 85)



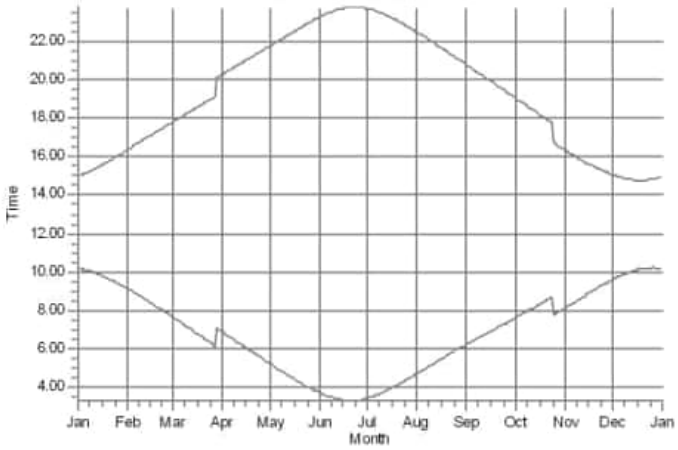
I: Lomarakennus I (Kyhrastäet, Bobacken)



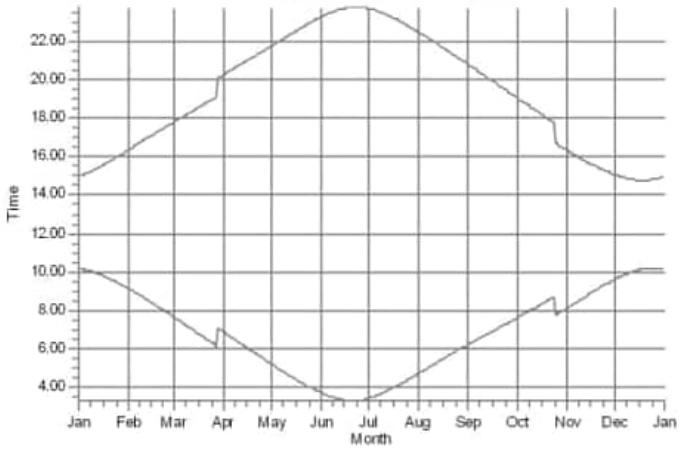
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



WTGs

43: Siemens Gamesa SG 6.0-170 6000 170.0 IOI hub: 215,0 m (TOT: 300,0 m) (244)

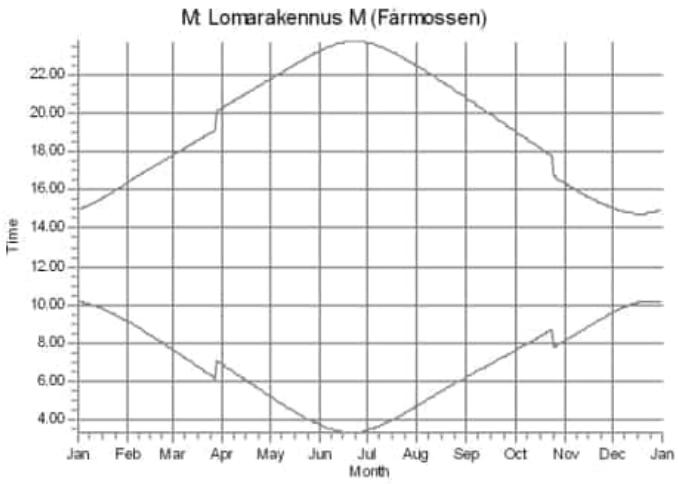
44: Siemens Gamesa SG 6.0-170 6000 170.0 IOI hub: 215,0 m (TOT: 300,0 m) (245)

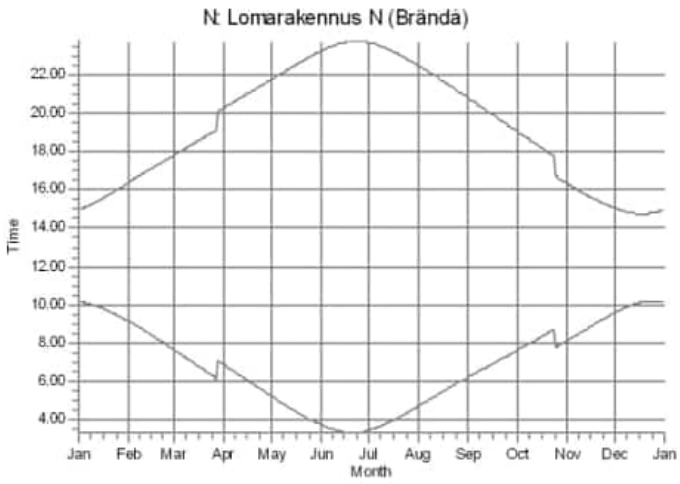
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Calculated:
18.9.2024 11.31/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest





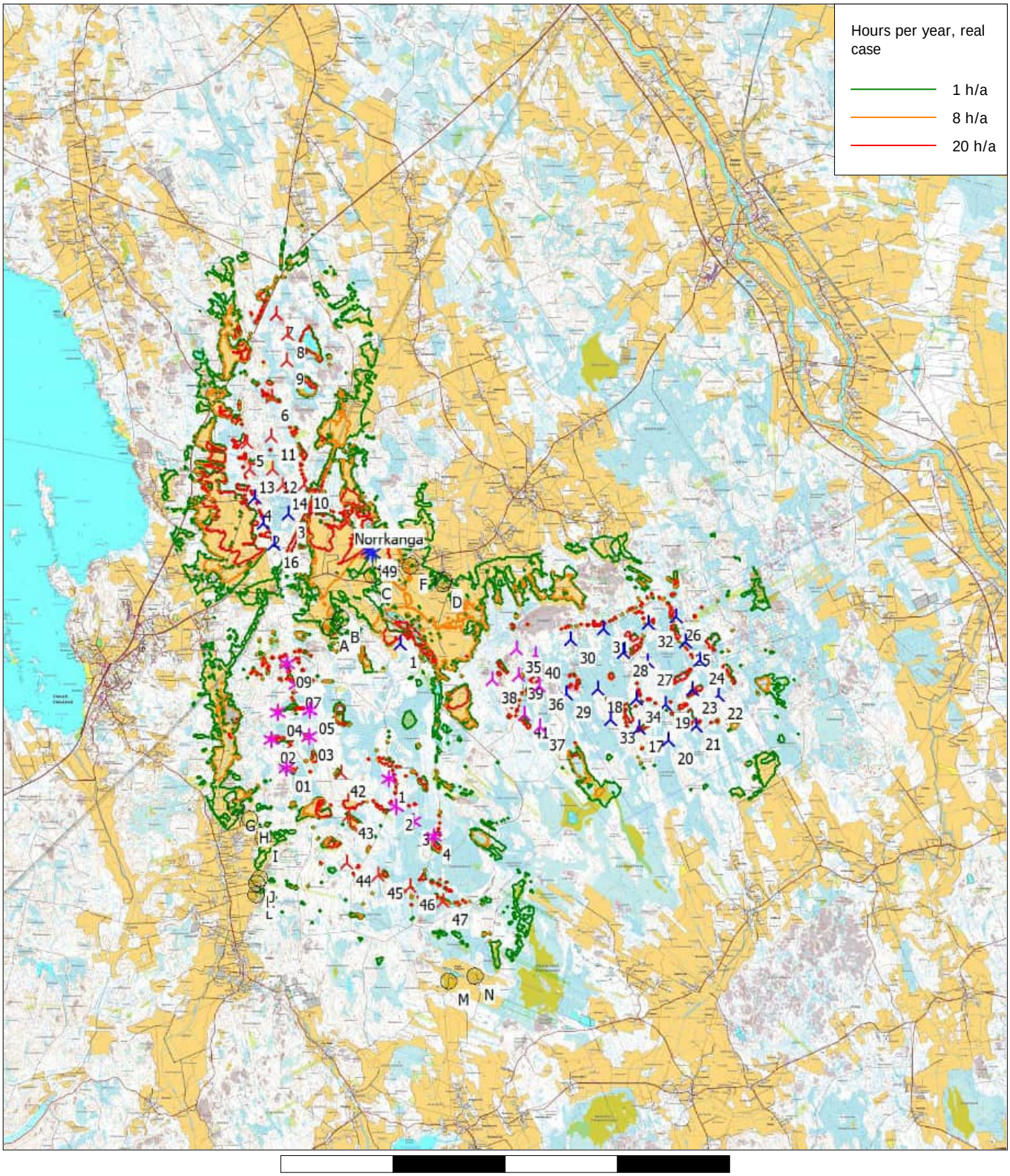
WTGs

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Calculated:
18.9.2024 11.31/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE2_rak_luvalliset_20240913_Luke forest



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 276 120 North: 7 028 790

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 13. Resultat av modellering av sammantaget buller ISO 9613-2 i projektalternativ 1 (ALT1).

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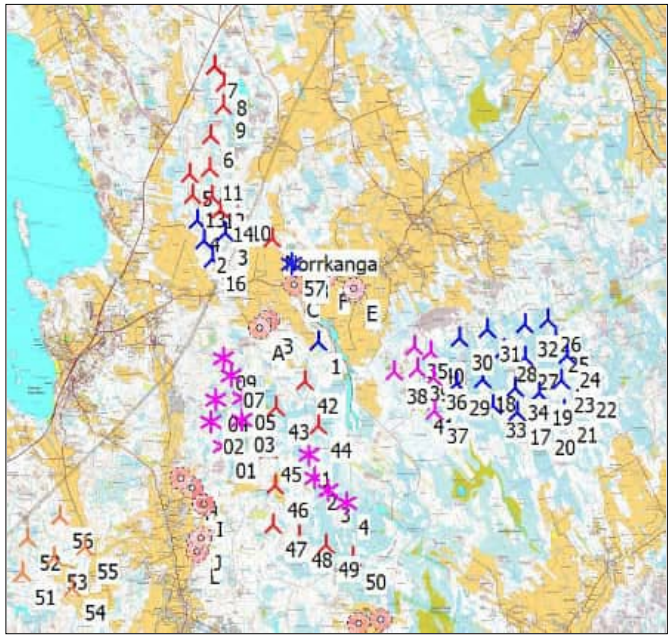
Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
02	272 153	7 026 165	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
03	272 991	7 026 229	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
04	272 290	7 026 759	26,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
05	273 002	7 026 818	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
07	272 700	7 027 390	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
09	272 494	7 027 846	25,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5700 163.0 !O!...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	108,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
10	272 876	7 031 835	22,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
11	272 142	7 032 911	27,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
12	272 176	7 032 174	25,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
13	271 677	7 032 186	20,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
14	272 407	7 031 814	22,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
16	272 217	7 030 505	17,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
17	280 336	7 026 417	51,4	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
18	279 422	7 027 294	47,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
19	280 918	7 026 942	43,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
2	271 975	7 030 974	19,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
20	280 996	7 026 139	45,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
21	281 600	7 026 467	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
22	282 102	7 027 147	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
23	281 524	7 027 270	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
24	281 681	7 027 926	43,3	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
25	281 366	7 028 337	44,7	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
26	281 165	7 028 894	38,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
27	280 535	7 027 893	42,5	VESTAS V172-7.2 7200 172.0 !O! ...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
28	279 986	7 028 096	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
29	278 725	7 027 182	49,9	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
3	272 536	7 031 182	18,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
30	278 813	7 028 386	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
31	279 541	7 028 621	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
32	280 544	7 028 746	40,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
33	279 701	7 026 603	52,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
34	280 279	7 027 063	50,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
35	277 608	7 028 174	38,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
40	278 041	7 028 049	43,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
43	273 914	7 026 560	28,6	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
44	275 031	7 026 054	29,7	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
45	273 706	7 025 416	34,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
46	273 877	7 024 480	30,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
47	273 828	7 023 413	40,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
48	274 526	7 023 150	36,3	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
49	275 242	7 022 891	37,9	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
5	271 608	7 032 764	15,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
50	275 965	7 022 551	42,3	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
51	267 145	7 022 129	27,6	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1

To be continued on next page...

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
52	267 266	7 023 061	30,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
53	267 989	7 022 558	20,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
54	268 475	7 021 720	20,5	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
55	268 805	7 022 822	15,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
56	268 123	7 023 645	20,2	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
57	274 303	7 030 363	16,9	LAGERWEY L100-2.5MW 2520 100...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	USER	Level 0 - - Standard mode - 01-2014	8,0	105,0
58	274 404	7 030 306	17,5	NORDTANK 150 24.6 !O! hub: 38...	No	NORDTANK	-150	150	24,6	38,0	USER	nordtank	8,0	97,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
8	272 507	7 035 178	27,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
9	272 494	7 034 589	30,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V162-5.6 5600...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	USER	V162 - 5.6 MW Mode 0 STE - 4-2019	8,0	104,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	4,0	40,0	38,1	483	Yes
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	4,0	40,0	37,9	539	Yes
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	4,0	40,0	41,1	-107	No
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	4,0	40,0	35,9	822	Yes
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	4,0	40,0	35,7	905	Yes
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	4,0	40,0	37,2	361	Yes
G	Lomarakennus G (Kullasteet 64b)	271 374	7 024 647	17,5	4,0	40,0	36,7	704	Yes
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	4,0	40,0	36,8	688	Yes
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	4,0	40,0	36,7	886	Yes
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	4,0	40,0	35,6	1 140	Yes
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	4,0	40,0	35,4	1 245	Yes
L	Asuinrakennus L (Kimo Skogsbilvdg 55)	271 811	7 022 704	20,6	4,0	40,0	35,2	1 333	Yes
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	4,0	40,0	32,7	1 061	Yes
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	4,0	40,0	32,3	1 110	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
01	3262	3524	4679	5371	5449	5265	1418	1401	1642	2528	2665	2906	5973	6265
02	2805	3092	4274	5148	5220	4938	1705	1837	2202	3101	3230	3476	6676	6957
03	2462	2706	3841	4513	4590	4407	2260	2262	2475	3338	3479	3715	6273	6495
04	2221	2515	3701	4661	4728	4397	2301	2447	2806	3706	3836	4081	7089	7335
05	1885	2140	3295	4081	4154	3906	2711	2767	3026	3903	4042	4280	6786	6981
07	1470	1764	2950	3959	4022	3657	3044	3169	3494	4389	4524	4767	7432	7626
09	1257	1566	2729	3904	3959	3503	3387	3550	3909	4808	4939	5184	7932	8122
1	1603	1433	1647	1634	1717	1746	5152	5138	5281	6076	6220	6438	7580	7578
1	3601	3708	4534	4496	4587	4755	3446	3218	3078	3618	3753	3919	4699	4799
10	3241	3105	2532	3809	3770	2984	7338	7536	7912	8811	8942	9187	11512	11587
11	4463	4357	3833	5051	5005	4240	8294	8528	8938	9835	9960	10206	12756	12848
12	3754	3665	3243	4577	4540	3748	7564	7795	8202	9100	9226	9471	12047	12149
13	3963	3910	3610	5005	4972	4173	7540	7790	8217	9110	9232	9477	12229	12354
14	3338	3242	2823	4188	4155	3357	7236	7455	7852	8751	8878	9124	11632	11730
16	2238	2231	2285	3860	3855	3065	5915	6135	6537	7435	7561	7807	10469	10602
17	7220	7056	6837	5406	5448	6233	9130	8895	8704	9072	9188	9294	7047	6618
18	6106	5919	5617	4154	4193	4985	8467	8273	8148	8623	8749	8883	7309	6959
19	7642	7455	7121	5617	5648	6450	9810	9588	9416	9810	9928	10040	7818	7379
2	2762	2745	2685	4222	4208	3405	6351	6586	7001	7897	8021	8266	10994	11129
2	4237	4347	5165	5058	5150	5359	3550	3266	3028	3420	3545	3679	4060	4169
20	7933	7771	7548	6105	6144	6934	9731	9483	9270	9596	9707	9801	7254	6785
21	8418	8240	7938	6444	6475	7276	10381	10139	9936	10274	10385	10482	7907	7426
22	8762	8561	8149	6603	6623	7430	11009	10784	10605	10982	11098	11203	8745	8268
23	8172	7971	7563	6022	6044	6851	10477	10261	10095	10496	10614	10727	8453	8000
24	8243	8024	7521	5948	5960	6764	10810	10611	10473	10915	11037	11161	9062	8622
25	7903	7673	7121	5538	5545	6345	10645	10463	10349	10828	10953	11086	9206	8789
26	7700	7456	6828	5237	5236	6023	10666	10503	10418	10938	11067	11211	9560	9165
27	7107	6892	6428	4872	4891	5698	9713	9527	9409	9886	10012	10145	8378	7985
28	6541	6321	5844	4287	4306	5113	9271	9099	9004	9516	9645	9788	8280	7920
29	5457	5284	5061	3671	3720	4487	7771	7583	7469	7964	8092	8233	6916	6610

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3	2699	2615	2311	3777	3754	2947	6633	6842	7230	8129	8258	8503	10992	11095
3	4676	4770	5536	5316	5407	5674	3933	3626	3339	3628	3742	3851	3652	3723
30	5352	5125	4639	3092	3115	3922	8321	8180	8134	8716	8851	9013	8072	7788
31	6073	5837	5279	3700	3711	4515	9077	8931	8874	9440	9573	9729	8559	8236
32	7076	6836	6237	4649	4652	5447	10039	9880	9803	10336	10466	10614	9117	8746
33	6559	6396	6195	4790	4836	5612	8549	8326	8155	8560	8680	8796	6843	6455
34	6992	6806	6489	5002	5036	5835	9221	9009	8854	9278	9399	9519	7542	7137
35	4168	3957	3603	2178	2228	2996	7158	7037	7023	7653	7791	7966	7543	7339
36	4832	4659	4463	3123	3179	3924	7262	7092	7006	7545	7677	7829	6867	6610
37	5163	5037	5030	3839	3906	4597	6993	6781	6633	7087	7212	7344	6015	5735
38	3777	3617	3531	2387	2461	3112	6356	6217	6182	6794	6931	7102	6778	6610
39	4325	4147	3947	2638	2699	3427	6934	6785	6731	7315	7450	7614	6979	6763
4	3338	3305	3125	4602	4579	3772	6897	7142	7565	8459	8581	8826	11584	11716
4	5177	5253	5957	5610	5700	6030	4441	4118	3792	3983	4087	4168	3245	3251
40	4613	4405	4046	2592	2636	3418	7480	7342	7304	7902	8038	8204	7521	7283
41	4725	4594	4584	3419	3488	4165	6724	6530	6412	6911	7040	7183	6161	5919
42	1845	1862	2572	2703	2789	2828	4197	4141	4241	5010	5154	5366	6623	6670
43	2133	2289	3280	3685	3768	3704	3177	3119	3233	4026	4170	4390	6179	6313
44	3027	3084	3804	3684	3775	3968	3916	3748	3695	4323	4462	4644	5381	5424
45	3237	3423	4442	4772	4859	4850	2454	2278	2252	2958	3102	3307	5218	5422
46	4184	4362	5348	5546	5635	5702	2507	2208	1965	2427	2560	2723	4317	4562
47	5243	5426	6415	6562	6652	6752	2745	2368	1931	1959	2057	2137	3479	3817
48	5594	5746	6654	6624	6715	6902	3487	3112	2675	2628	2709	2750	2847	3131
49	6020	6142	6963	6762	6854	7124	4245	3872	3435	3347	3418	3434	2280	2472
5	4515	4446	4061	5380	5340	4554	8115	8368	8797	9690	9811	10056	12794	12911
50	6584	6680	7419	7062	7153	7498	5044	4670	4229	4098	4159	4155	1777	1814
51	9072	9379	10553	11571	11641	11300	4919	5055	5168	4842	4746	4698	9054	9623
52	8339	8648	9808	10895	10961	10580	4402	4598	4796	4629	4555	4556	9122	9669
53	8184	8489	9668	10653	10724	10401	3976	4110	4229	3940	3851	3822	8302	8858
54	8531	8830	10016	10885	10961	10704	4118	4162	4161	3678	3564	3476	7682	8256
55	7454	7757	8940	9873	9946	9652	3150	3264	3372	3101	3018	3006	7574	8117
56	7314	7622	8787	9860	9927	9552	3401	3623	3867	3816	3762	3804	8475	8998
57	1910	1634	564	1830	1809	1002	6418	6523	6800	7673	7813	8049	9747	9766
58	1906	1622	499	1715	1695	889	6414	6512	6781	7650	7791	8027	9673	9687
6	5301	5179	4563	5650	5594	4869	9167	9403	9814	10711	10836	11081	13586	13665
7	7079	6933	6194	7058	6990	6347	11009	11245	11654	12552	12678	12923	15328	15381
8	6598	6446	5690	6550	6482	5838	10585	10813	11215	12113	12240	12486	14834	14882
9	6018	5871	5143	6066	6001	5331	9998	10225	10626	11525	11652	11897	14267	14322
Norrkanga	2417	2202	1374	2606	2571	1777	6832	6977	7297	8186	8324	8565	10515	10555

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	14.8.2024 12.33

DMS no.: 0079-5298_01

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	169,0	8,0	104,0	No	85,1	92,6	97,2	99,1	98,1	94,3	87,7	78,3

WTG: Siemens Gamesa SG 6.2-170 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	14.8.2024 13.02

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	115,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

WTG: NORDEX N163/5.7 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	14.8.2024 13.19

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	178,5	8,0	108,7	No	90,4	96,6	100,3	102,9	103,6	101,1	93,5	85,5

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	16.9.2024 15.25

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	166,0	8,0	104,8	No	85,1	92,7	97,6	99,8	99,1	95,6	89,4	80,4

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	23.8.2024 9.52

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	164,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: VESTAS V162-7.2 7200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	15.8.2024 12.12

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	134,0	8,0	105,5	No	86,0	93,6	98,4	100,5	99,7	96,2	89,9	80,8

WTG: Siemens Gamesa SG 6.0-170 6000 170.0 !O!
Noise: (AM 0, 6.0MW) - 106dB(A) + 2dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	19.8.2024 13.43

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: Generic RD200 7.2MW 7200 200.0 !O!
Noise: V172 - 7,2 MW PO7200 No STE PO7200-0S

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	20.8.2024 12.58

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	200,0	8,0	112,1	No	93,5	102,2	106,1	107,0	105,7	101,3	93,6	82,8

WTG: LAGERWEY L100-2.5MW 2520 100.0 !O!
Noise: Level 0 - - Standard mode - 01-2014

Source	Source/Date	Creator	Edited
L100-2.5MW rev 27-1-2014	27.1.2014	USER	15.8.2024 12.41

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	98,0	8,0	105,0	No	86,6	93,6	97,0	99,6	99,4	96,5	91,7	82,2

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

WTG: NORDTANK 150 24.6 !O!
Noise: nordtank

Source	Source/Date	Creator	Edited
Rambøll (Memo)	1.4.1989	USER	15.8.2024 12.44

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	38,0	8,0	97,8	No	79,4	86,4	89,8	92,4	92,2	89,3	84,5	75,0

WTG: VESTAS V150-4.2 4200 150.0 !O!
Noise: Level 00 - Measured - Mode PO1 - 03-2018

Source	Source/Date	Creator	Edited
Manufacturer Document n. 0067-4767 V06.	15.3.2018	USER	15.8.2024 12.30

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	145,0	8,0	104,9	No	84,2	92,3	97,4	99,8	99,4	96,1	90,1	81,0

WTG: NORDEX N163/5.X 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	16.9.2024 9.24

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	158,0	8,0	109,2	No	90,9	97,1	100,8	103,4	104,1	101,6	94,0	86,0

Noise sensitive area: A Asuinrakennus A (England)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: B Asuinrakennus B (Renlund)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: C Asuinrakennus C (Jepuantie 586)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: D Lomarakennus D (Kvarnbacka)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

Noise sensitive area: E Asuinrakennus E (Gullback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: F Asuinrakennus F (Jepuantie 675)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: G Lomarakennus G (Kullasteet 64b)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: H Asuinrakennus H (Kullastået 85)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: I Lomarakennus I (Kyhrastået, Bobacken)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: J Asuinrakennus J (Hagabacktået 71)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: K Asuinrakennus K (Nyback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: L Asuinrakennus L (Kimo Skogsbilvdg 55)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: M Lomarakennus M (Fårmossen)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: N Lomarakennus N (Brändå)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

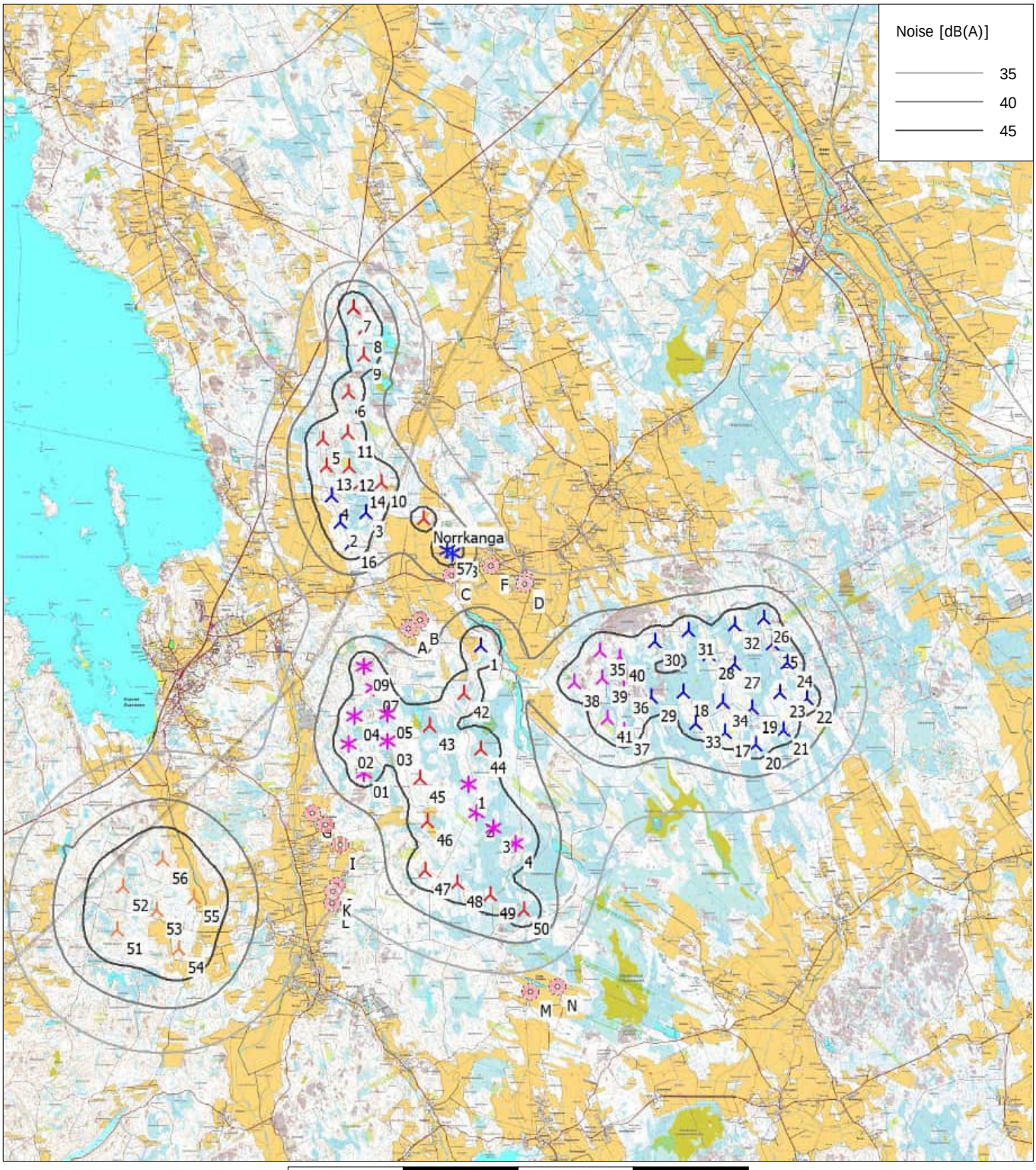
Noise demand: 40,0 dB(A)
No distance demand

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Calculated:
16.9.2024 16.38/3.6.377

DECIBEL - Map 8,0 m/s

Calculation: Vargitmossen VE1_SG170-6.0MW (108.0dB)x9xHH215_kaikki_yhteisvaikutukset_2024



Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 624 North: 7 028 673

New WTG Existing WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

Bilaga 14. Resultat av modellering av sammantaget buller ISO 9613-2 i projektalternativ 2 (ALT2).

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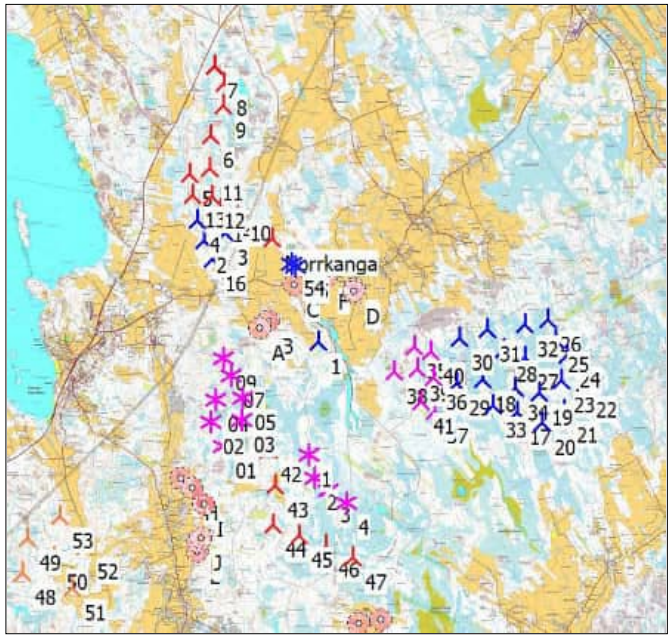
Calculated:
17.9.2024 10.39/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
02	272 153	7 026 165	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
03	272 991	7 026 229	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
04	272 290	7 026 759	26,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
05	273 002	7 026 818	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
07	272 700	7 027 390	30,0	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
09	272 494	7 027 846	25,1	VESTAS V150-4.2 4200 150.0 !O! ...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	USER	Level 00 - Measured - Mode PO1 - 03-2018	8,0	104,9
1	275 027	7 028 285	22,6	NORDEX N163/5.7 5700 163.0 !O!...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	108,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
10	272 876	7 031 835	22,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
11	272 142	7 032 911	27,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
12	272 176	7 032 174	25,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
13	271 677	7 032 186	20,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
14	272 407	7 031 814	22,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
16	272 217	7 030 505	17,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
17	280 336	7 026 417	51,4	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
18	279 422	7 027 294	47,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
19	280 918	7 026 942	43,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
2	271 975	7 030 974	19,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	274 926	7 024 666	32,5	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
20	280 996	7 026 139	45,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
21	281 600	7 026 467	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
22	282 102	7 027 147	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
23	281 524	7 027 270	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
24	281 681	7 027 926	43,3	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
25	281 366	7 028 337	44,7	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
26	281 165	7 028 894	38,8	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
27	280 535	7 027 893	42,5	VESTAS V172-7.2 7200 172.0 !O! ...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
28	279 986	7 028 096	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
29	278 725	7 027 182	49,9	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
3	272 536	7 031 182	18,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
30	278 813	7 028 386	45,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
31	279 541	7 028 621	42,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
32	280 544	7 028 746	40,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
33	279 701	7 026 603	52,5	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
34	280 279	7 027 063	50,0	VESTAS V162-6.2 6200 162.0 !O! ...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	104,8
35	277 608	7 028 174	38,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
4	275 772	7 024 008	40,0	NORDEX N163/5.X 5700 163.0 !O!...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	109,2
4	271 789	7 031 536	17,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
40	278 041	7 028 049	43,8	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 7200 162.0 !O! ...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	USER	Level 0 - Calculated - PO7200 - 04-2022	8,0	105,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
43	273 877	7 024 480	30,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
44	273 828	7 023 413	40,0	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
45	274 526	7 023 150	36,3	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
46	275 242	7 022 891	37,9	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
47	275 965	7 022 551	42,3	Siemens Gamesa SG 6.0-170 6000...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	USER	(AM 0, 6.0MW) - 106dB(A) + 2dB(A)	8,0	108,0
48	267 145	7 022 129	27,6	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
49	267 266	7 023 061	30,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
5	271 608	7 032 764	15,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
50	267 989	7 022 558	20,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
51	268 475	7 021 720	20,5	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1

To be continued on next page...

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Calculated:
17.9.2024 10.39/3.6.377

DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

...continued from previous page

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]
52	268 805	7 022 822	15,0	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
53	268 123	7 023 645	20,2	Generic RD200 7.2MW 7200 200.0...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW PO7200 No STE PO7200-0S	8,0	112,1
54	274 303	7 030 363	16,9	LAGERWEY L100-2.5MW 2520 100...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	USER	Level 0 - - Standard mode - 01-2014	8,0	105,0
55	274 404	7 030 306	17,5	NORDTANK 150 24.6 !O! hub: 38...	No	NORDTANK	-150	150	24,6	38,0	USER	nordtank	8,0	97,8
6	272 158	7 033 787	24,9	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
8	272 507	7 035 178	27,5	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
9	272 494	7 034 589	30,0	Siemens Gamesa SG 6.2-170 6200...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V162-5.6 5600...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	USER	V162 - 5.6 MW Mode 0 STE - 4-2019	8,0	104,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]	Distance to noise demand [m]	Demands fulfilled ? Noise
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	4,0	40,0	37,4	553	Yes
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	4,0	40,0	37,2	638	Yes
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	4,0	40,0	41,0	-91	No
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	4,0	40,0	35,6	857	Yes
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	4,0	40,0	35,3	940	Yes
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	4,0	40,0	37,0	371	Yes
G	Lomarakennus G (Kullasteet 64b)	271 374	7 024 647	17,5	4,0	40,0	36,5	723	Yes
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	4,0	40,0	36,6	708	Yes
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	4,0	40,0	36,5	918	Yes
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	4,0	40,0	35,4	1 150	Yes
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	4,0	40,0	35,3	1 254	Yes
L	Asuinrakennus L (Kimo Skogsbilvdg 55)	271 811	7 022 704	20,6	4,0	40,0	35,1	1 342	Yes
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	4,0	40,0	32,6	1 064	Yes
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	4,0	40,0	32,2	1 113	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
01	3262	3524	4679	5371	5449	5265	1418	1401	1642	2528	2665	2906	5973	6265
02	2805	3092	4274	5148	5220	4938	1705	1837	2202	3101	3230	3476	6676	6957
03	2462	2706	3841	4513	4590	4407	2260	2262	2475	3338	3479	3715	6273	6495
04	2221	2515	3701	4661	4728	4397	2301	2447	2806	3706	3836	4081	7089	7335
05	1885	2140	3295	4081	4154	3906	2711	2767	3026	3903	4042	4280	6786	6981
07	1470	1764	2950	3959	4022	3657	3044	3169	3494	4389	4524	4767	7432	7626
09	1257	1566	2729	3904	3959	3503	3387	3550	3909	4808	4939	5184	7932	8122
1	1603	1433	1647	1634	1717	1746	5152	5138	5281	6076	6220	6438	7580	7578
1	3601	3708	4534	4496	4587	4755	3446	3218	3078	3618	3753	3919	4699	4799
10	3241	3105	2532	3809	3770	2984	7338	7536	7912	8811	8942	9187	11512	11587
11	4463	4357	3833	5051	5005	4240	8294	8528	8938	9835	9960	10206	12756	12848
12	3754	3665	3243	4577	4540	3748	7564	7795	8202	9100	9226	9471	12047	12149
13	3963	3910	3610	5005	4972	4173	7540	7790	8217	9110	9232	9477	12229	12354
14	3338	3242	2823	4188	4155	3357	7236	7455	7852	8751	8878	9124	11632	11730
16	2238	2231	2285	3860	3855	3065	5915	6135	6537	7435	7561	7807	10469	10602
17	7220	7056	6837	5406	5448	6233	9130	8895	8704	9072	9188	9294	7047	6618
18	6106	5919	5617	4154	4193	4985	8467	8273	8148	8623	8749	8883	7309	6959
19	7642	7455	7121	5617	5648	6450	9810	9588	9416	9810	9928	10040	7818	7379
2	2762	2745	2685	4222	4208	3405	6351	6586	7001	7897	8021	8266	10994	11129
2	4237	4347	5165	5058	5150	5359	3550	3266	3028	3420	3545	3679	4060	4169
20	7933	7771	7548	6105	6144	6934	9731	9483	9270	9596	9707	9801	7254	6785
21	8418	8240	7938	6444	6475	7276	10381	10139	9936	10274	10385	10482	7907	7426
22	8762	8561	8149	6603	6623	7430	11009	10784	10605	10982	11098	11203	8745	8268
23	8172	7971	7563	6022	6044	6851	10477	10261	10095	10496	10614	10727	8453	8000
24	8243	8024	7521	5948	5960	6764	10810	10611	10473	10915	11037	11161	9062	8622
25	7903	7673	7121	5538	5545	6345	10645	10463	10349	10828	10953	11086	9206	8789
26	7700	7456	6828	5237	5236	6023	10666	10503	10418	10938	11067	11211	9560	9165
27	7107	6892	6428	4872	4891	5698	9713	9527	9409	9886	10012	10145	8378	7985
28	6541	6321	5844	4287	4306	5113	9271	9099	9004	9516	9645	9788	8280	7920
29	5457	5284	5061	3671	3720	4487	7771	7583	7469	7964	8092	8233	6916	6610
3	4676	4770	5536	5316	5407	5674	3933	3626	3339	3628	3742	3851	3652	3723
3	2699	2615	2311	3777	3754	2947	6633	6842	7230	8129	8258	8503	10992	11095

To be continued on next page...

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DECIBEL - Main Result

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N
30	5352	5125	4639	3092	3115	3922	8321	8180	8134	8716	8851	9013	8072	7788
31	6073	5837	5279	3700	3711	4515	9077	8931	8874	9440	9573	9729	8559	8236
32	7076	6836	6237	4649	4652	5447	10039	9880	9803	10336	10466	10614	9117	8746
33	6559	6396	6195	4790	4836	5612	8549	8326	8155	8560	8680	8796	6843	6455
34	6992	6806	6489	5002	5036	5835	9221	9009	8854	9278	9399	9519	7542	7137
35	4168	3957	3603	2178	2228	2996	7158	7037	7023	7653	7791	7966	7543	7339
36	4832	4659	4463	3123	3179	3924	7262	7092	7006	7545	7677	7829	6867	6610
37	5163	5037	5030	3839	3906	4597	6993	6781	6633	7087	7212	7344	6015	5735
38	3777	3617	3531	2387	2461	3112	6356	6217	6182	6794	6931	7102	6778	6610
39	4325	4147	3947	2638	2699	3427	6934	6785	6731	7315	7450	7614	6979	6763
4	5177	5253	5957	5610	5700	6030	4441	4118	3792	3983	4087	4168	3245	3251
4	3338	3305	3125	4602	4579	3772	6897	7142	7565	8459	8581	8826	11584	11716
40	4613	4405	4046	2592	2636	3418	7480	7342	7304	7902	8038	8204	7521	7283
41	4725	4594	4584	3419	3488	4165	6724	6530	6412	6911	7040	7183	6161	5919
42	3237	3423	4442	4772	4859	4850	2454	2278	2252	2958	3102	3307	5218	5422
43	4184	4362	5348	5546	5635	5702	2507	2208	1965	2427	2560	2723	4317	4562
44	5243	5426	6415	6562	6652	6752	2745	2368	1931	1959	2057	2137	3479	3817
45	5594	5746	6654	6624	6715	6902	3487	3112	2675	2628	2709	2750	2847	3131
46	6020	6142	6963	6762	6854	7124	4245	3872	3435	3347	3418	3434	2280	2472
47	6584	6680	7419	7062	7153	7498	5044	4670	4229	4098	4159	4155	1777	1814
48	9072	9379	10553	11571	11641	11300	4919	5055	5168	4842	4746	4698	9054	9623
49	8339	8648	9808	10895	10961	10580	4402	4598	4796	4629	4555	4556	9122	9669
5	4515	4446	4061	5380	5340	4554	8115	8368	8797	9690	9811	10056	12794	12911
50	8184	8489	9668	10653	10724	10401	3976	4110	4229	3940	3851	3822	8302	8858
51	8531	8830	10016	10885	10961	10704	4118	4162	4161	3678	3564	3476	7682	8256
52	7454	7757	8940	9873	9946	9652	3150	3264	3372	3101	3018	3006	7574	8117
53	7314	7622	8787	9860	9927	9552	3401	3623	3867	3816	3762	3804	8475	8998
54	1910	1634	564	1830	1809	1002	6418	6523	6800	7673	7813	8049	9747	9766
55	1906	1622	499	1715	1695	889	6414	6512	6781	7650	7791	8027	9673	9687
6	5301	5179	4563	5650	5594	4869	9167	9403	9814	10711	10836	11081	13586	13665
7	7079	6933	6194	7058	6990	6347	11009	11245	11654	12552	12678	12923	15328	15381
8	6598	6446	5690	6550	6482	5838	10585	10813	11215	12113	12240	12486	14834	14882
9	6018	5871	5143	6066	6001	5331	9998	10225	10626	11525	11652	11897	14267	14322
Norrkanga	2417	2202	1374	2606	2571	1777	6832	6977	7297	8186	8324	8565	10515	10555

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17.9.2024 10.39/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (vesistöt): (13)
Area type with hard ground: Vesistöt
Ground factor for hard ground: 0,0
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Ignore pure tones setting on WTG
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	14.8.2024 12.33

DMS no.: 0079-5298_01

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	169,0	8,0	104,0	No	85,1	92,6	97,2	99,1	98,1	94,3	87,7	78,3

WTG: Siemens Gamesa SG 6.2-170 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	14.8.2024 13.02

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	115,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

WTG: NORDEX N163/5.7 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	14.8.2024 13.19

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	178,5	8,0	108,7	No	90,4	96,6	100,3	102,9	103,6	101,1	93,5	85,5

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DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	16.9.2024 15.25

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	166,0	8,0	104,8	No	85,1	92,7	97,6	99,8	99,1	95,6	89,4	80,4

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	23.8.2024 9.52

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	164,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: VESTAS V162-7.2 7200 162.0 !O!
Noise: Level 0 - Calculated - PO7200 - 04-2022

Source	Source/Date	Creator	Edited
Manufacturer	25.4.2022	USER	15.8.2024 12.12

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	134,0	8,0	105,5	No	86,0	93,6	98,4	100,5	99,7	96,2	89,9	80,8

WTG: Siemens Gamesa SG 6.0-170 6000 170.0 !O!
Noise: (AM 0, 6.0MW) - 106dB(A) + 2dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	19.8.2024 13.43

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					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: Generic RD200 7.2MW 7200 200.0 !O!
Noise: V172 - 7,2 MW PO7200 No STE PO7200-0S

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	20.8.2024 12.58

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	200,0	8,0	112,1	No	93,5	102,2	106,1	107,0	105,7	101,3	93,6	82,8

WTG: LAGERWEY L100-2.5MW 2520 100.0 !O!
Noise: Level 0 - - Standard mode - 01-2014

Source	Source/Date	Creator	Edited
L100-2.5MW rev 27-1-2014	27.1.2014	USER	15.8.2024 12.41

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	98,0	8,0	105,0	No	86,6	93,6	97,0	99,6	99,4	96,5	91,7	82,2

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Calculated:
17.9.2024 10.39/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

WTG: NORDTANK 150 24.6 !O!
Noise: nordtank

Source	Source/Date	Creator	Edited
Rambøll (Memo)	1.4.1989	USER	15.8.2024 12.44

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	38,0	8,0	97,8	No	79,4	86,4	89,8	92,4	92,2	89,3	84,5	75,0

WTG: VESTAS V150-4.2 4200 150.0 !O!
Noise: Level 00 - Measured - Mode PO1 - 03-2018

Source	Source/Date	Creator	Edited
Manufacturer Document n. 0067-4767 V06.	15.3.2018	USER	15.8.2024 12.30

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	145,0	8,0	104,9	No	84,2	92,3	97,4	99,8	99,4	96,1	90,1	81,0

WTG: NORDEX N163/5.X 5700 163.0 !O!
Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	16.9.2024 9.24

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	158,0	8,0	109,2	No	90,9	97,1	100,8	103,4	104,1	101,6	94,0	86,0

Noise sensitive area: A Asuinrakennus A (England)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: B Asuinrakennus B (Renlund)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: C Asuinrakennus C (Jepuantie 586)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: D Lomarakennus D (Kvarnbacka)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

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Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

Noise sensitive area: E Asuinrakennus E (Gullback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: F Asuinrakennus F (Jepuantie 675)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: G Lomarakennus G (Kullasteet 64b)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: H Asuinrakennus H (Kullastået 85)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: I Lomarakennus I (Kyhrastået, Bobacken)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: J Asuinrakennus J (Hagabacktået 71)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: K Asuinrakennus K (Nyback)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: L Asuinrakennus L (Kimo Skogsbilvdg 55)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: M Lomarakennus M (Fårmossen)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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FI-00601 Helsinki
+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
17.9.2024 10.39/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

Noise demand: 40,0 dB(A)
No distance demand

Noise sensitive area: N Lomarakennus N (Brändå)

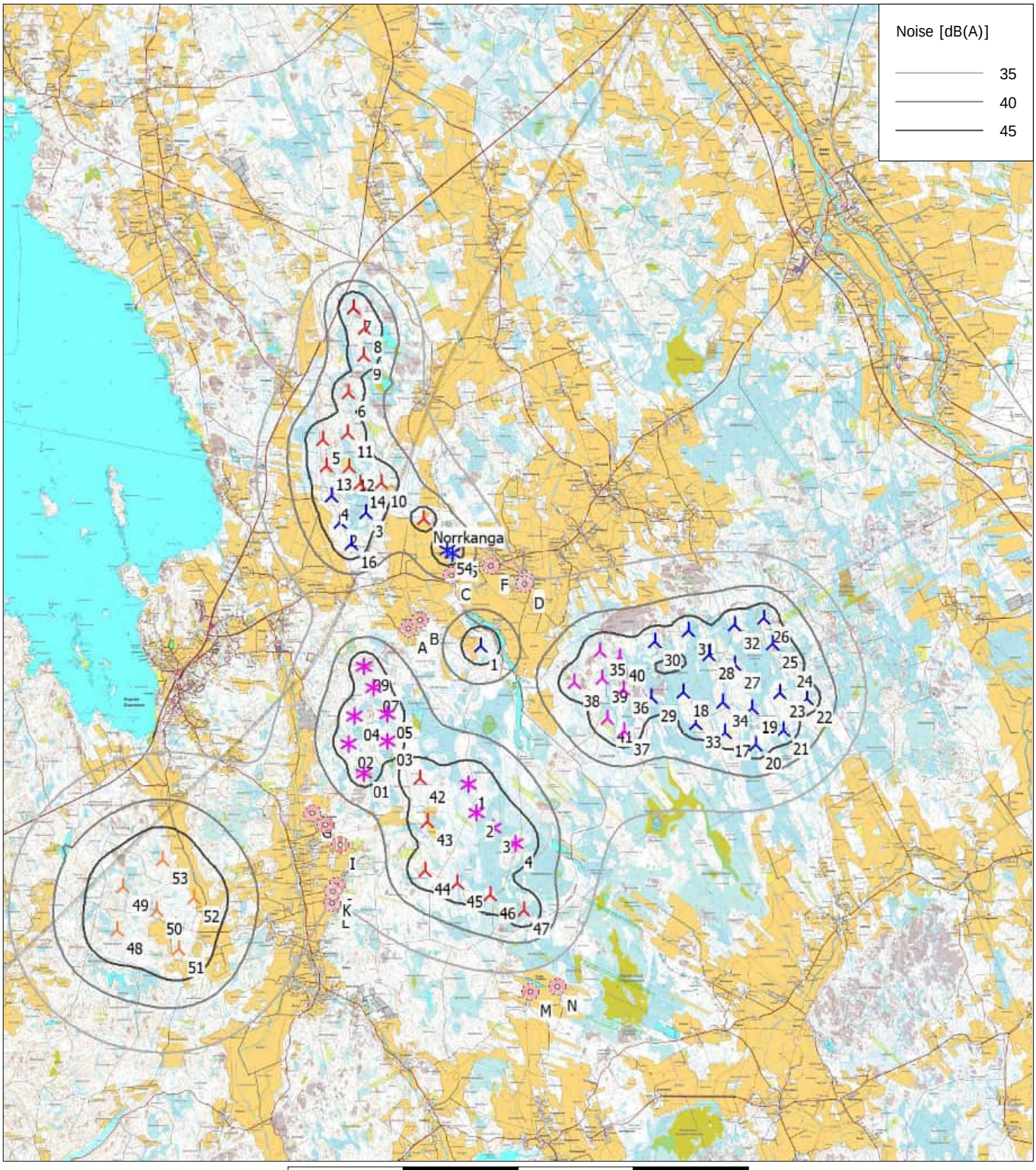
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand

Licensed user:
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+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi

DECIBEL - Map 8,0 m/s

Calculation: Vargitmossen VE2_SG170-6.0MW (108.0dB)x6xHH215_kaikki_yhteisvaikutukset_2024

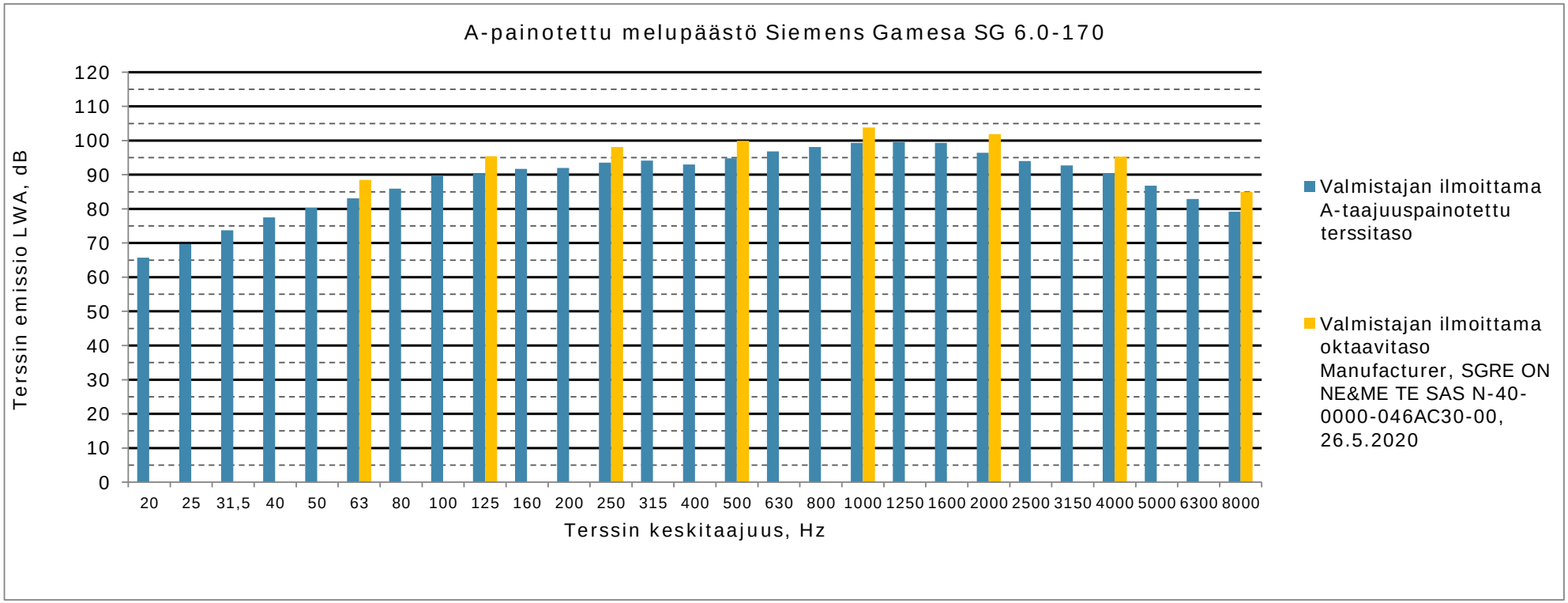


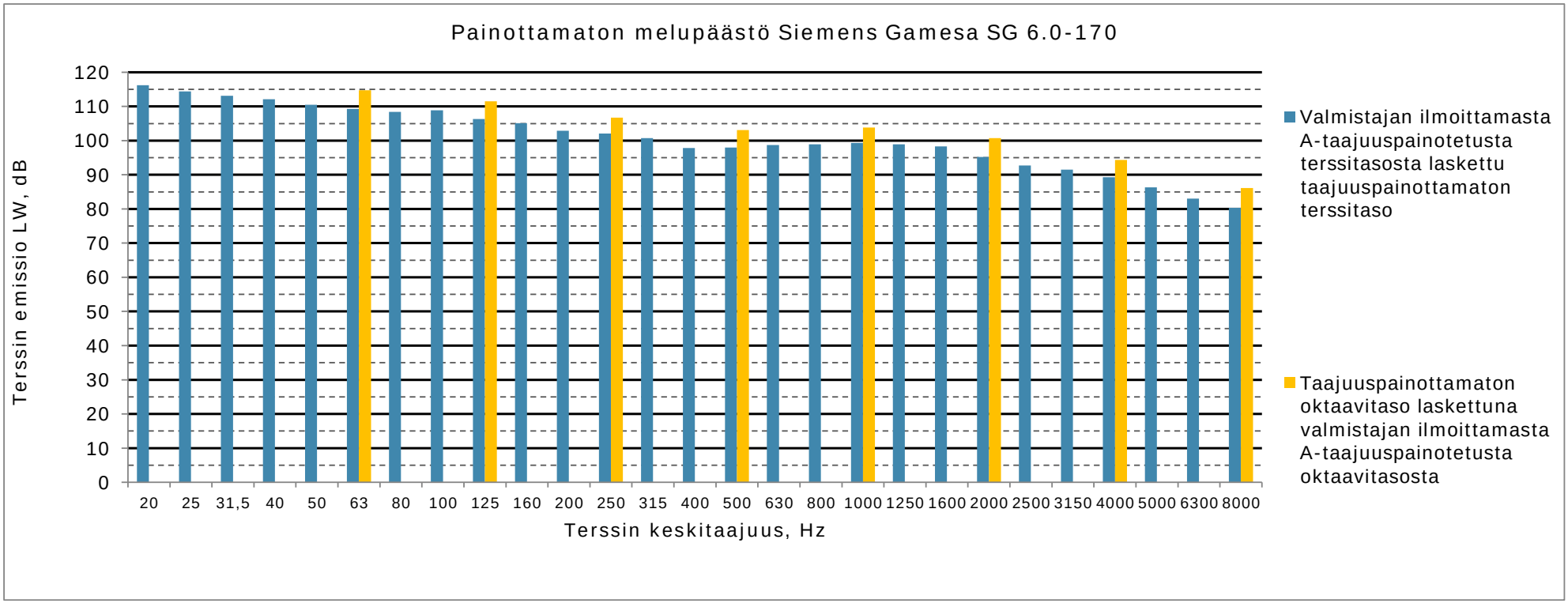
Map: Peruskarttarasteri , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 624 North: 7 028 673

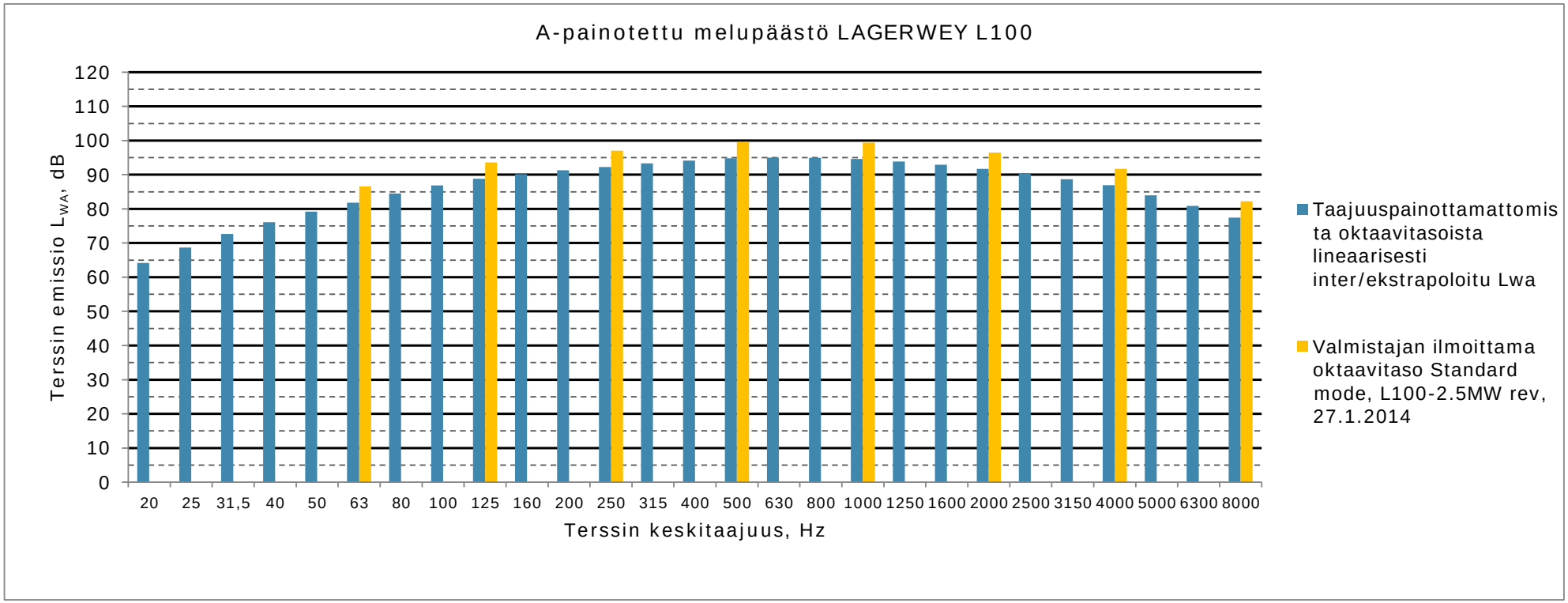
New WTG Existing WTG Noise sensitive area

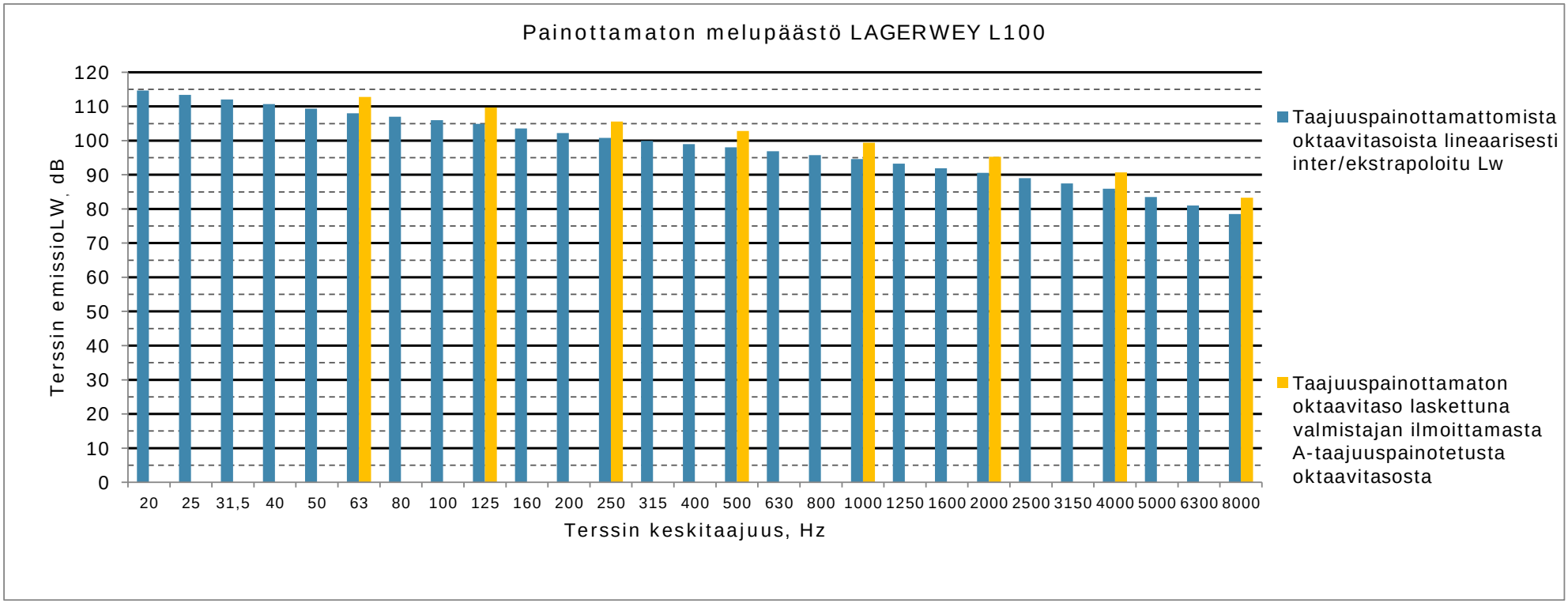
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

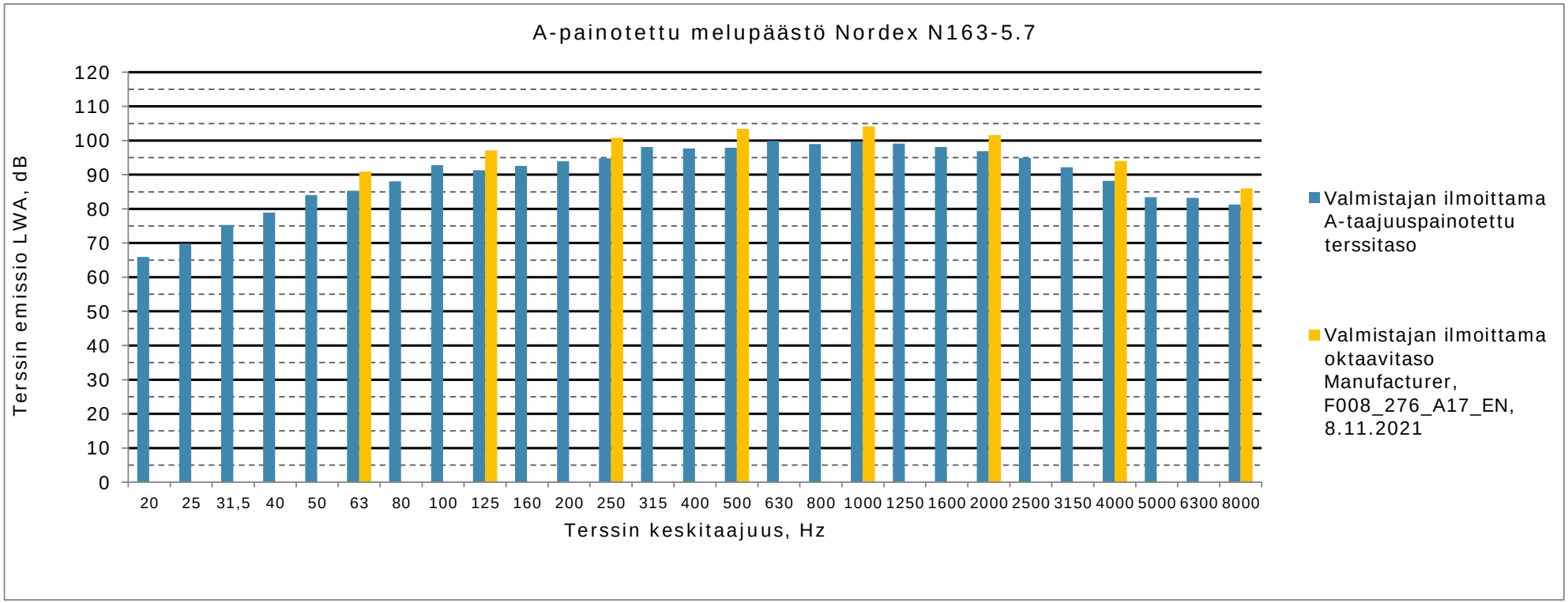
Bilaga 15. Värden för sammantaget buller vid olika byggnader - Projektalternativ 1 (ALT1).

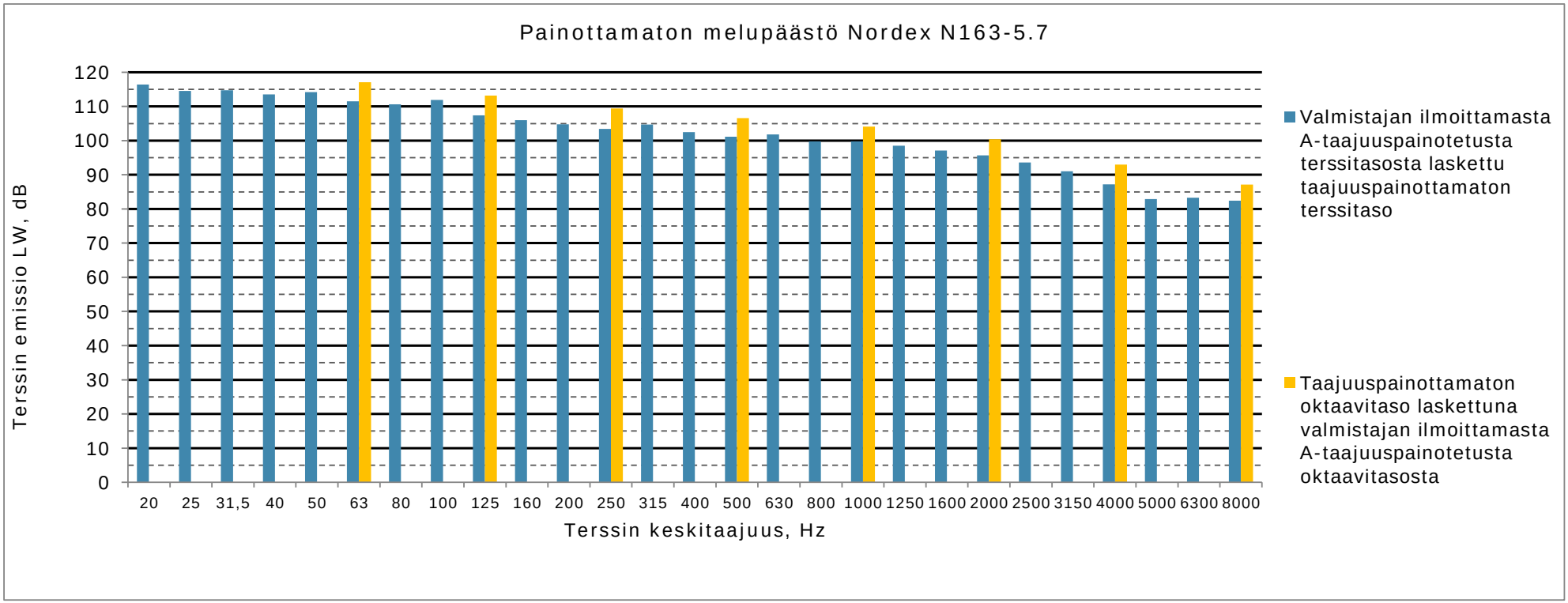

A-painotettu melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

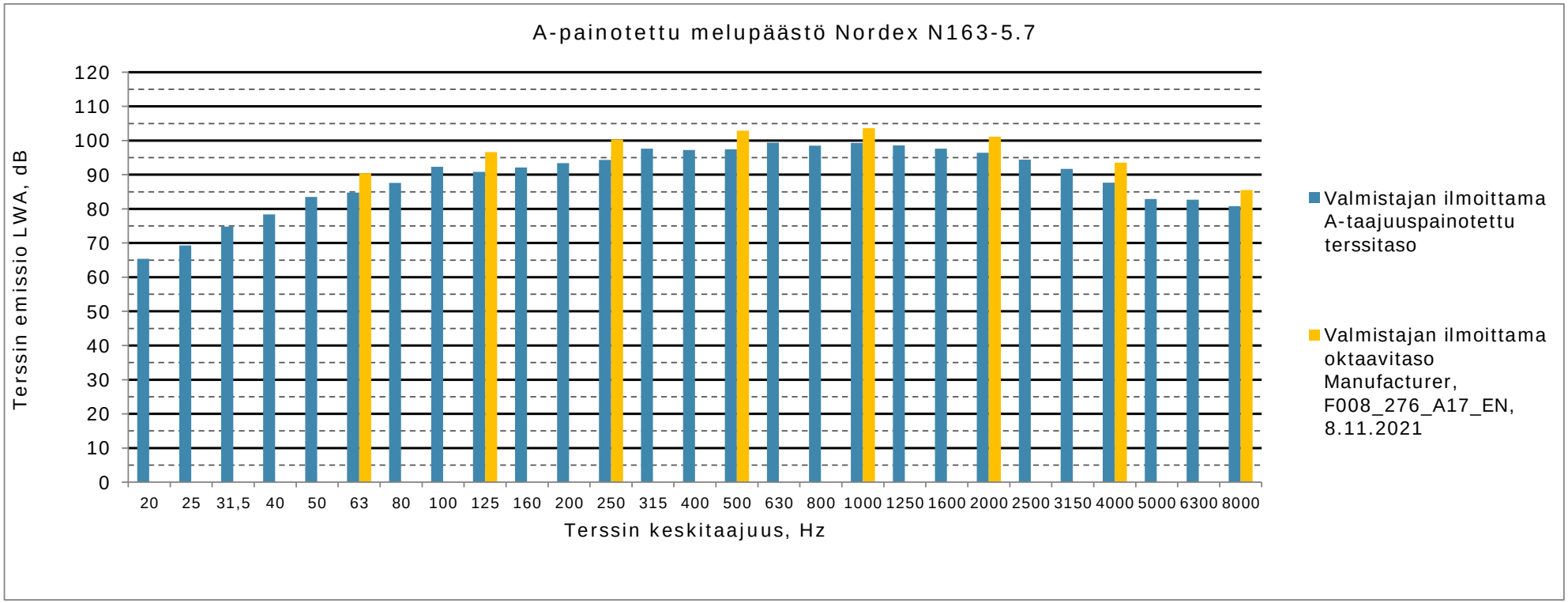

Painottamaton melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

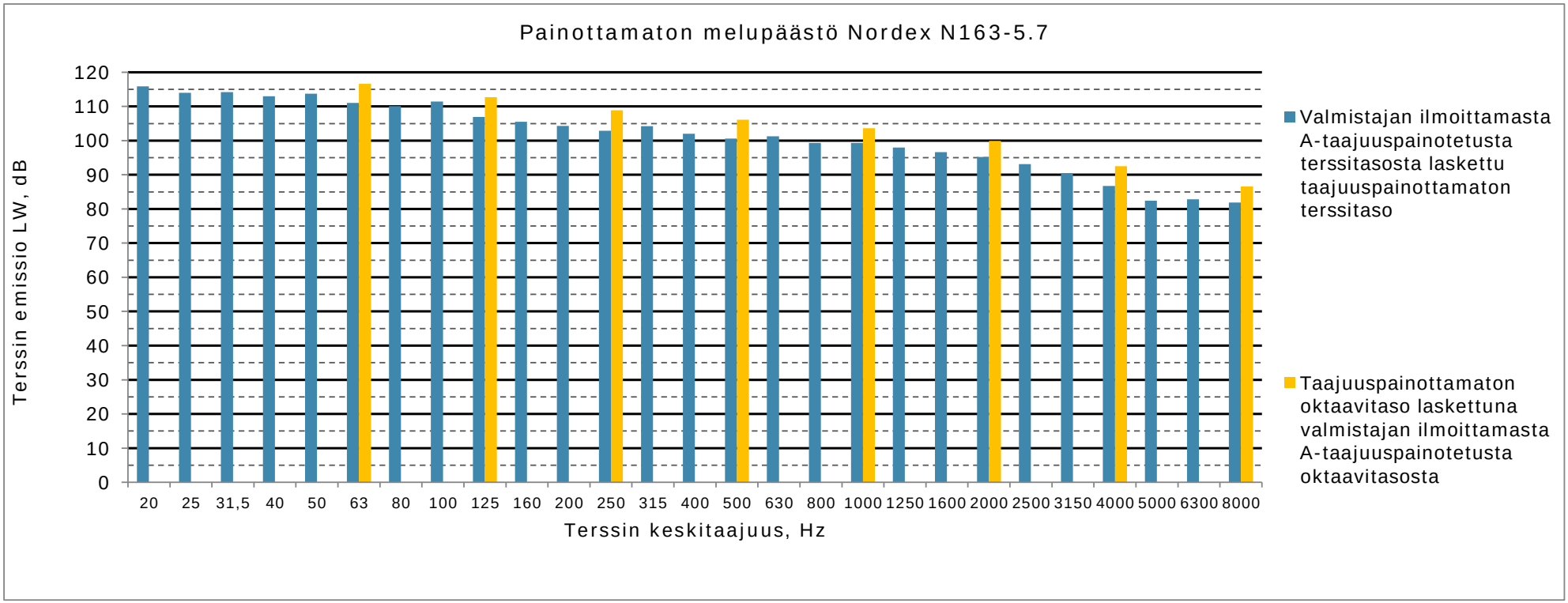

A-painotettu melupäästö LAGERWEY L100
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Standard mode, L100-2.5MW rev, 27.1.2014

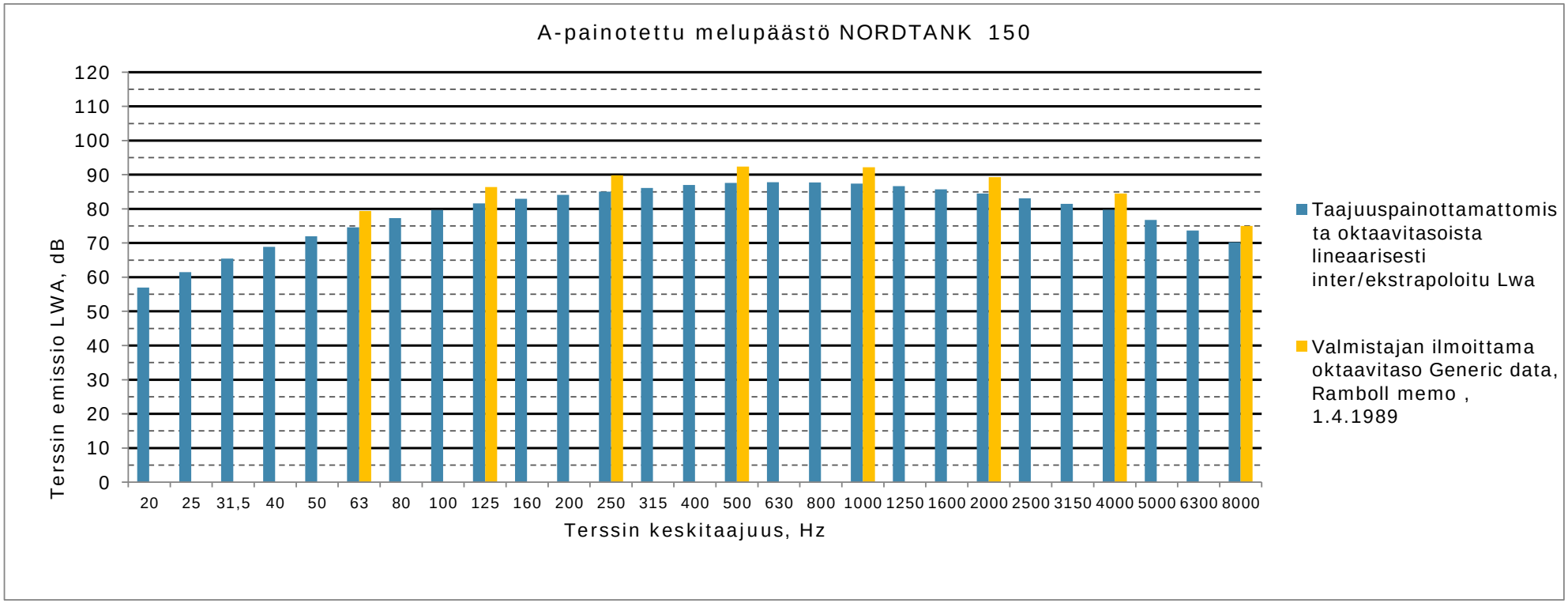

Painottamaton melupäästö LAGERWEY L100
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

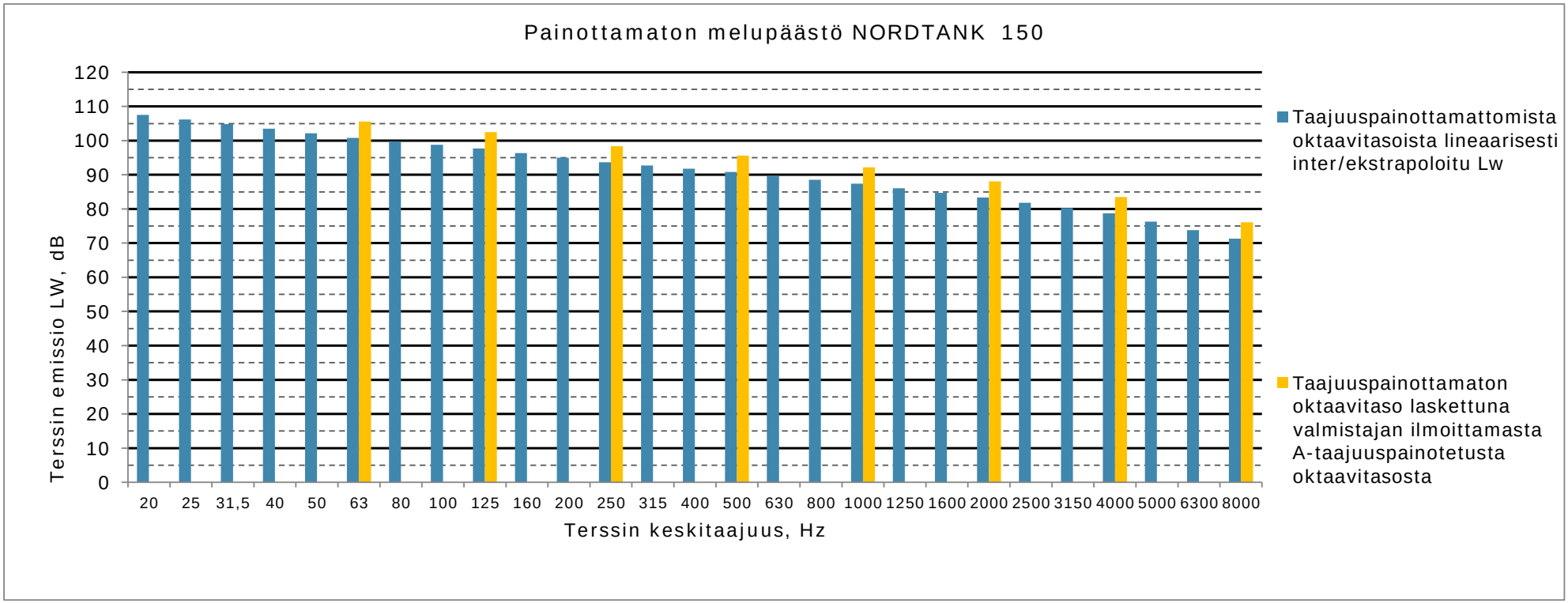

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

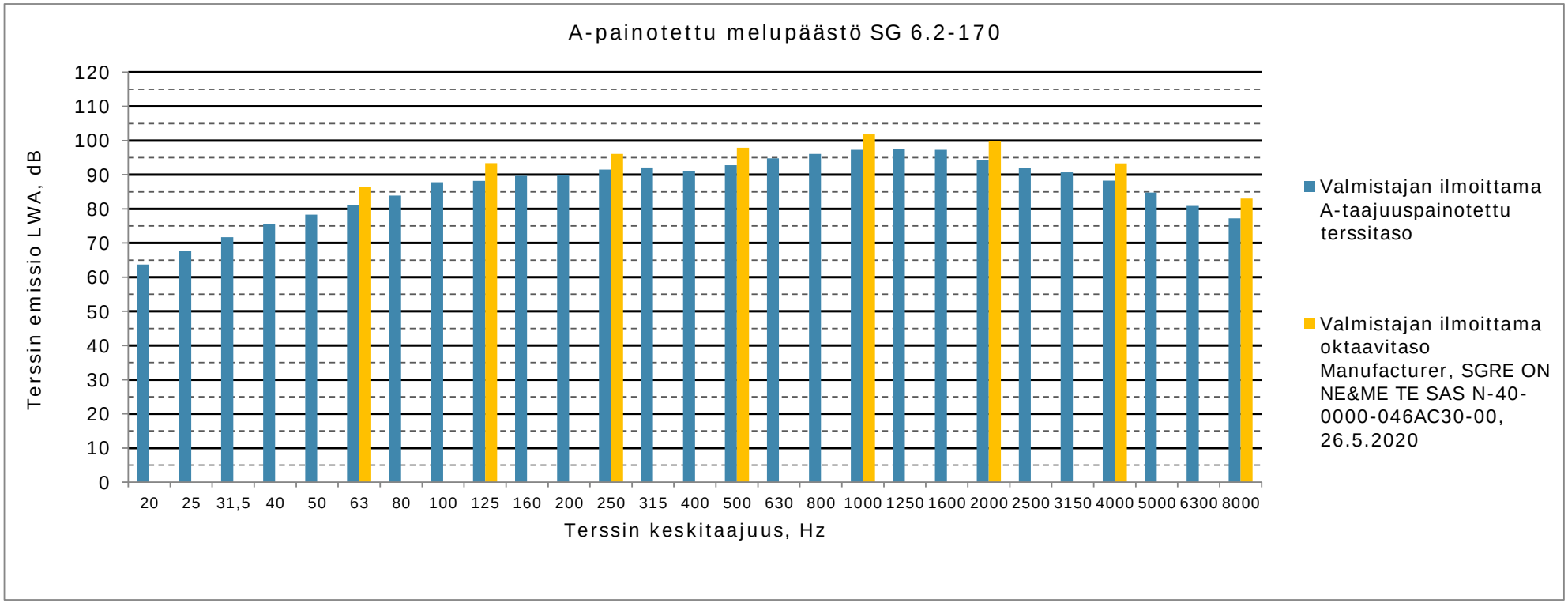

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

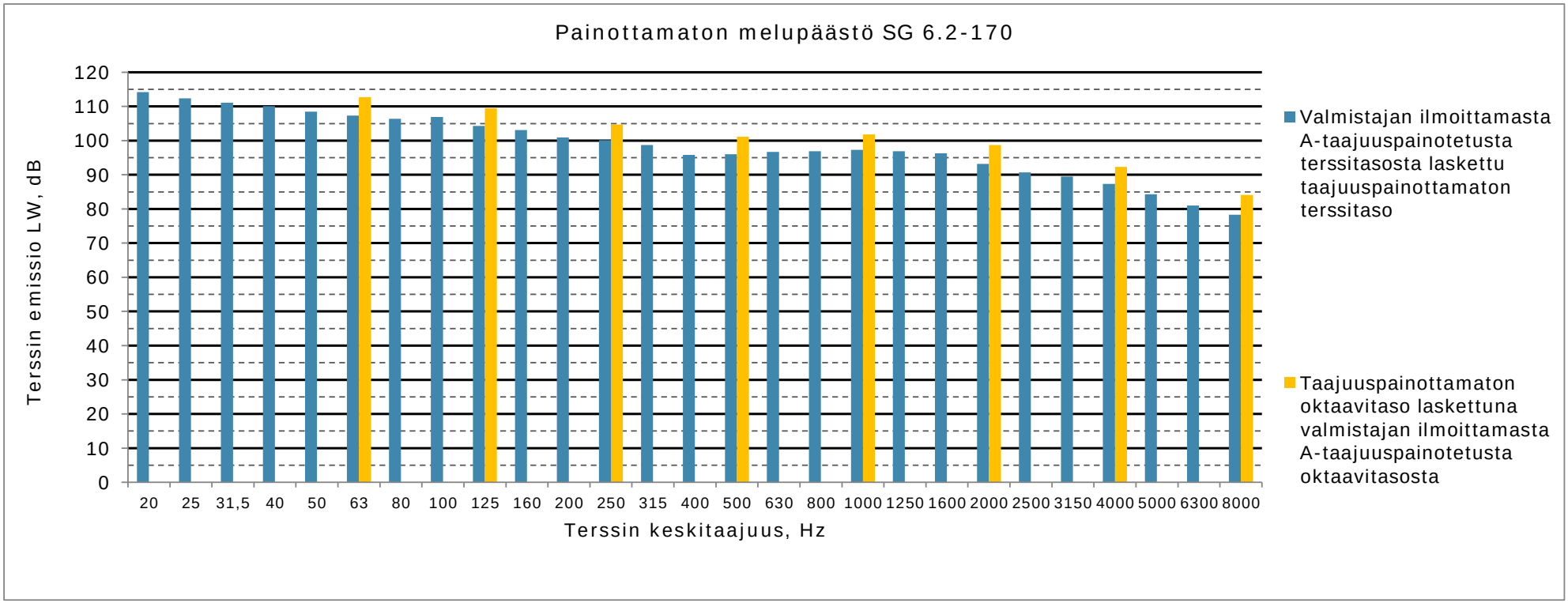

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

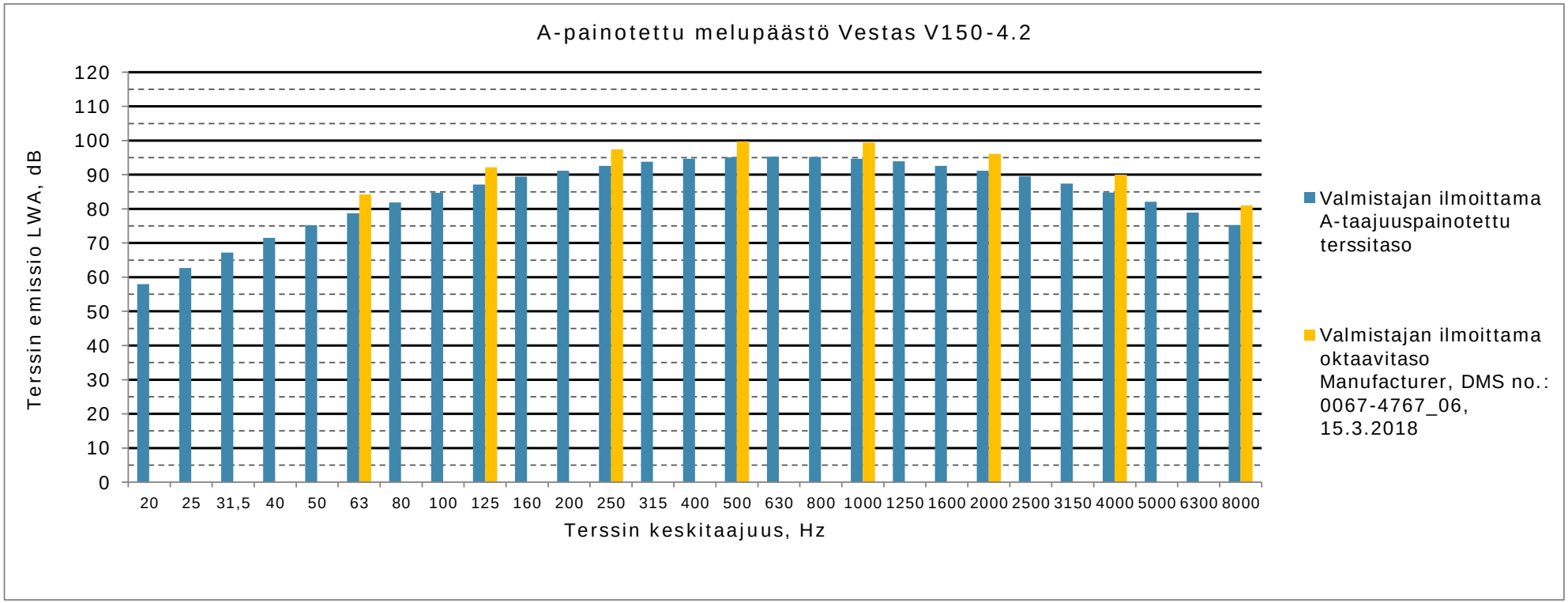

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

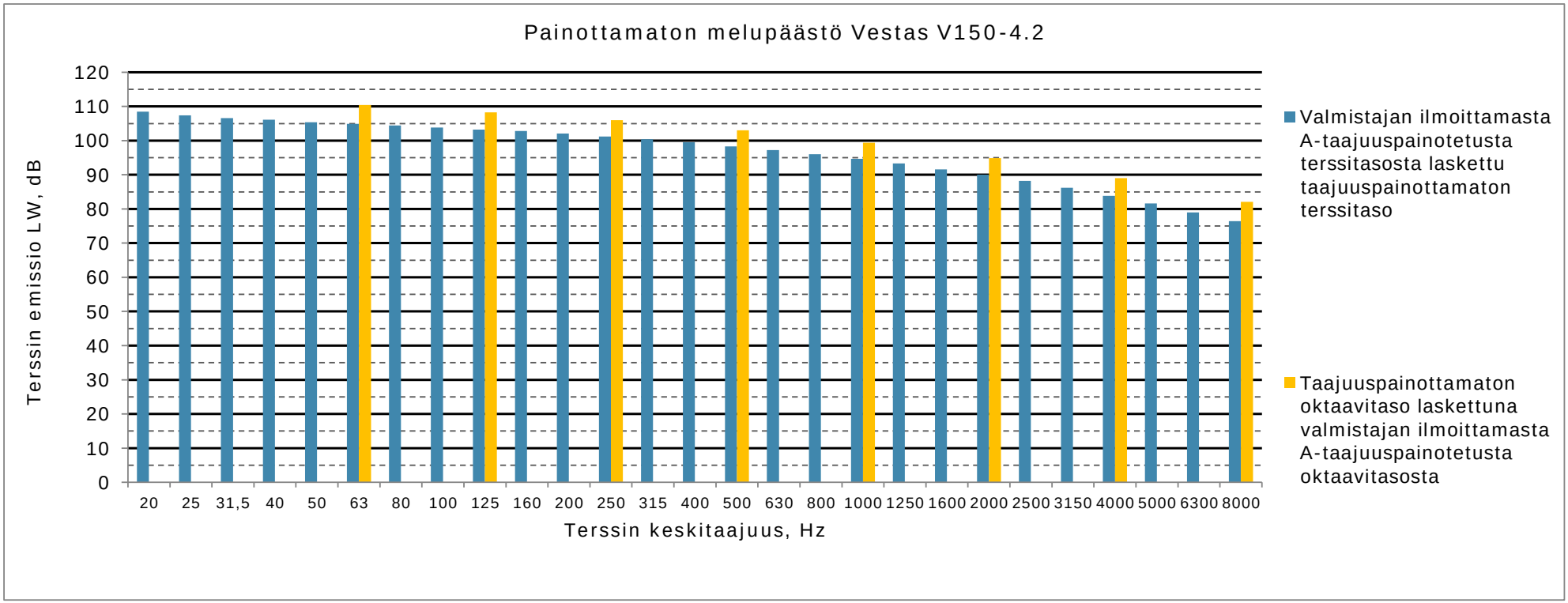

A-painotettu melupäästö NORDTANK 150
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Generic data, Ramboll memo , 1.4.1989

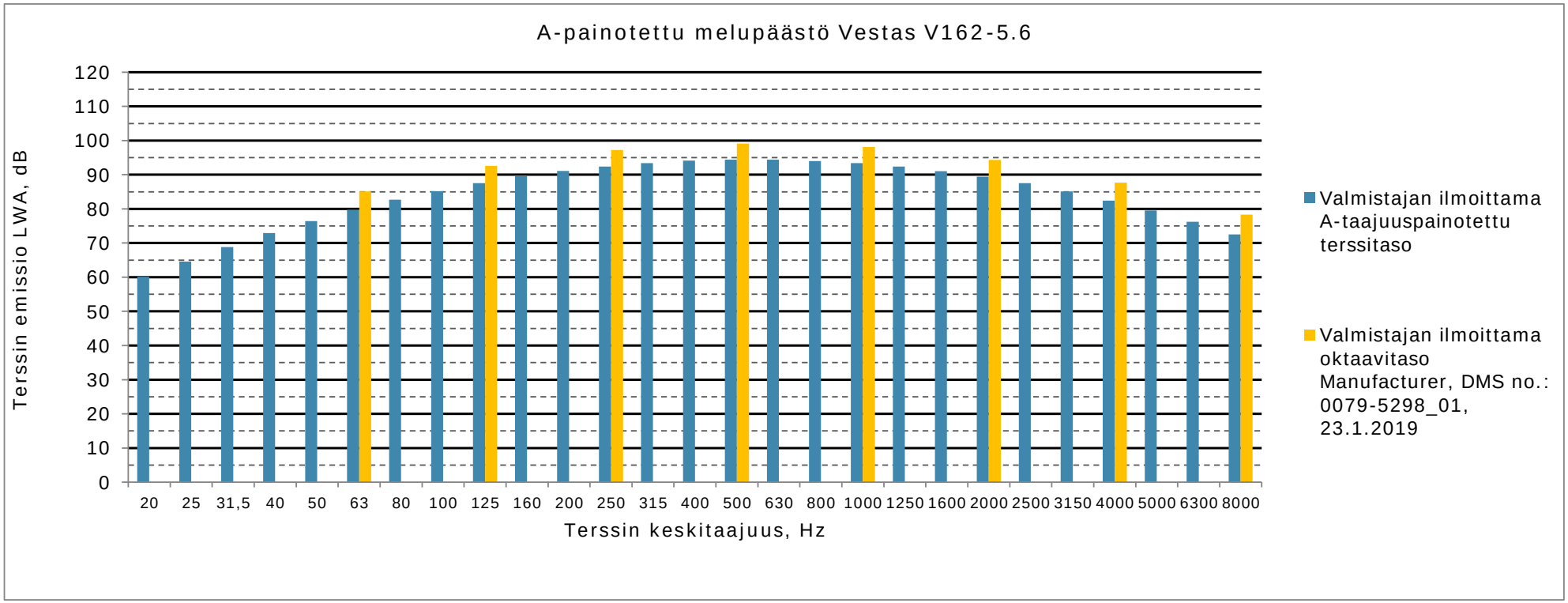

Painottamaton melupäästö NORDTANK 150
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

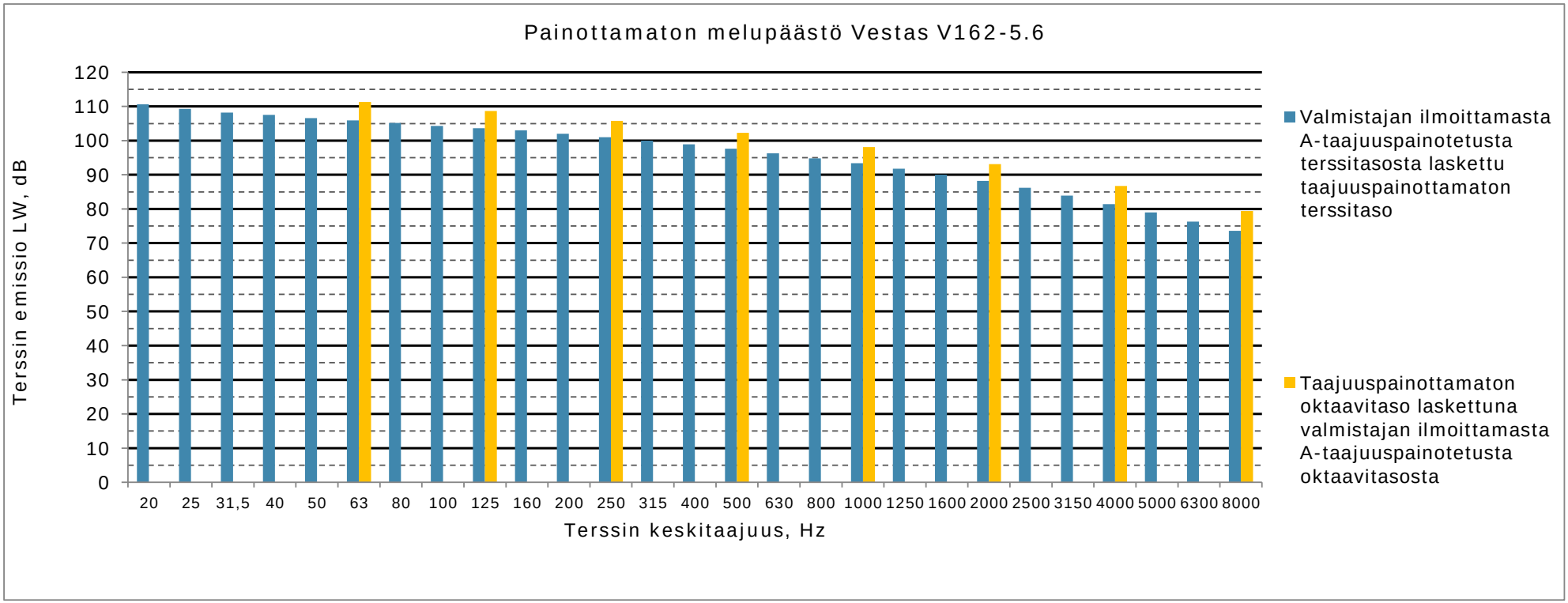

A-painotettu melupäästö SG 6.2-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

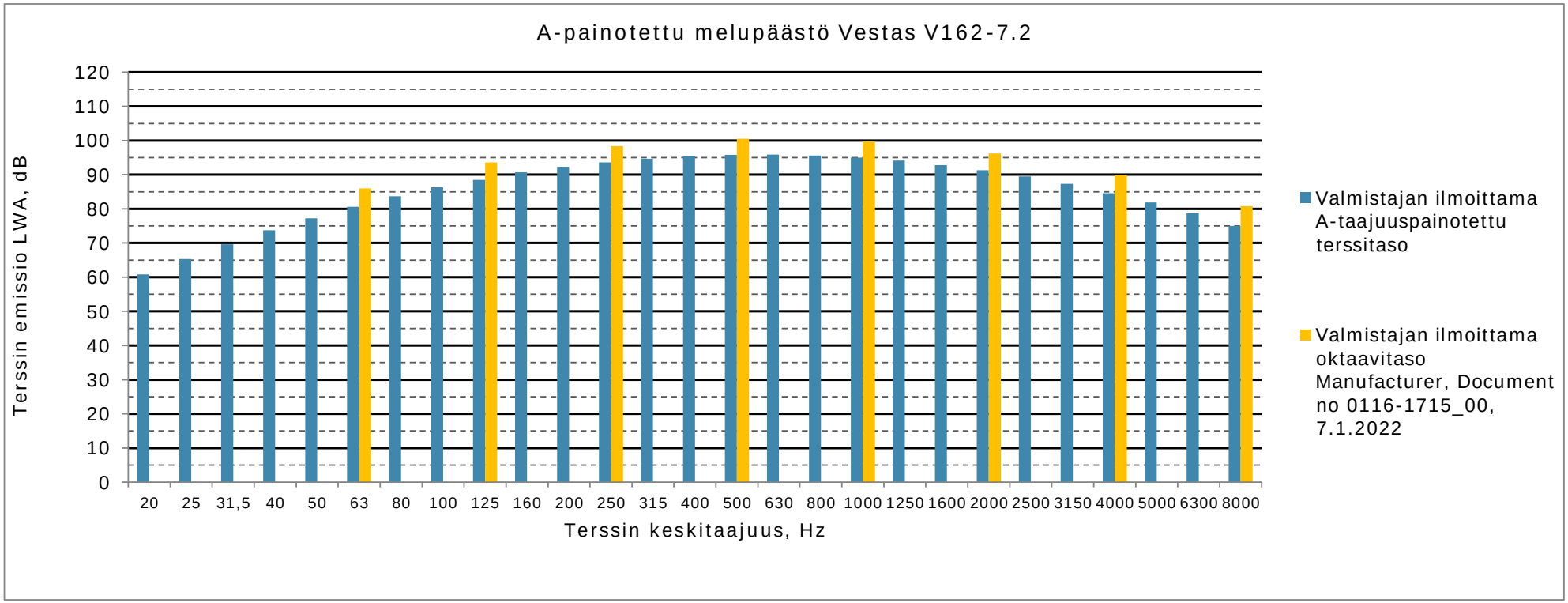

Painottamaton melupäästö SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

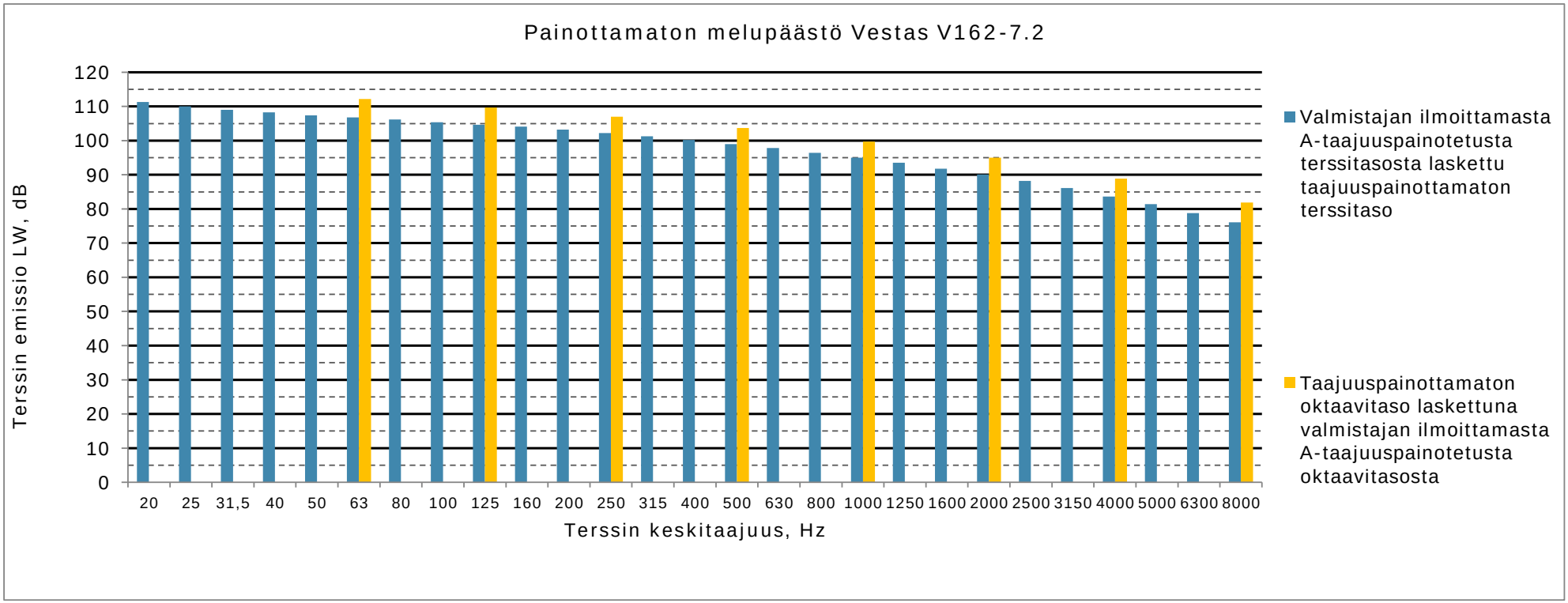

A-painotettu melupäästö Vestas V150-4.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0067-4767_06, 15.3.2018

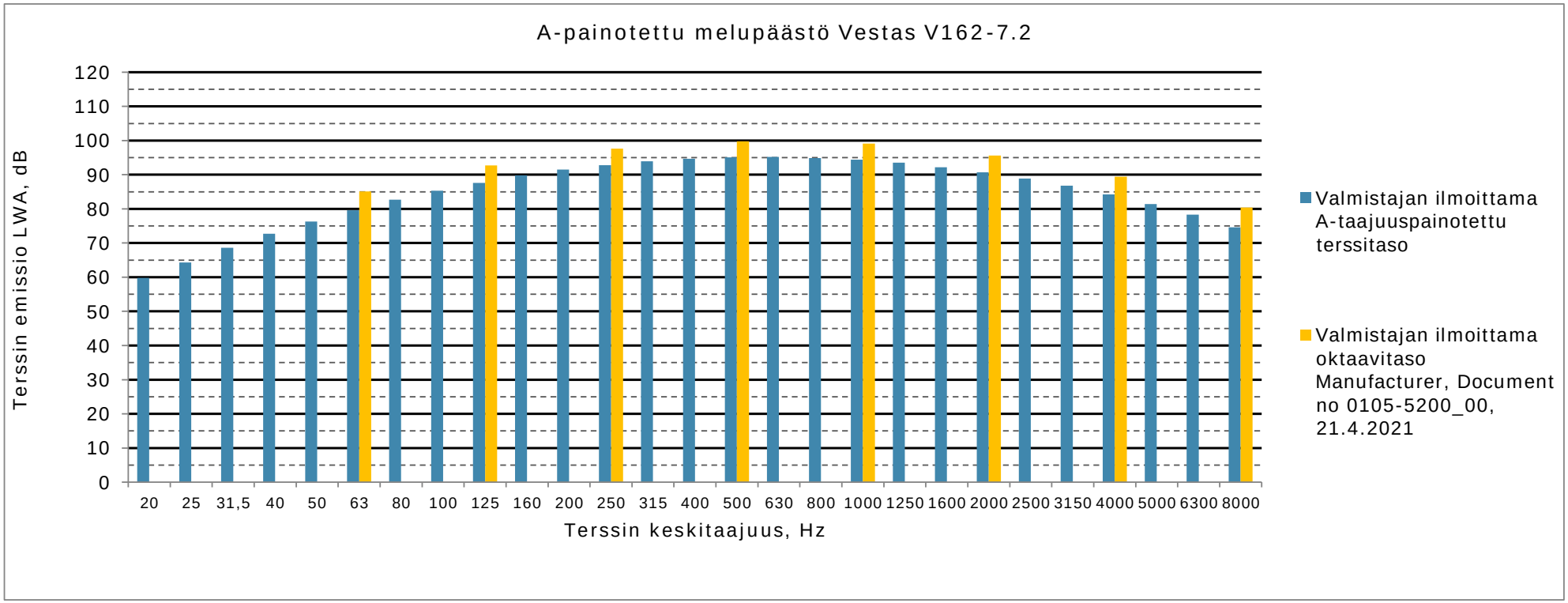

Painottamaton melupäästö Vestas V150-4.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

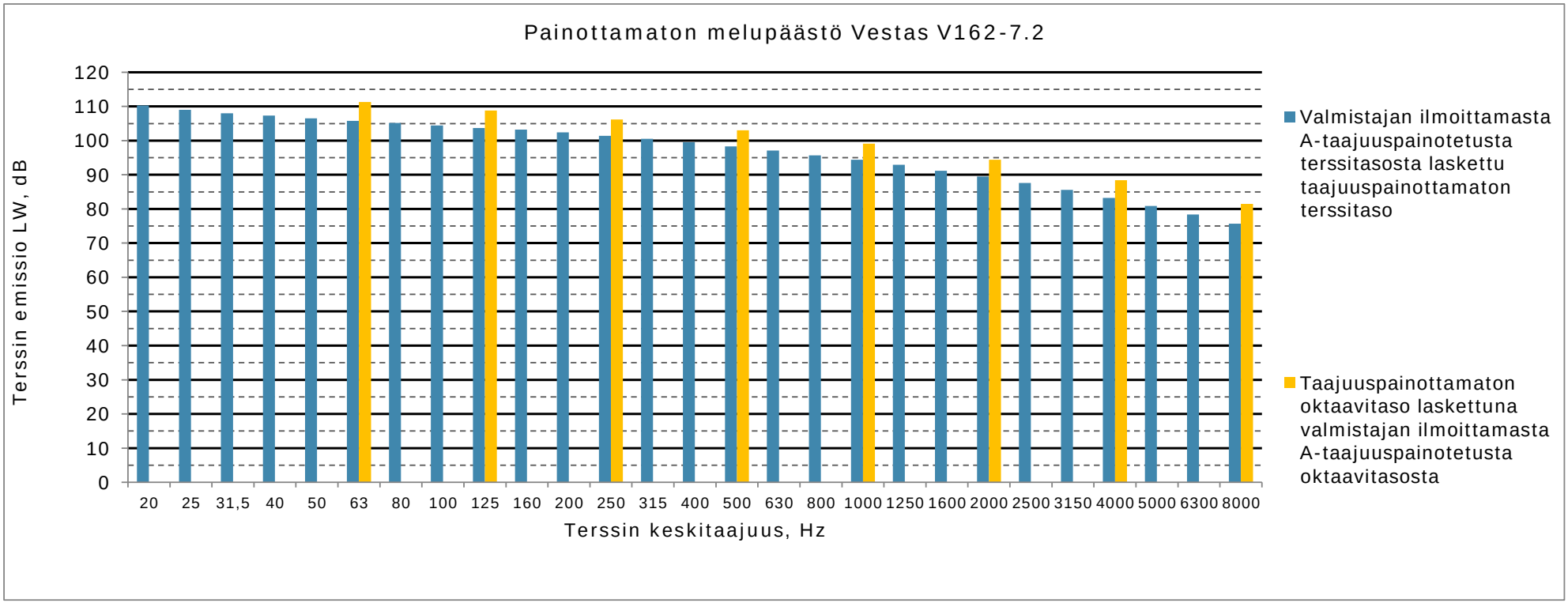

A-painotettu melupäästö Vestas V162-5.6
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0079-5298_01, 23.1.2019

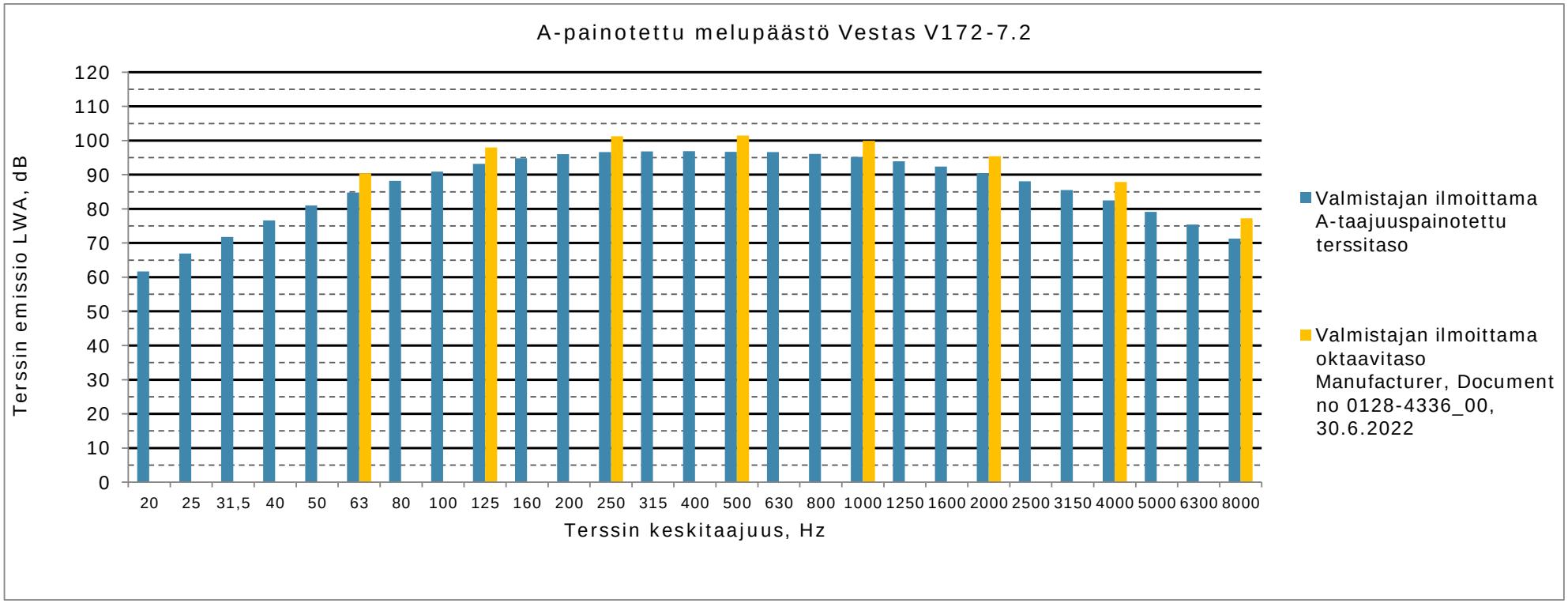

Painottamaton melupäästö Vestas V162-5.6
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

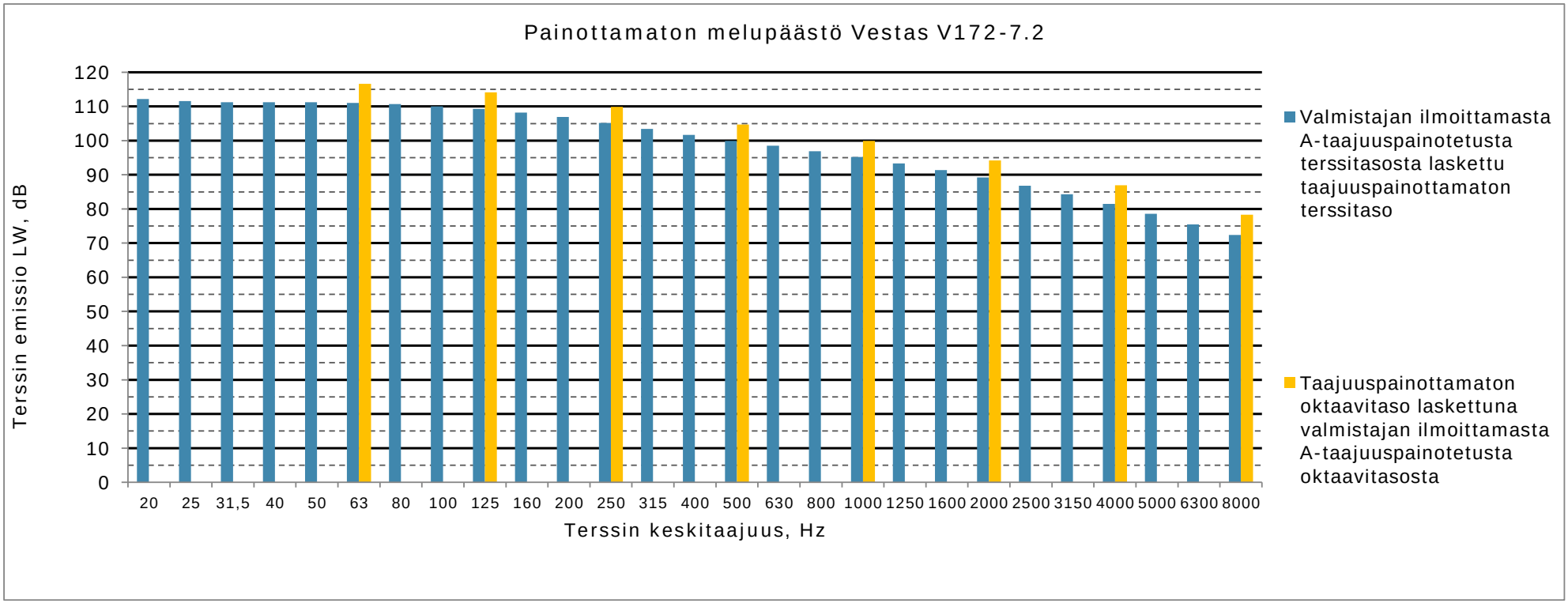

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0116-1715_00, 7.1.2022

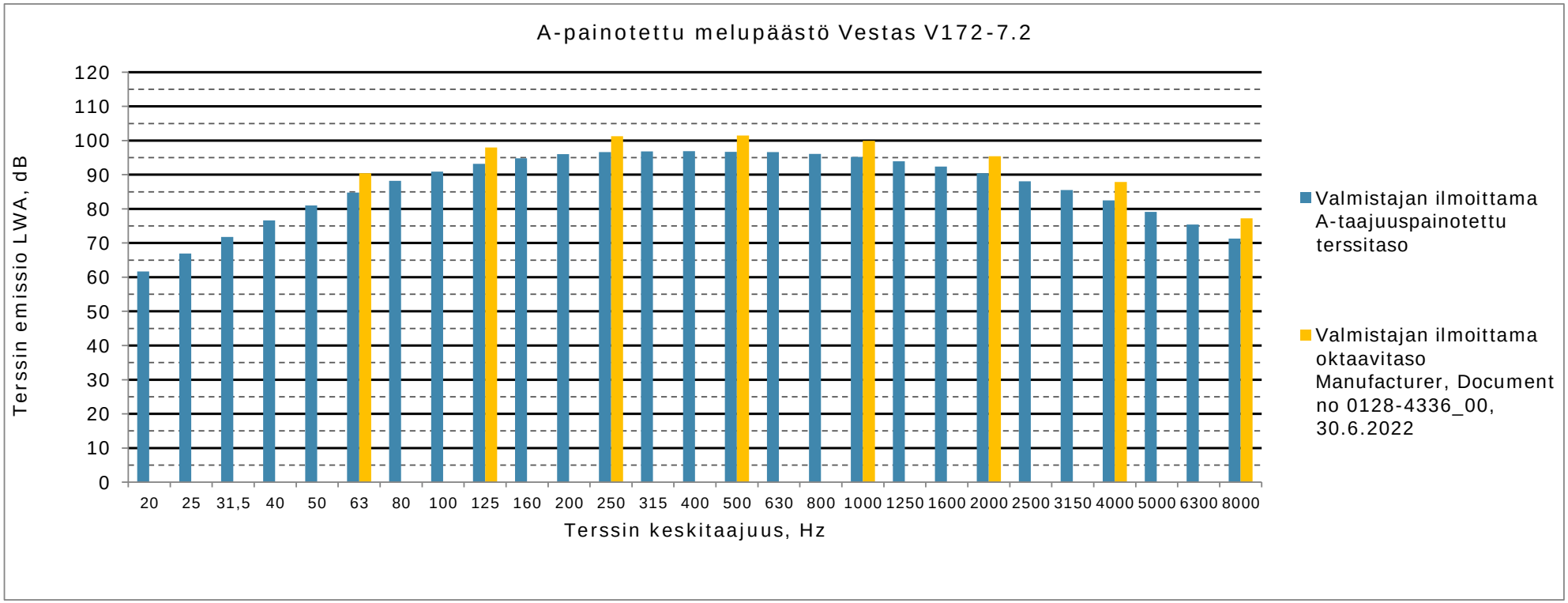

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

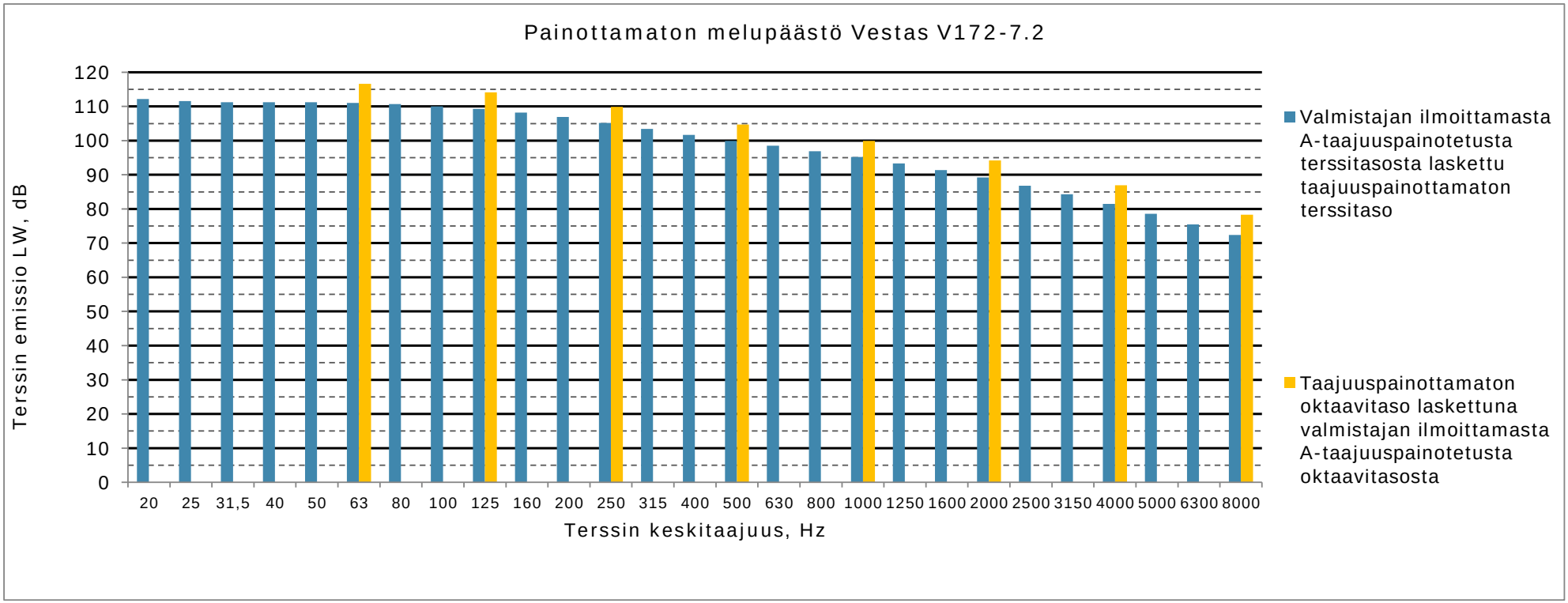

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0105-5200_00, 21.4.2021

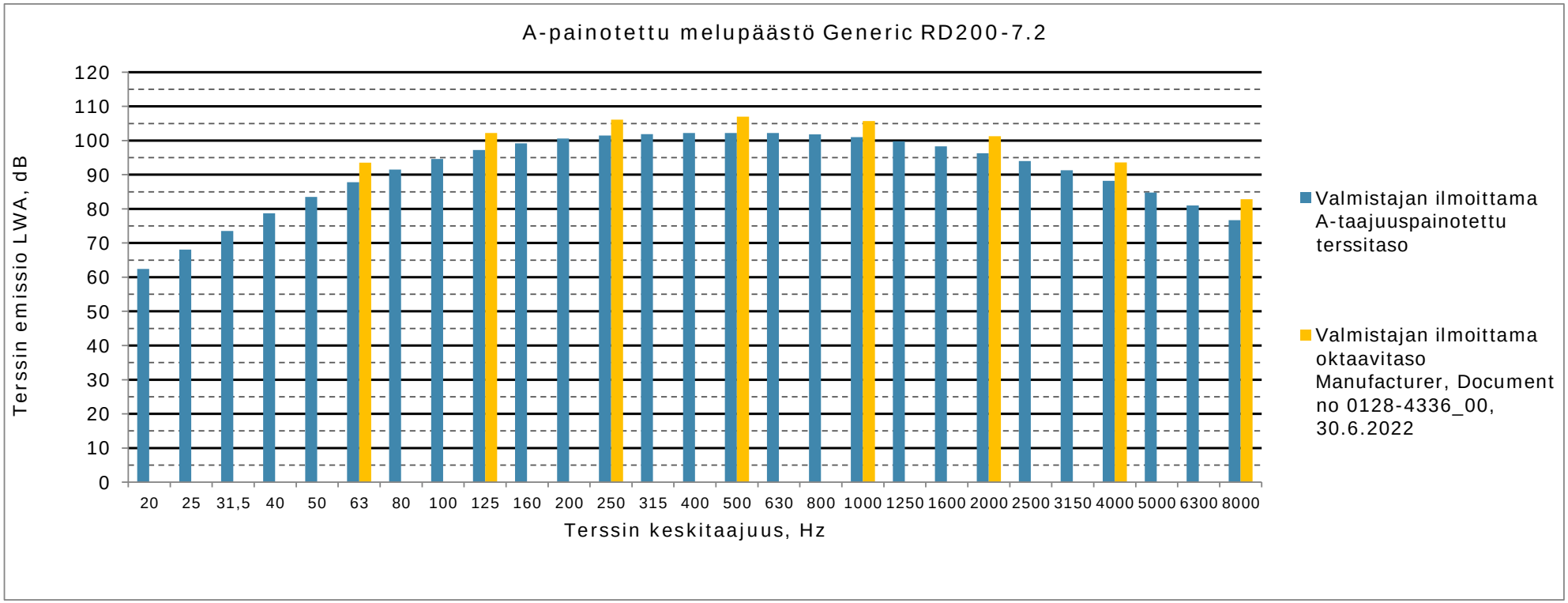

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

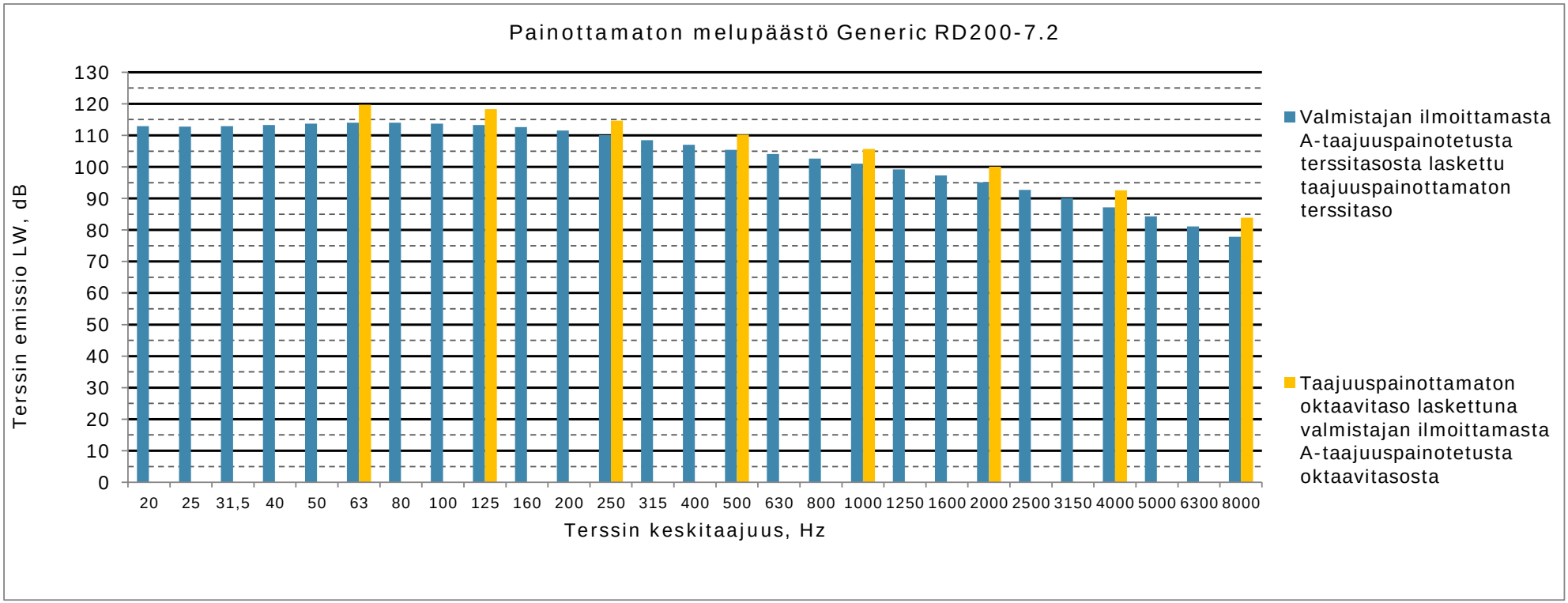

A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022

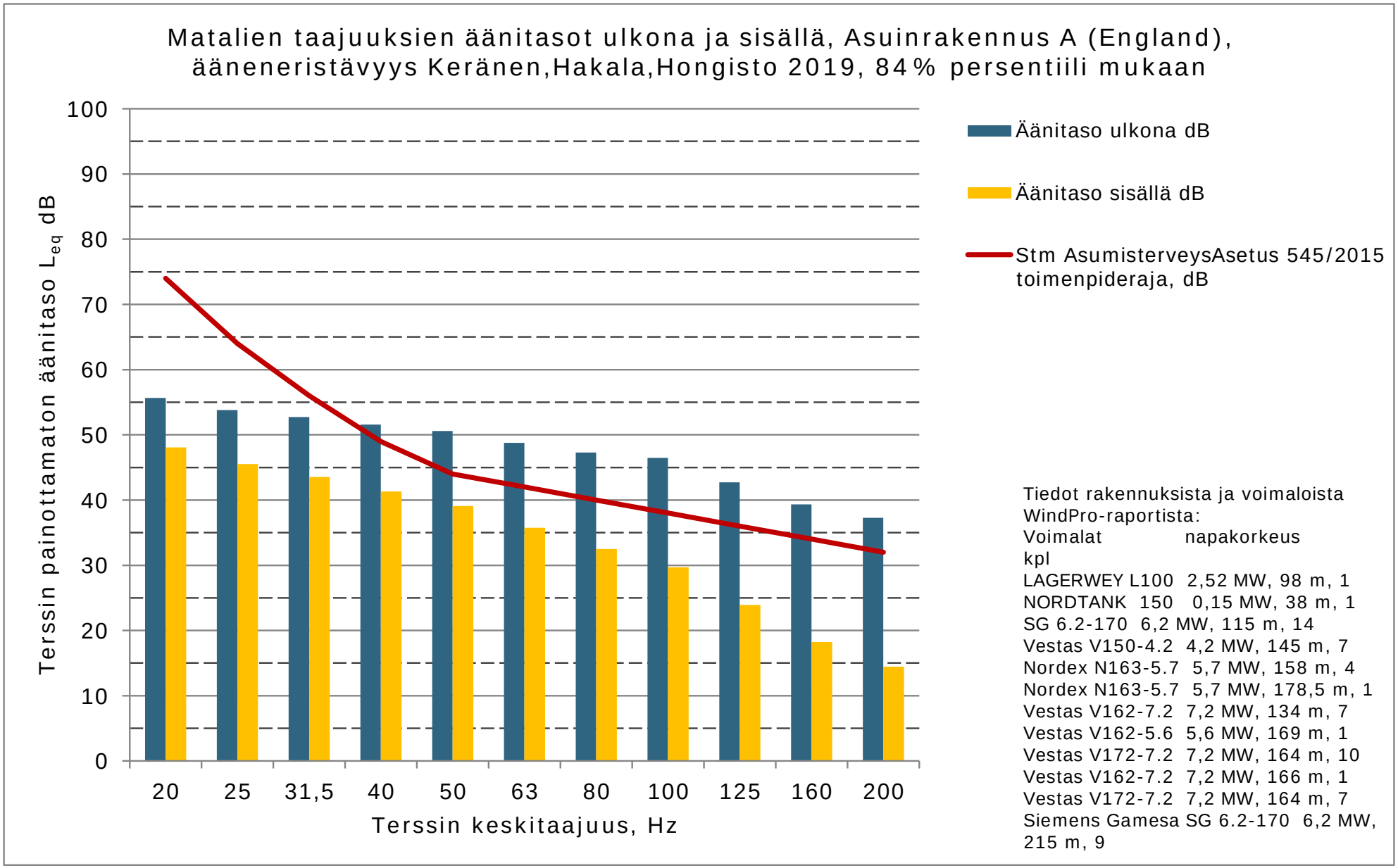

Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

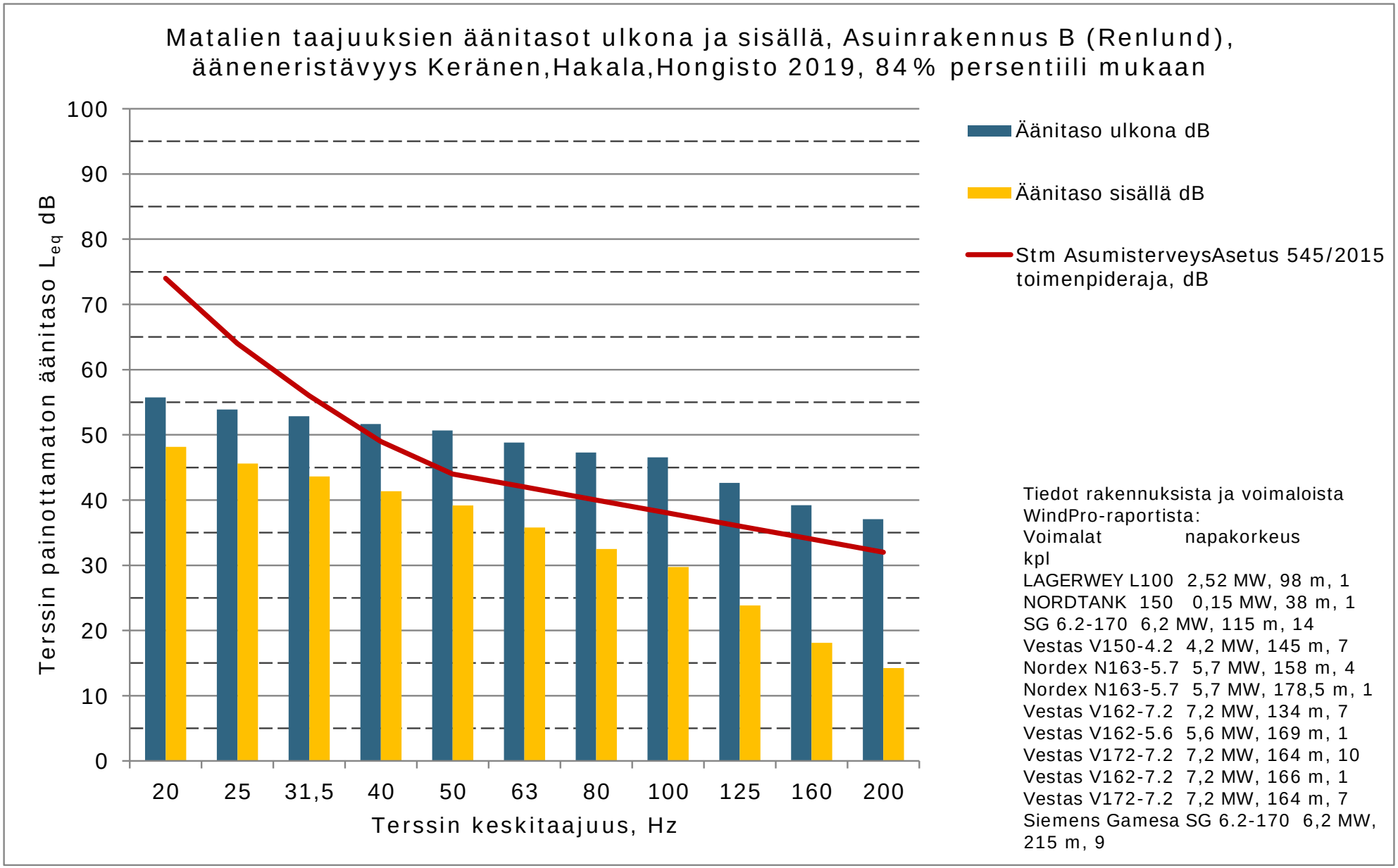

A-painotettu melupäästö Generic RD200-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Generic RD200-7.2
Terssin emissio LW, dB
130
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta



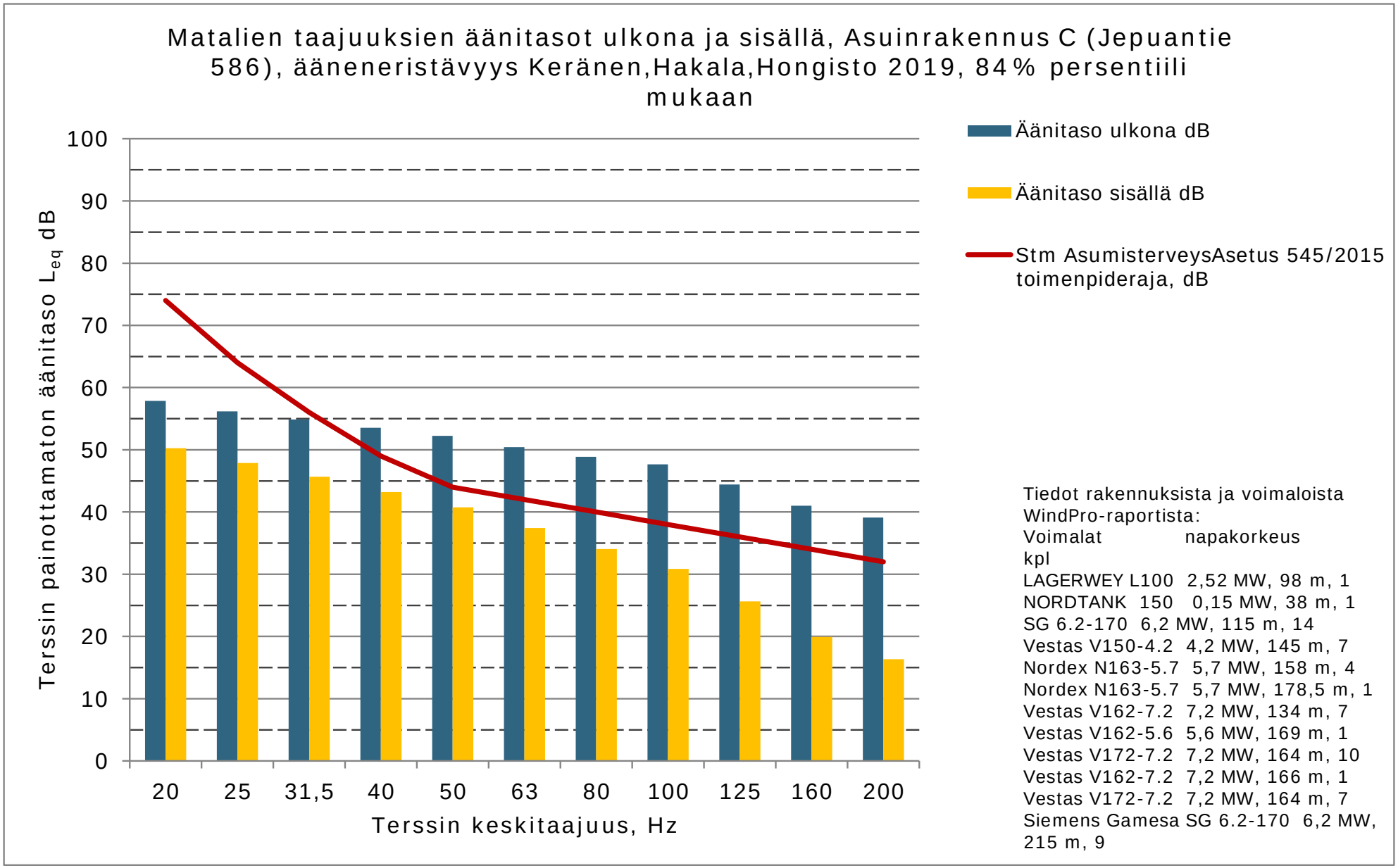
Tiedot rakennuksista ja voimaloista WindPro-raportista:

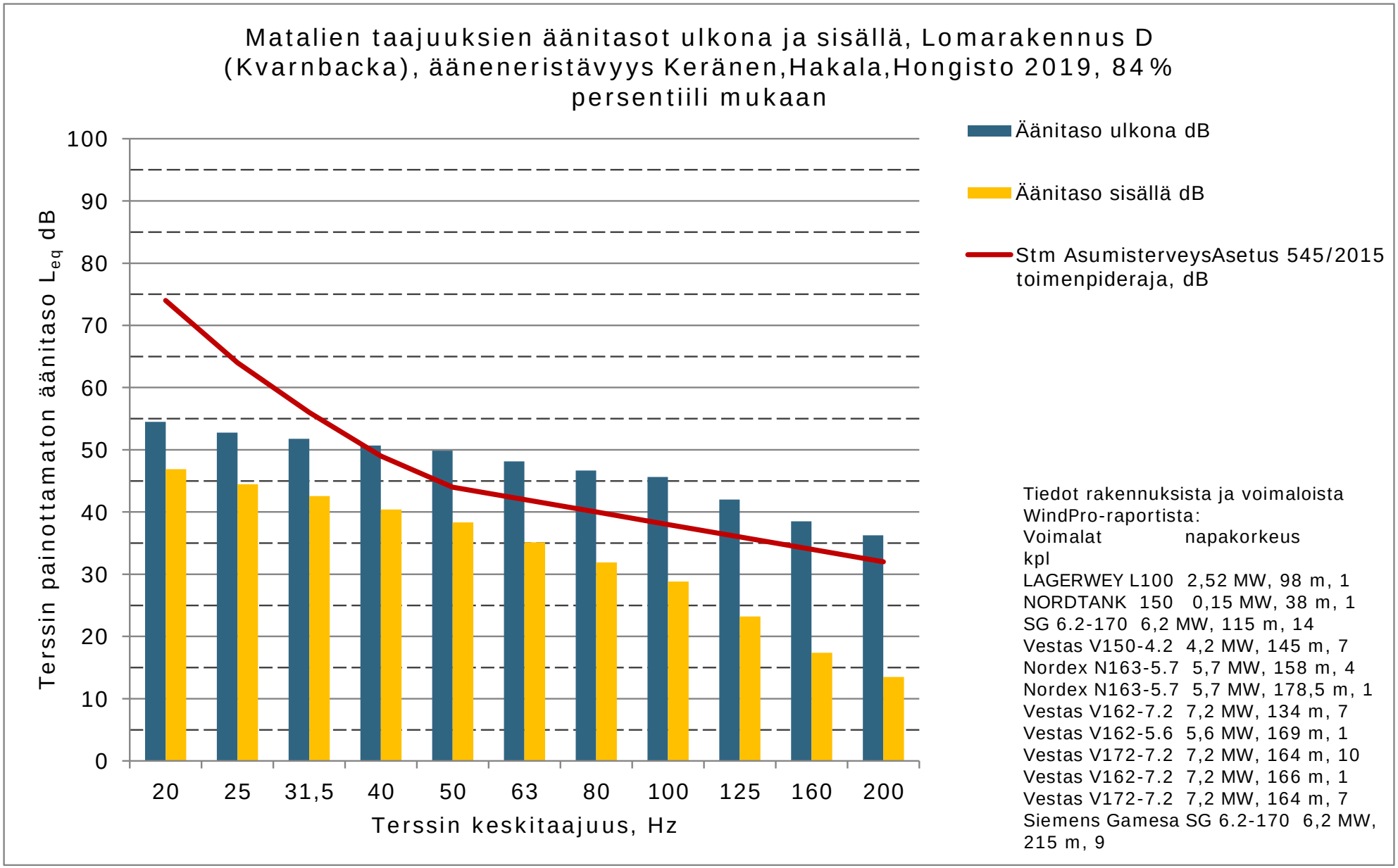
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9



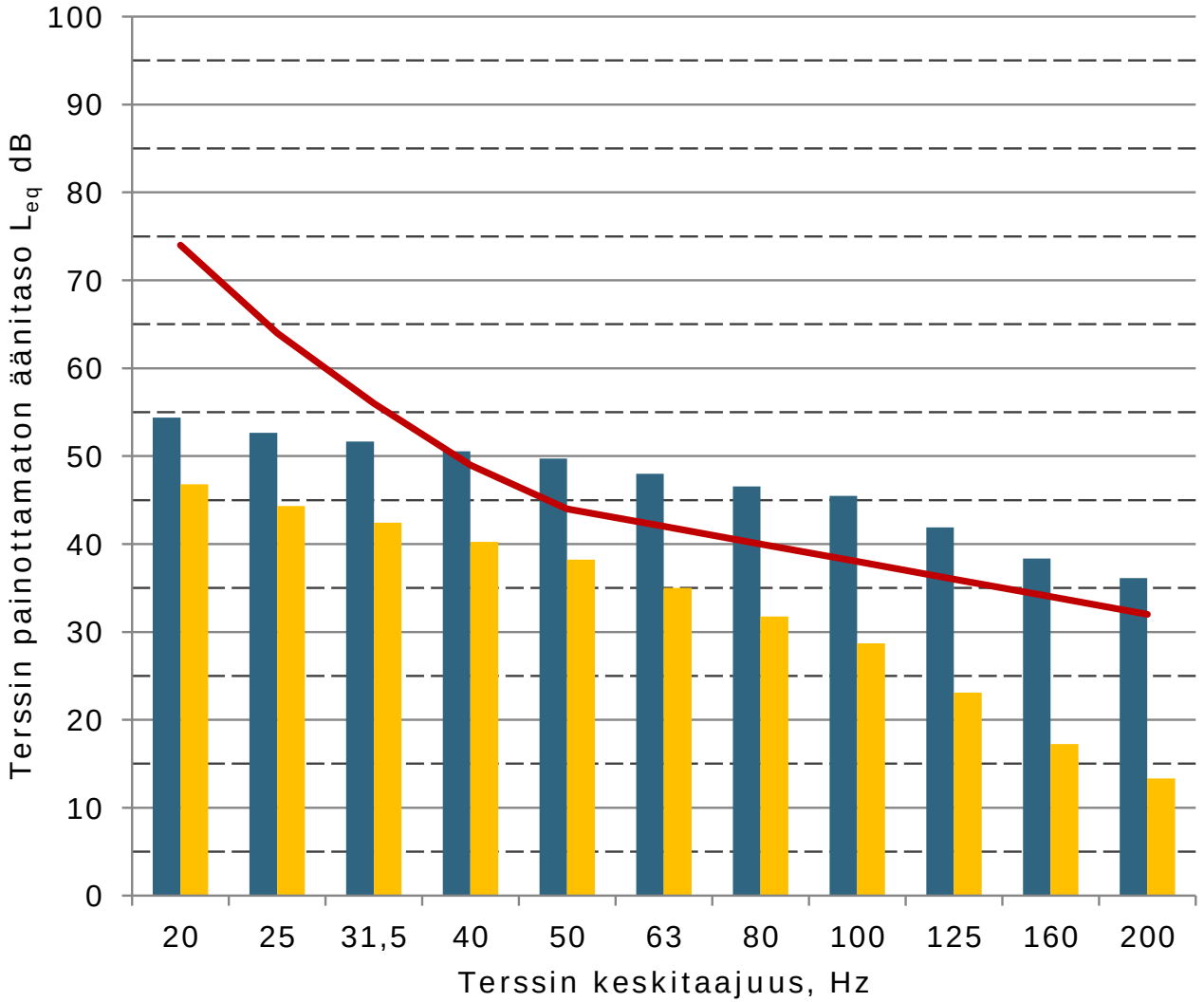
Tiedot rakennuksista ja voimaloista WindPro-raportista:

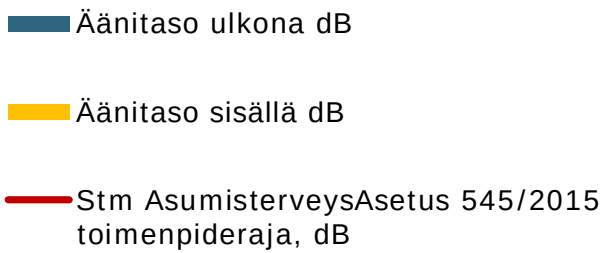
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Jepuantie 586), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D (Kvarnbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

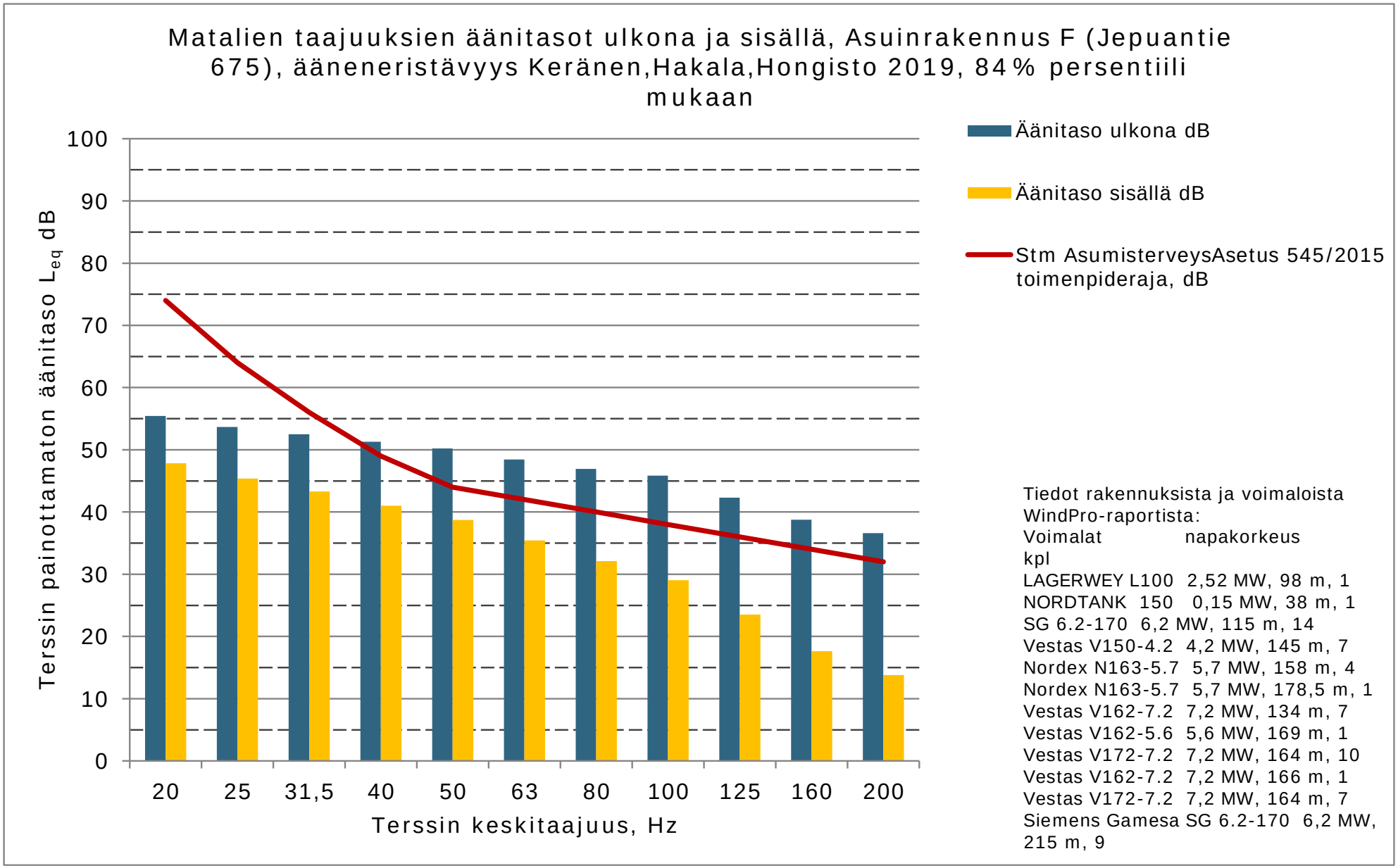
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Gullback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

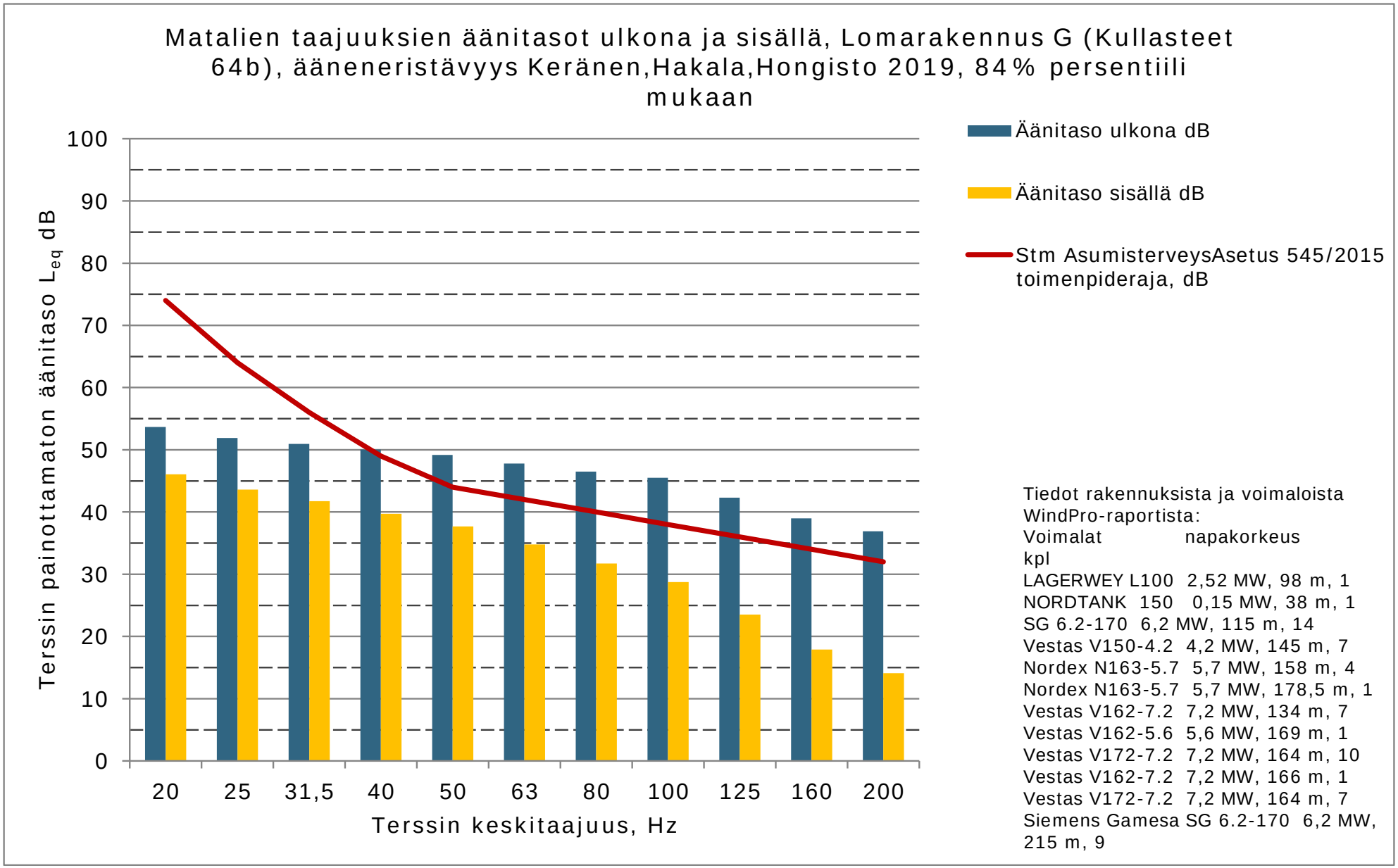


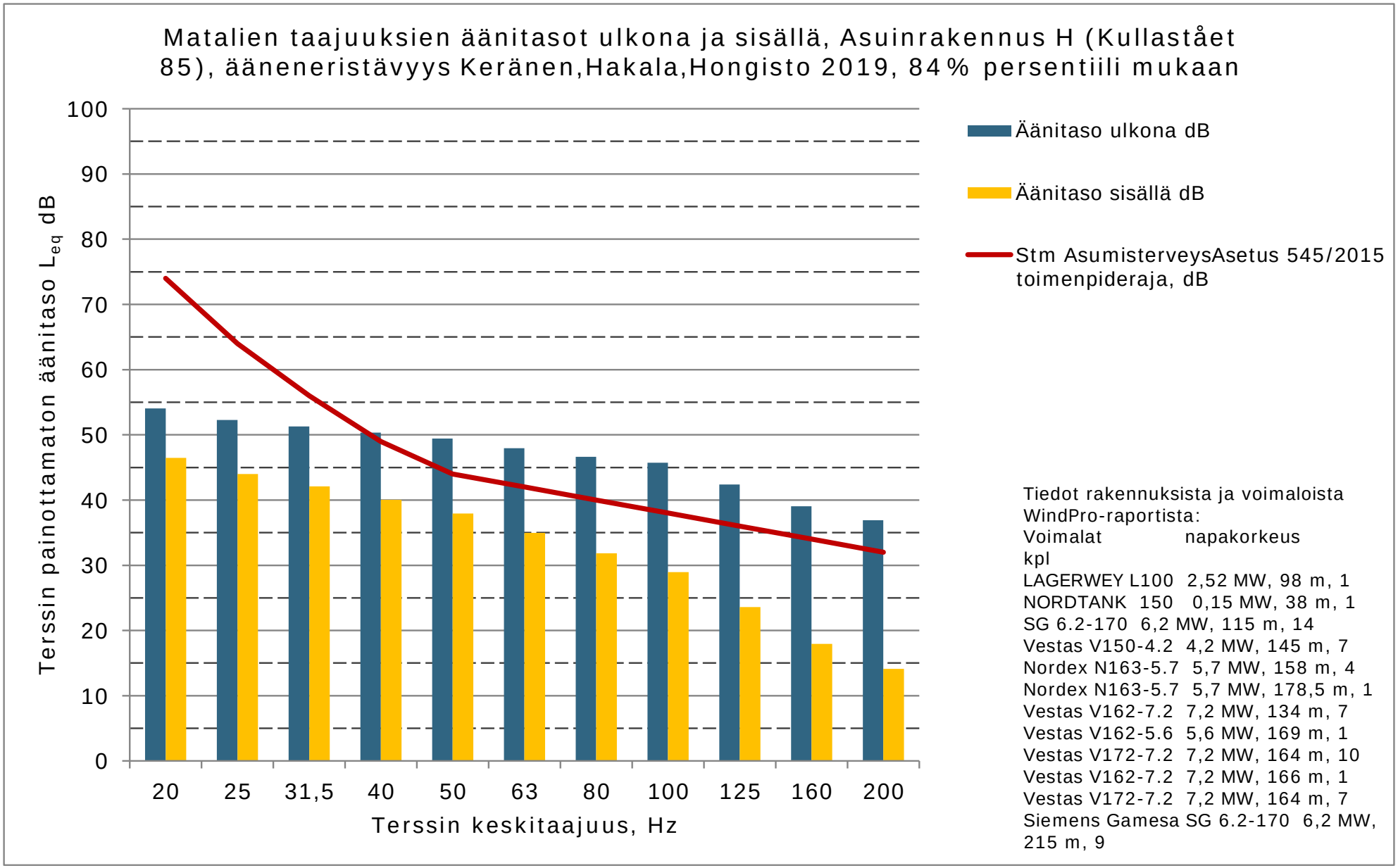


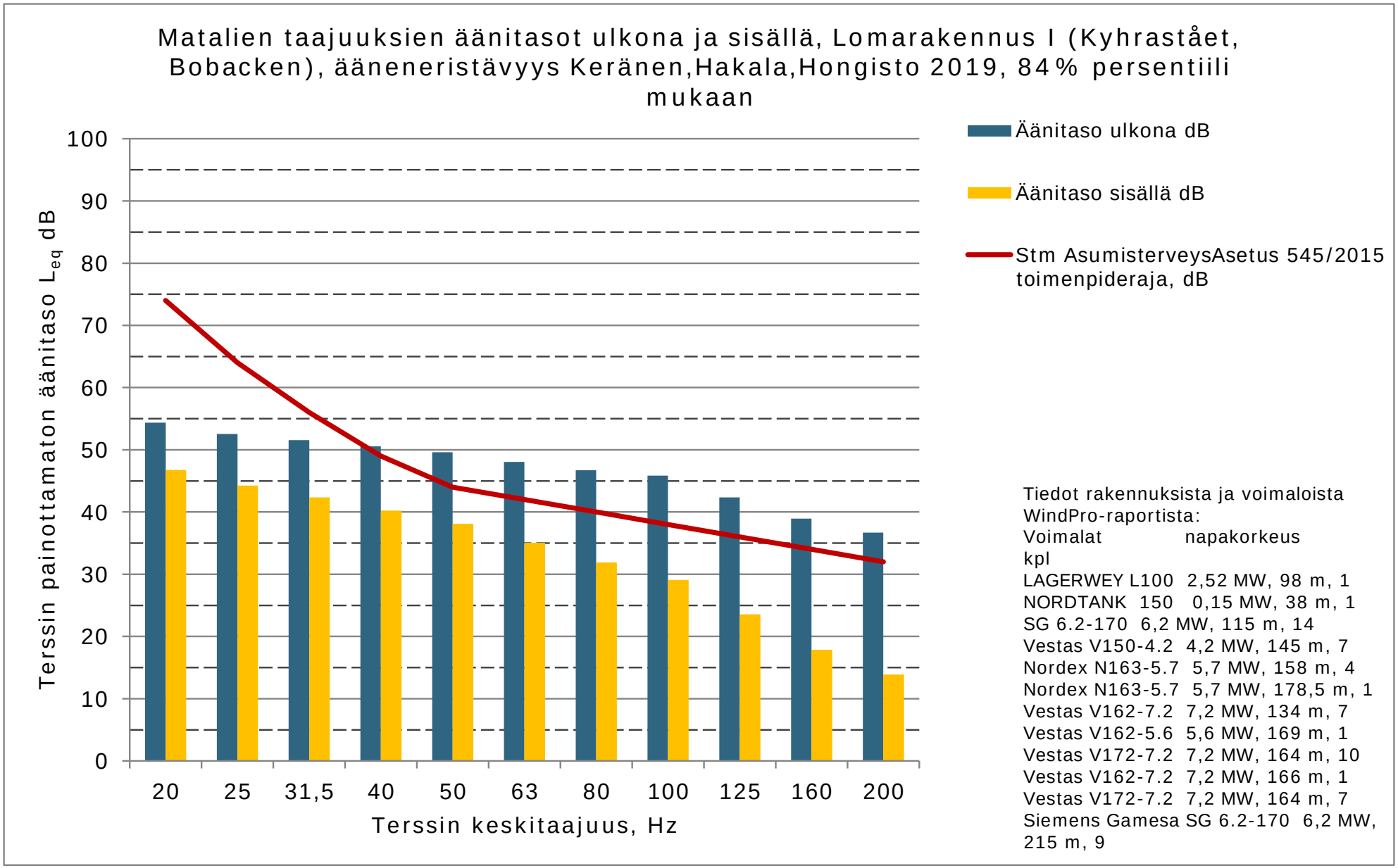
Tiedot rakennuksista ja voimaloista WindPro-raportista:

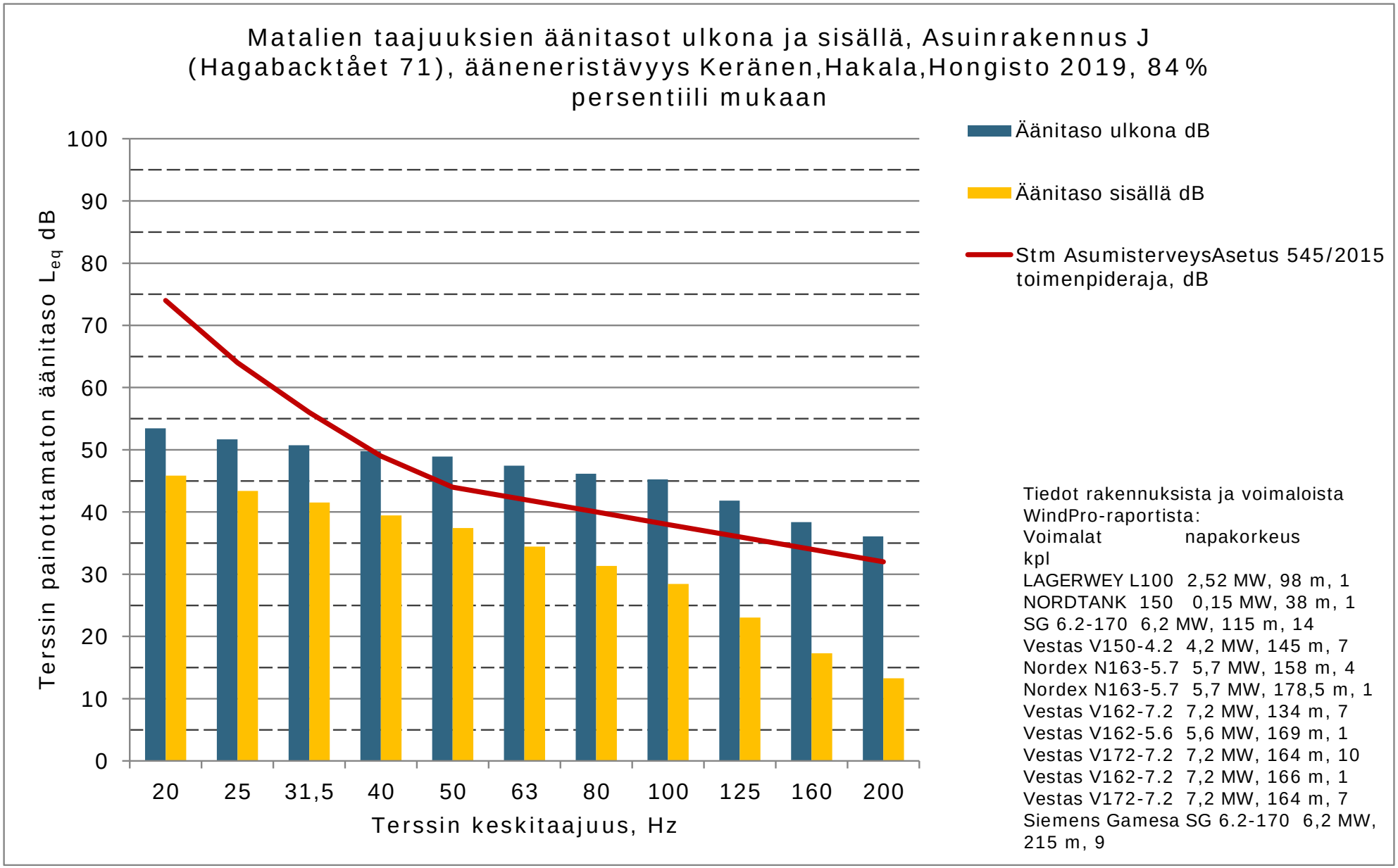
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	9

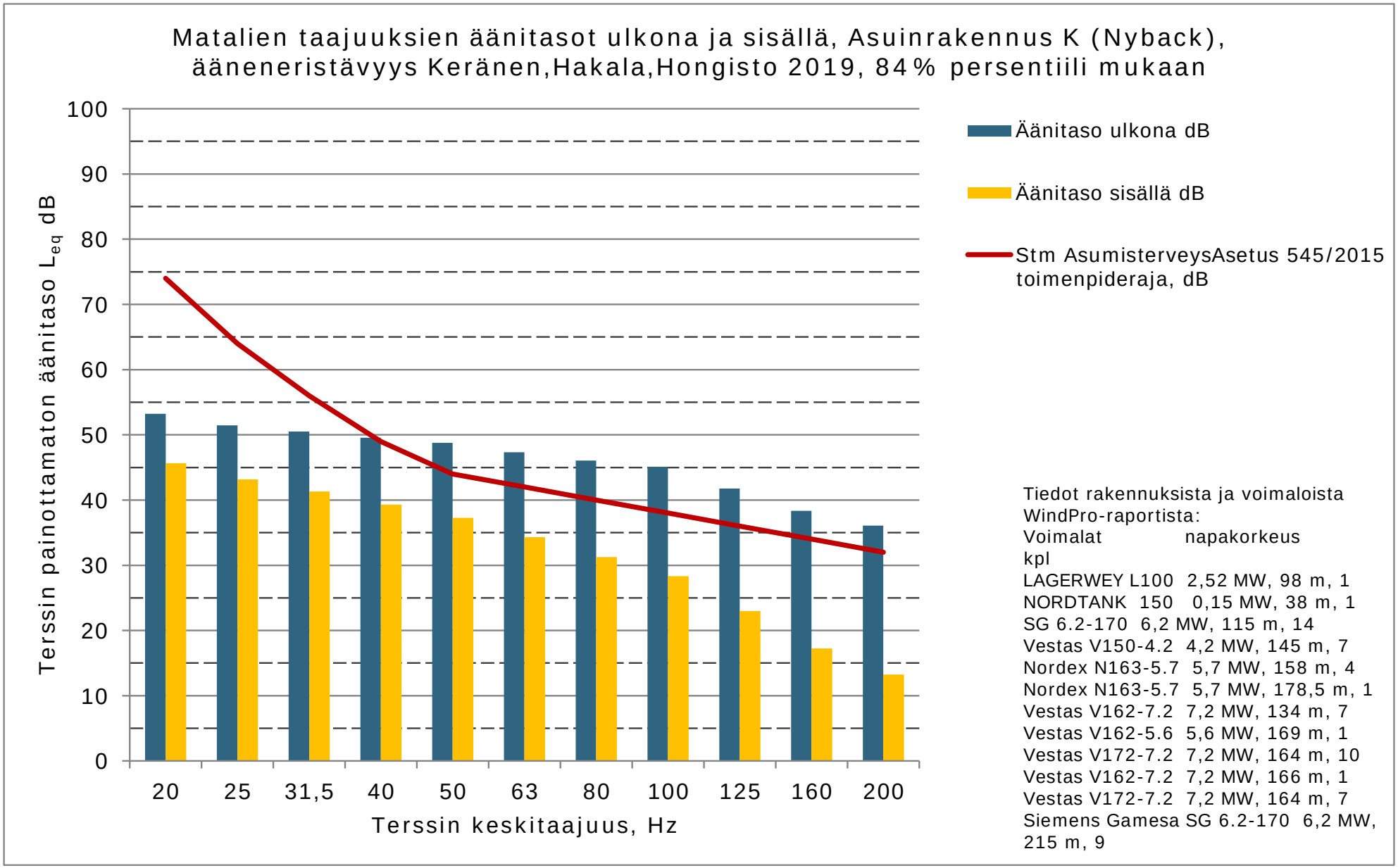

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Jepuantie 675), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

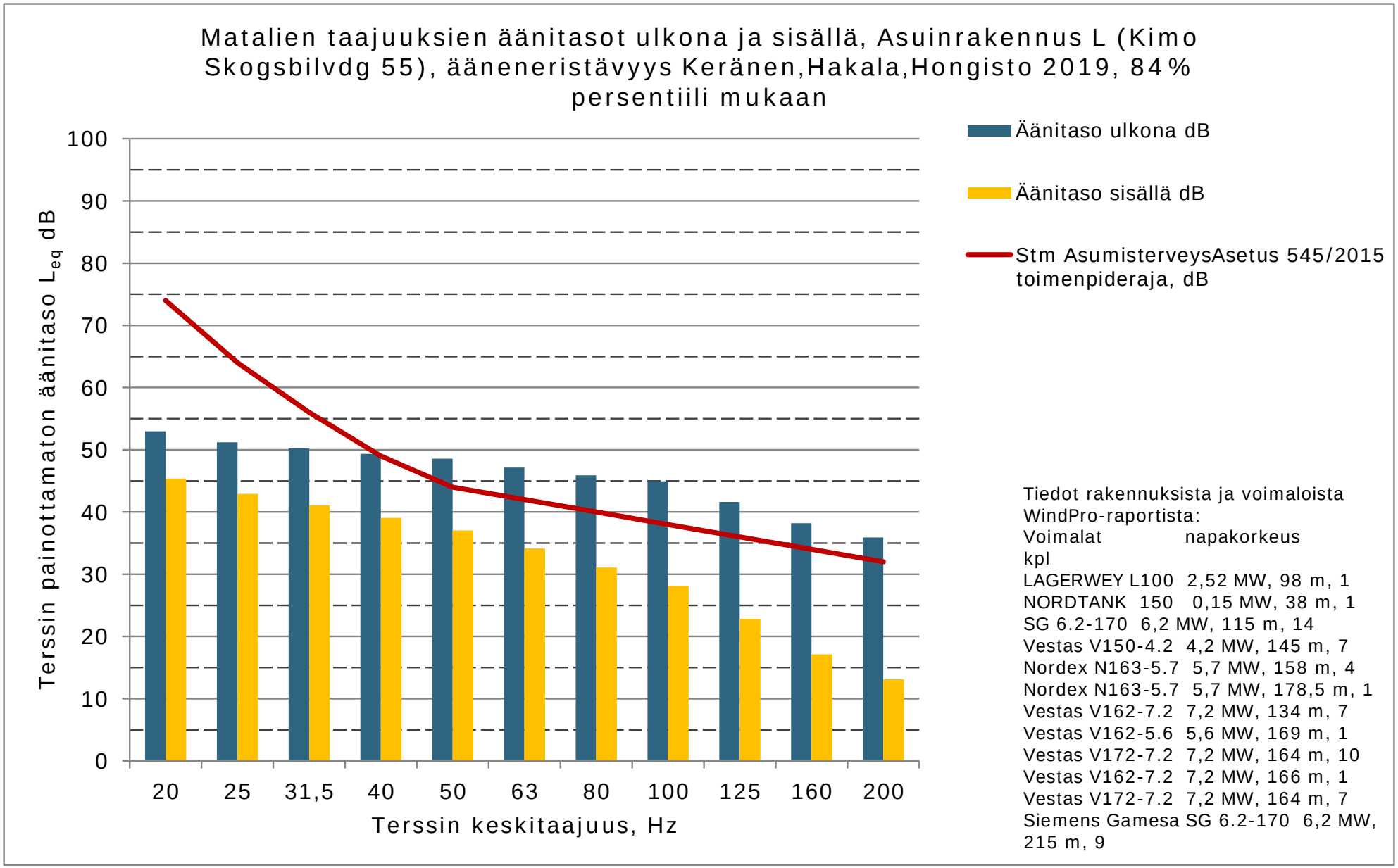

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Kullasteet 64b), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

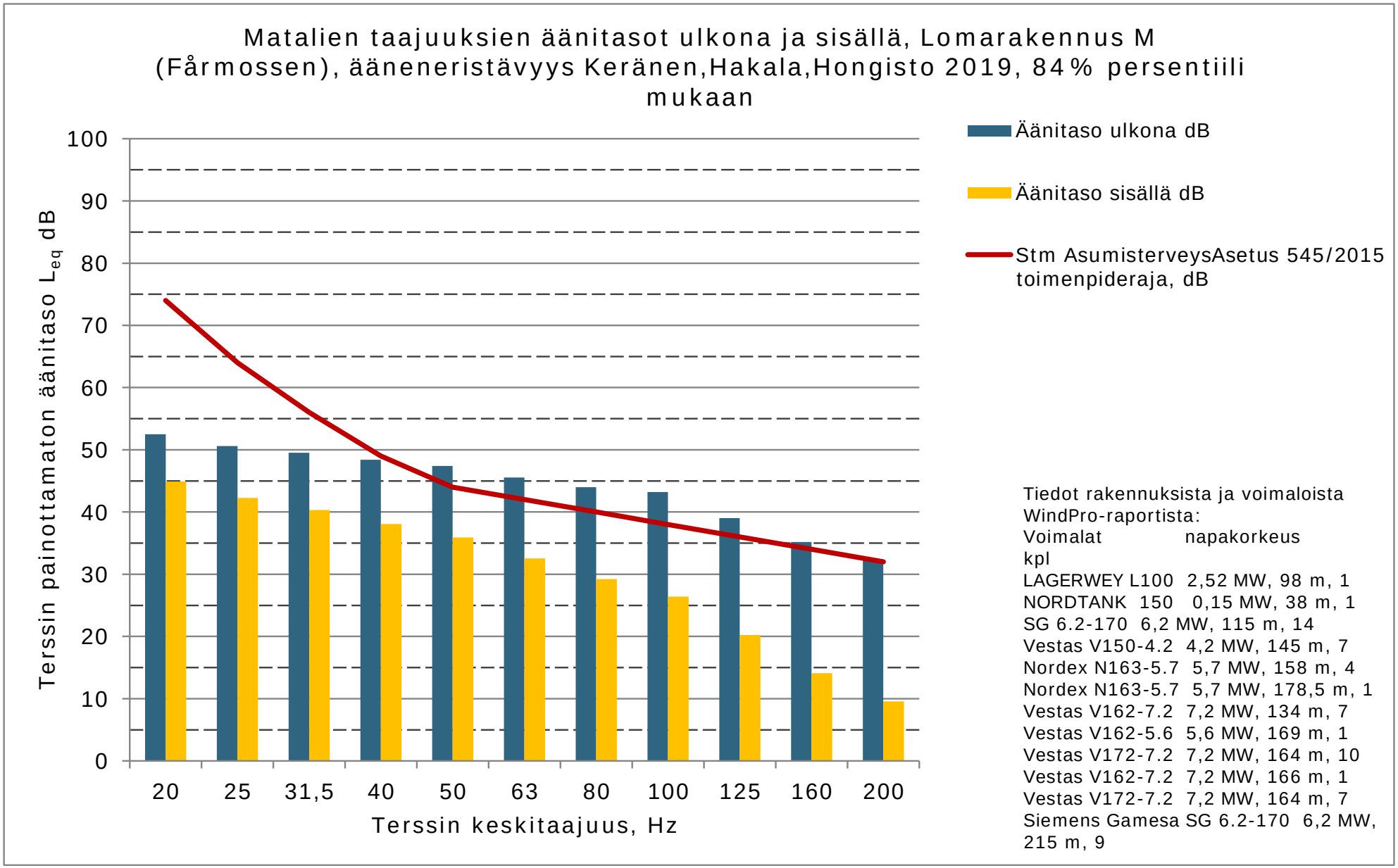

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Kullastået 85), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

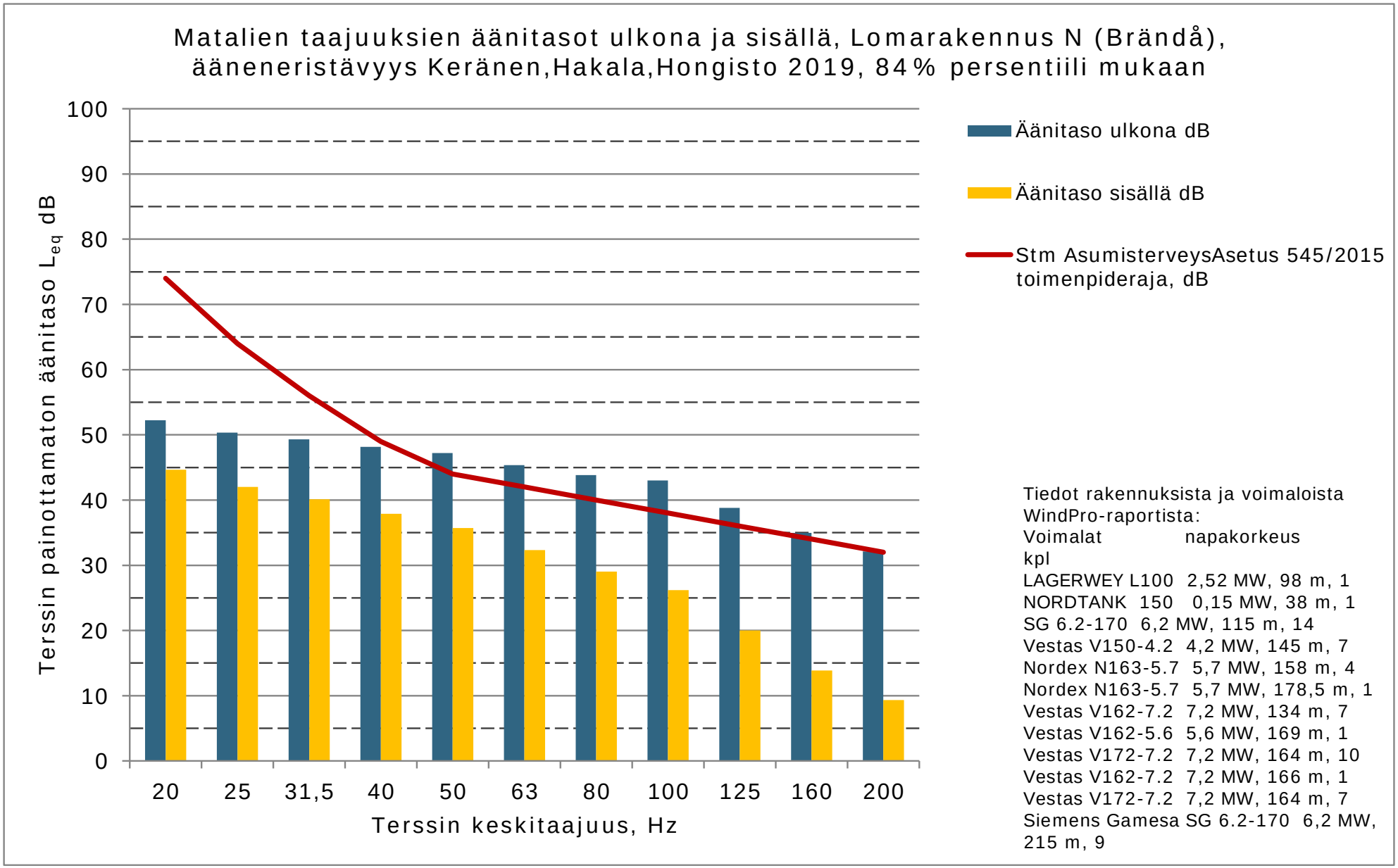

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Kyhrastået, Bobacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Hagabacktået 71), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

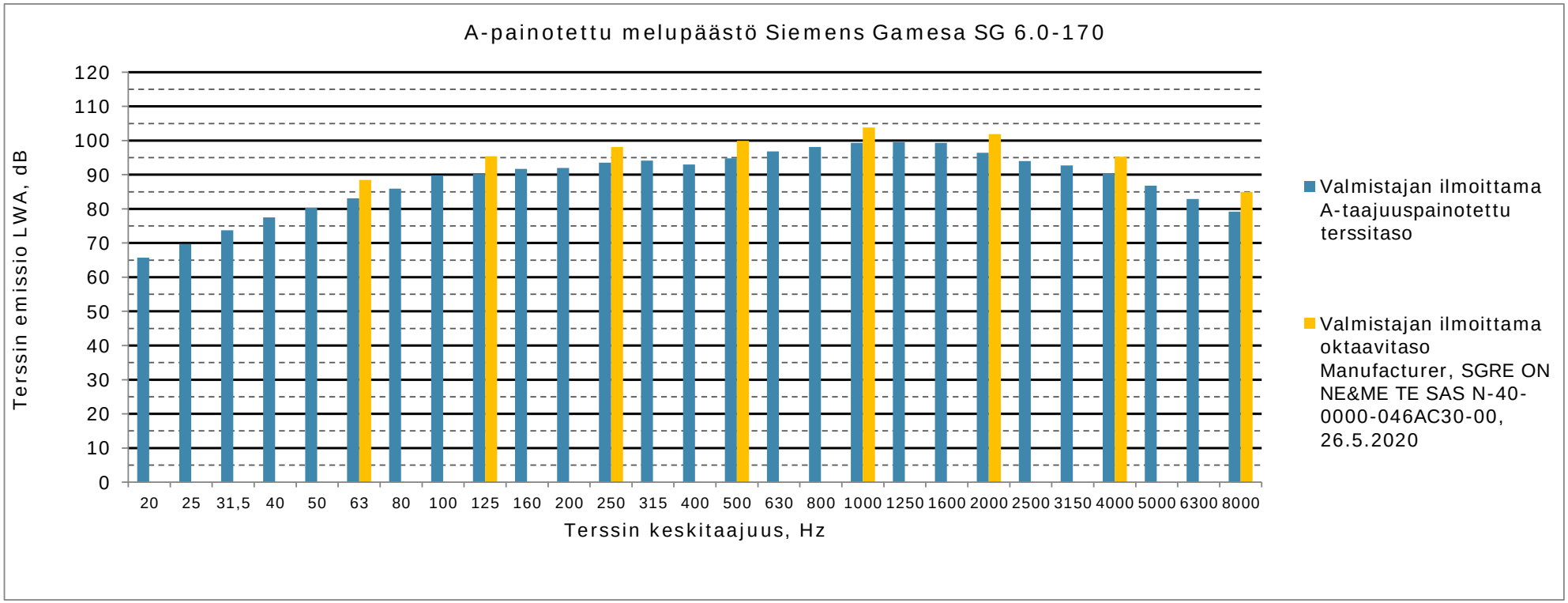

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Nyback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

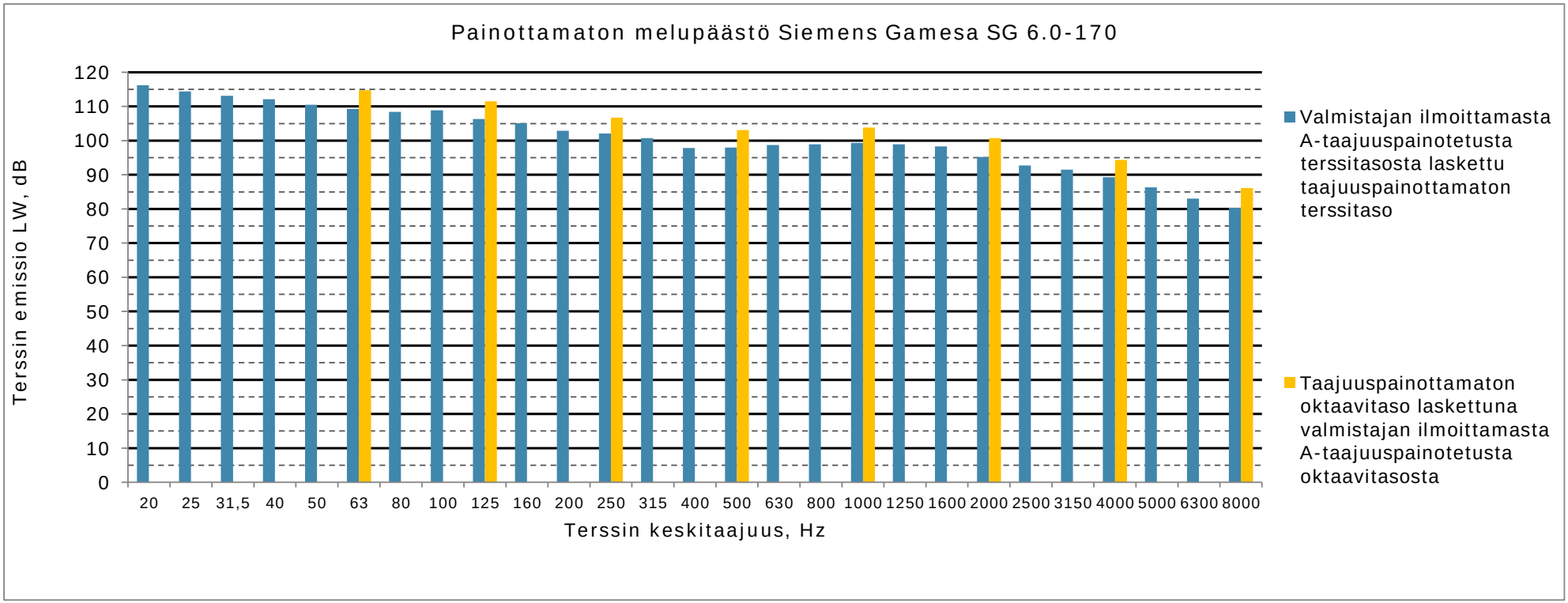

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Kimo Skogsbilvdg 55), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

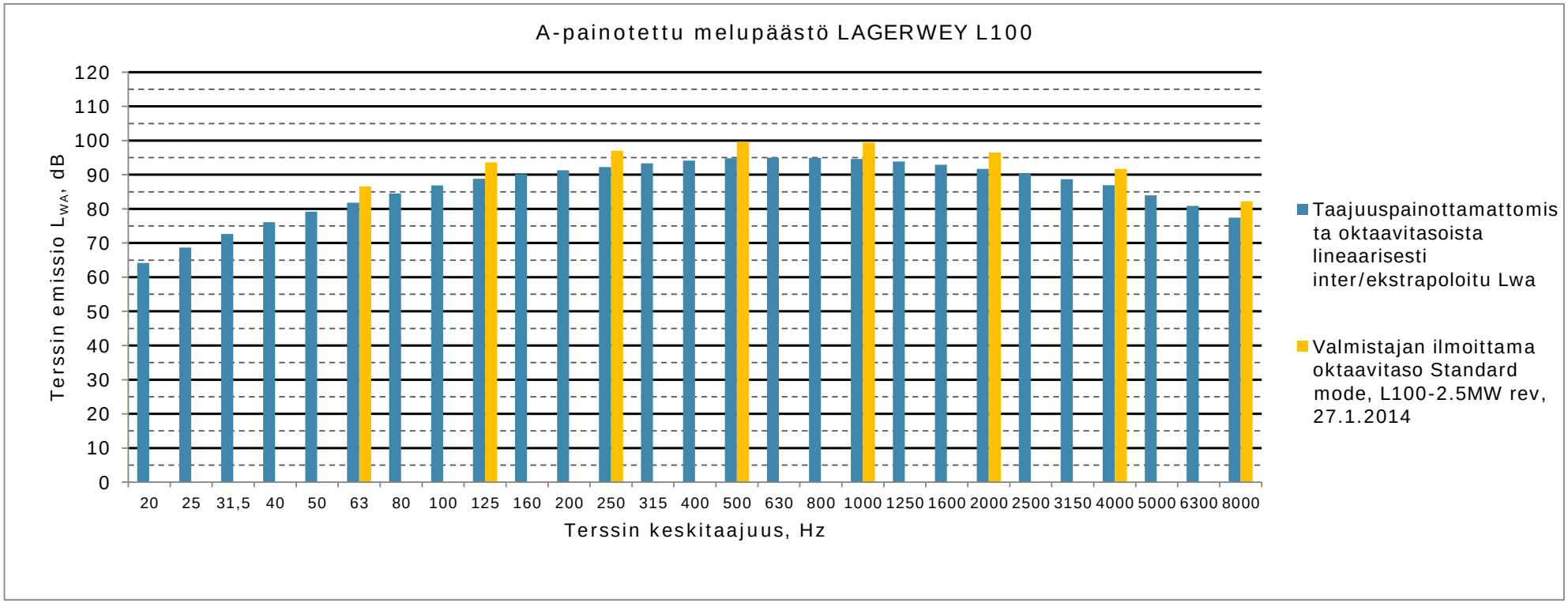

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus M (Fårmossen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

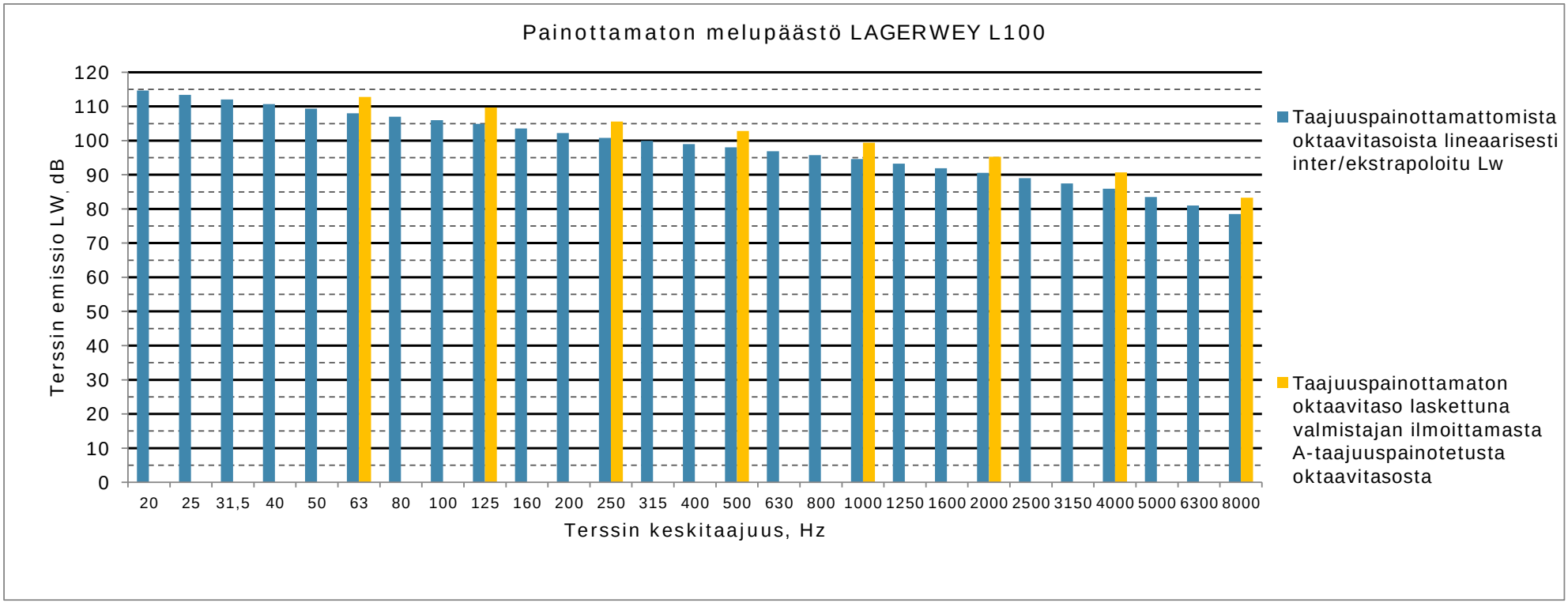

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Brändå), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 9

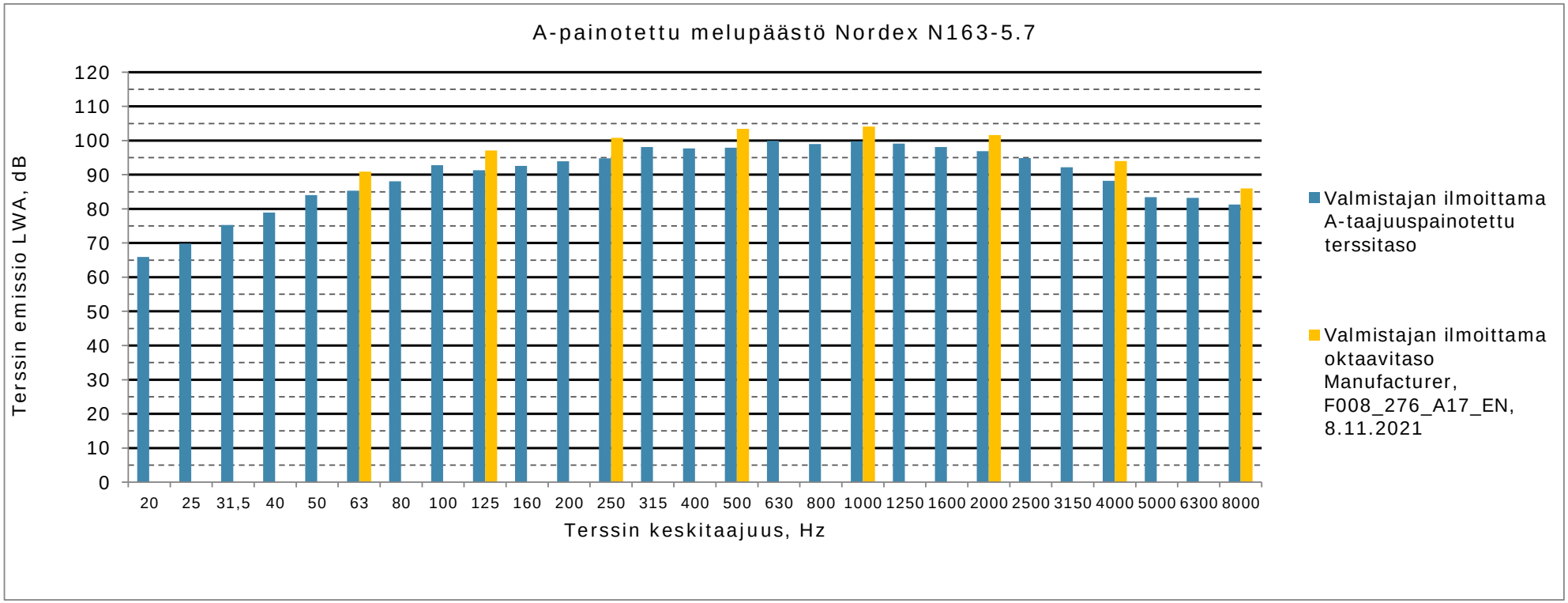
Bilaga 16. Värden för sammantaget buller vid olika byggnader - Projektalternativ 2 (ALT2).

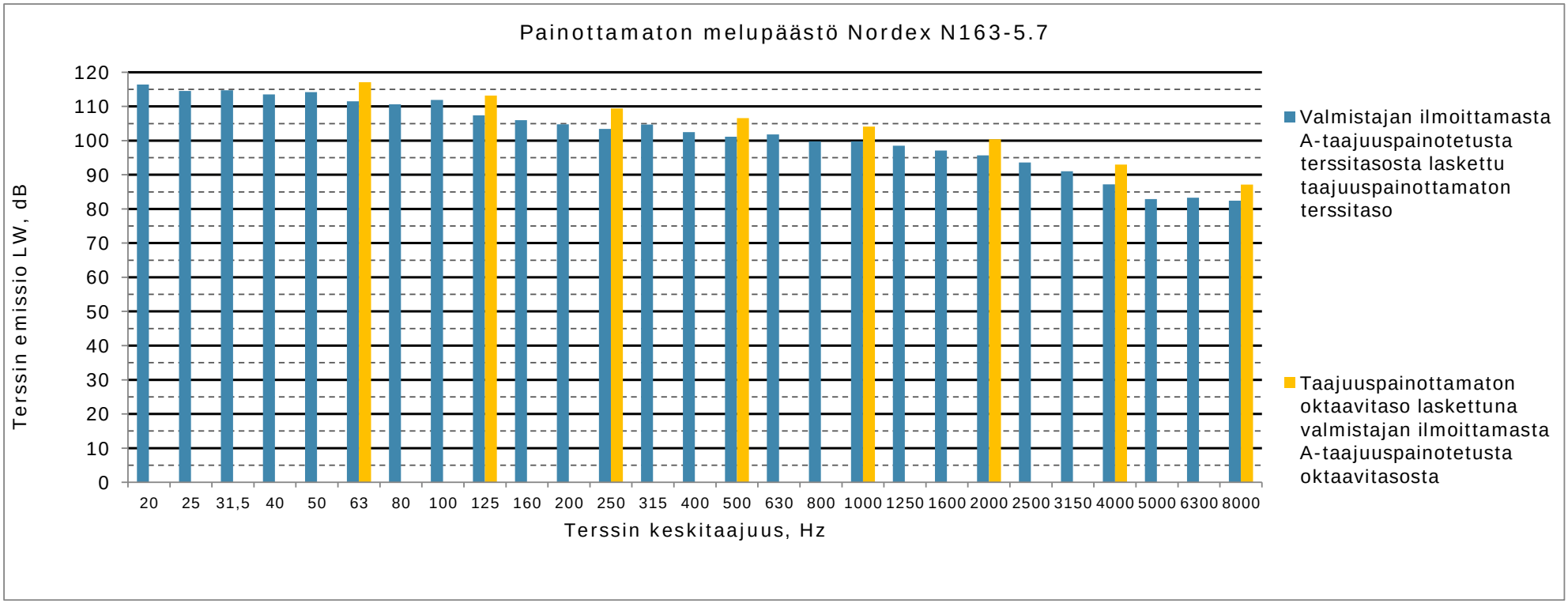

A-painotettu melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

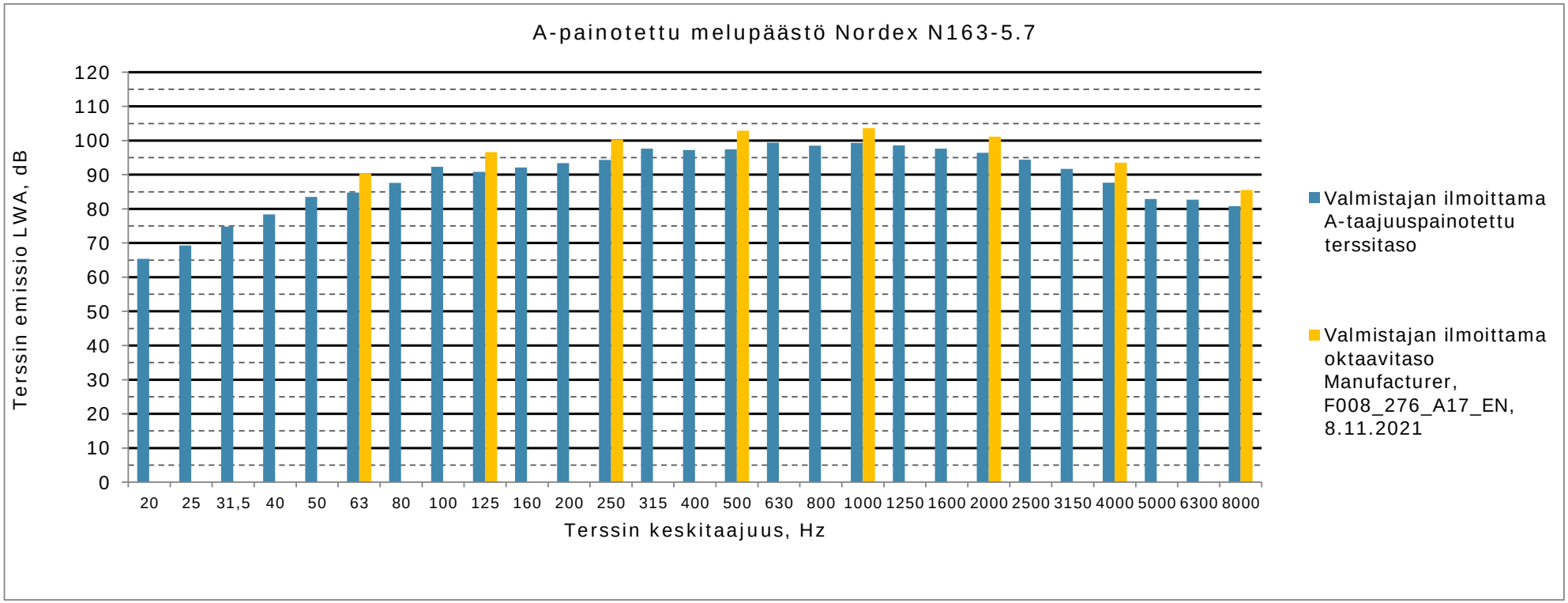

Painottamaton melupäästö Siemens Gamesa SG 6.0-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

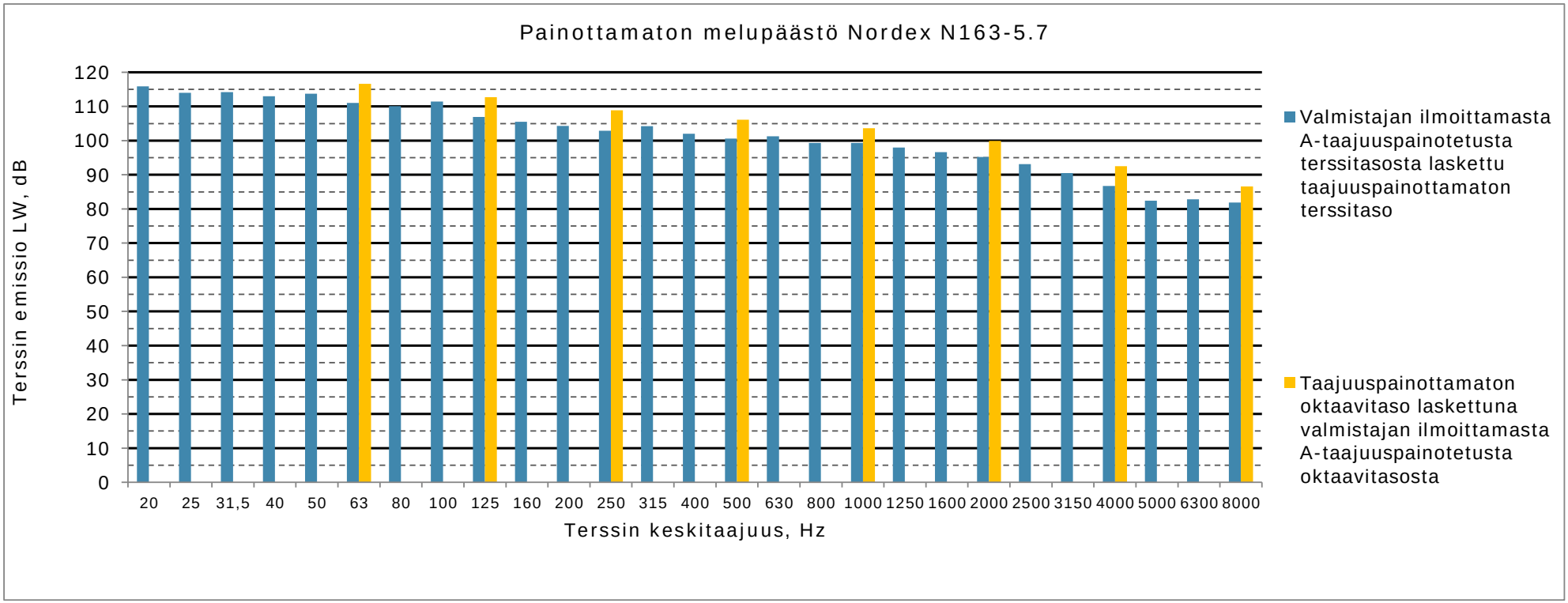

A-painotettu melupäästö LAGERWEY L100
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Standard mode, L100-2.5MW rev, 27.1.2014

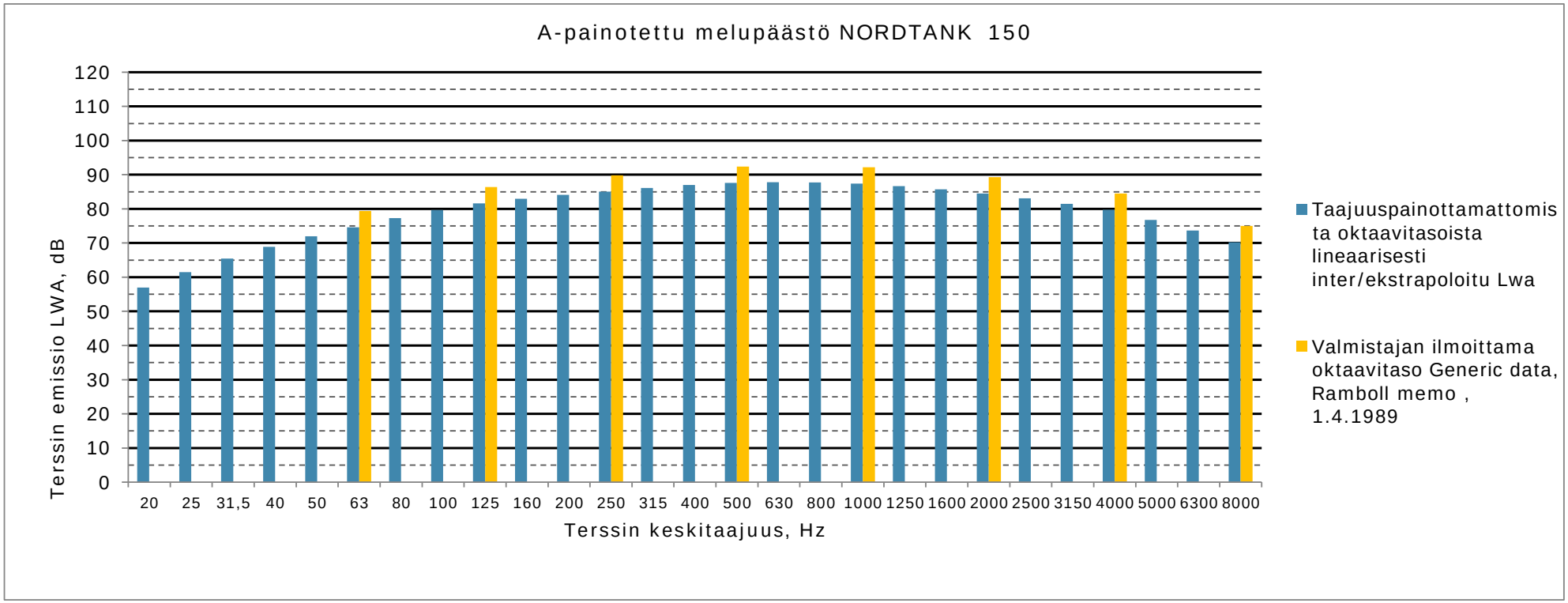

Painottamaton melupäästö LAGERWEY L100
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

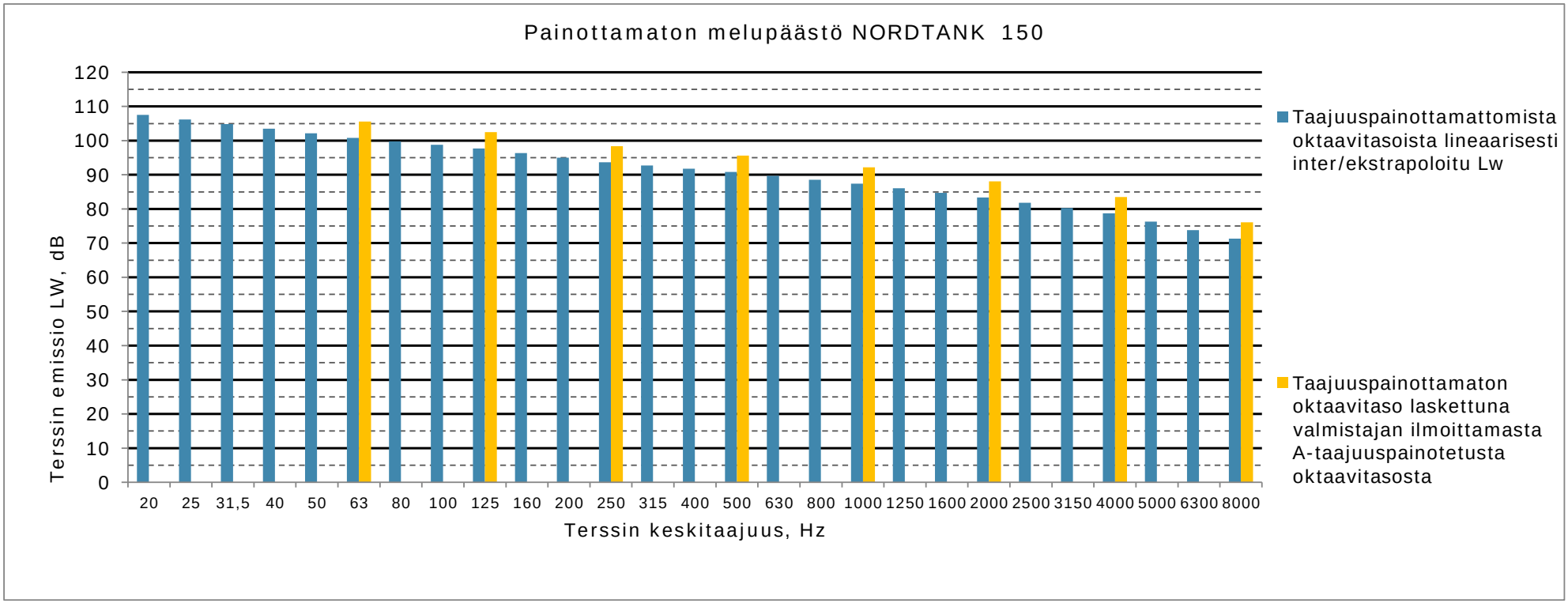

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

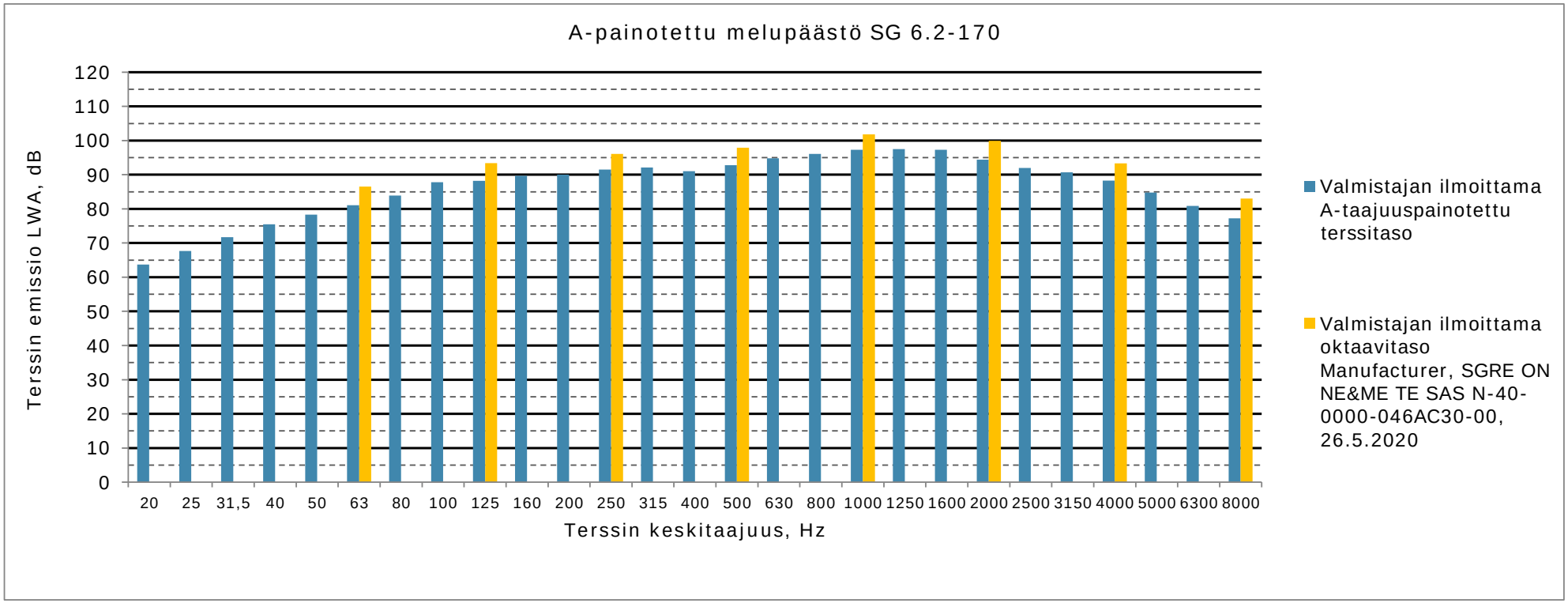

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

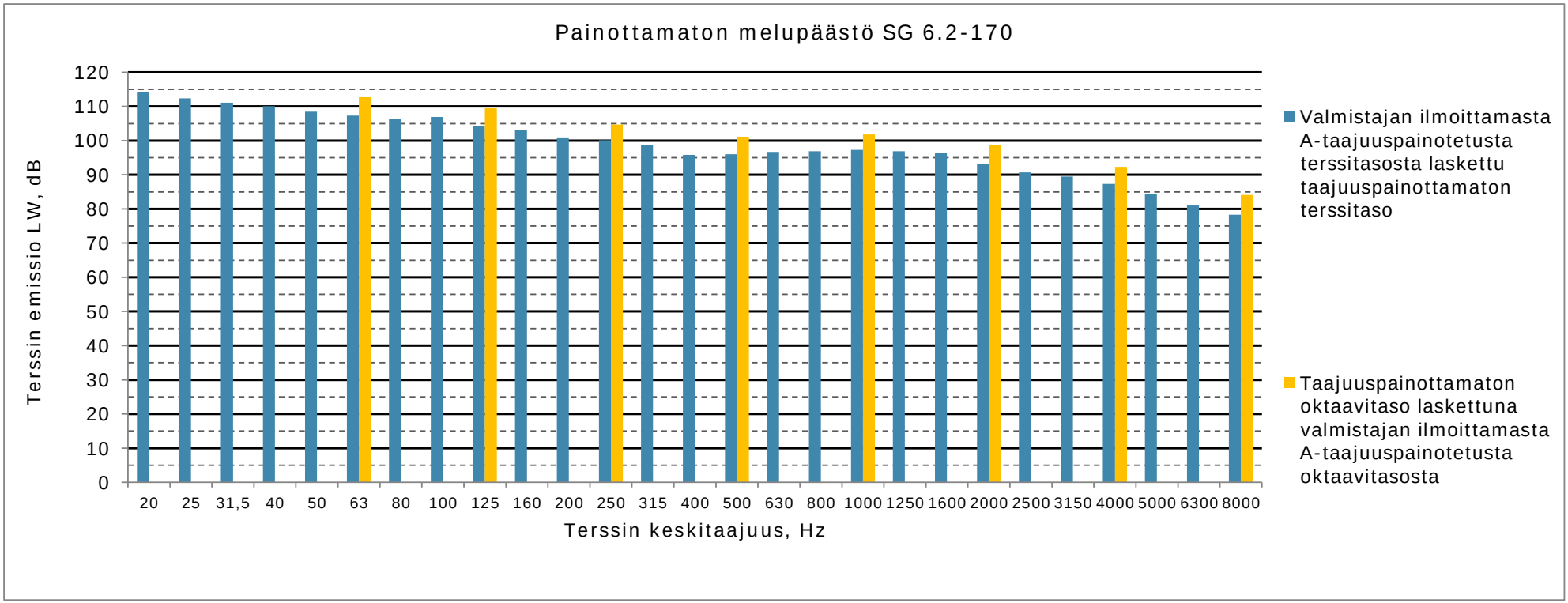

A-painotettu melupäästö Nordex N163-5.7
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN, 8.11.2021

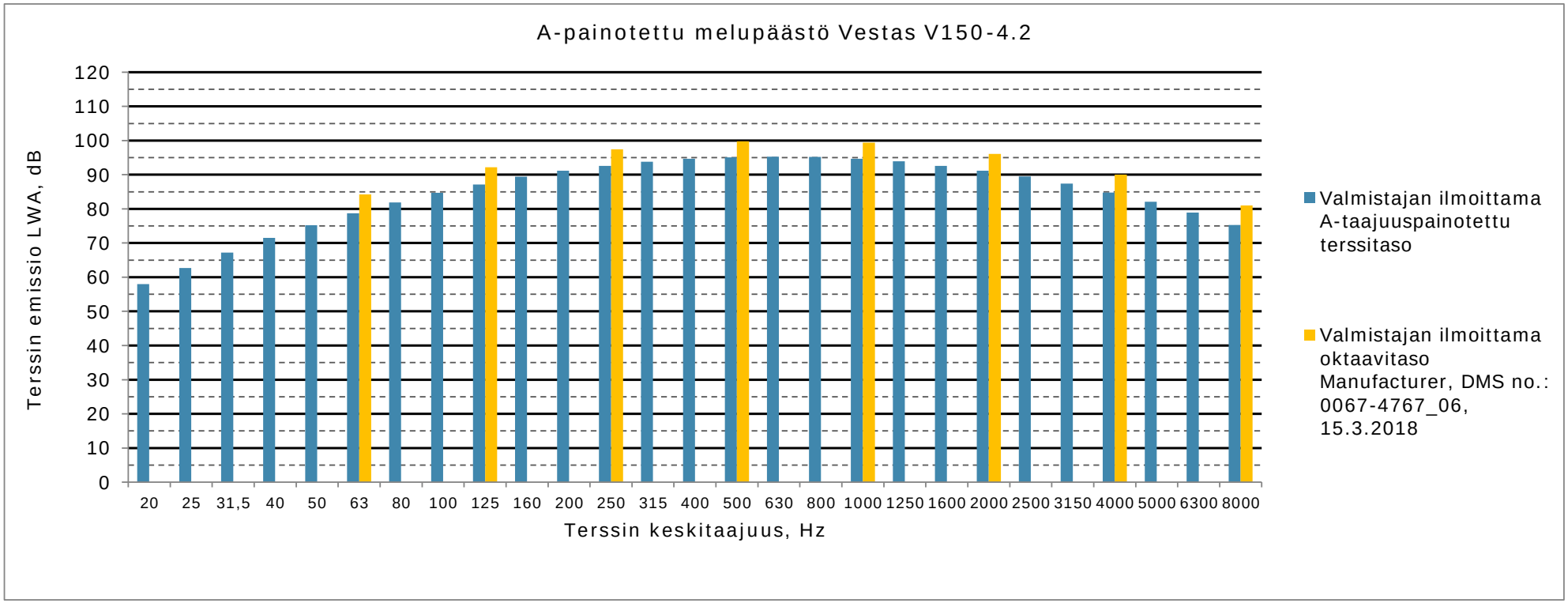

Painottamaton melupäästö Nordex N163-5.7
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

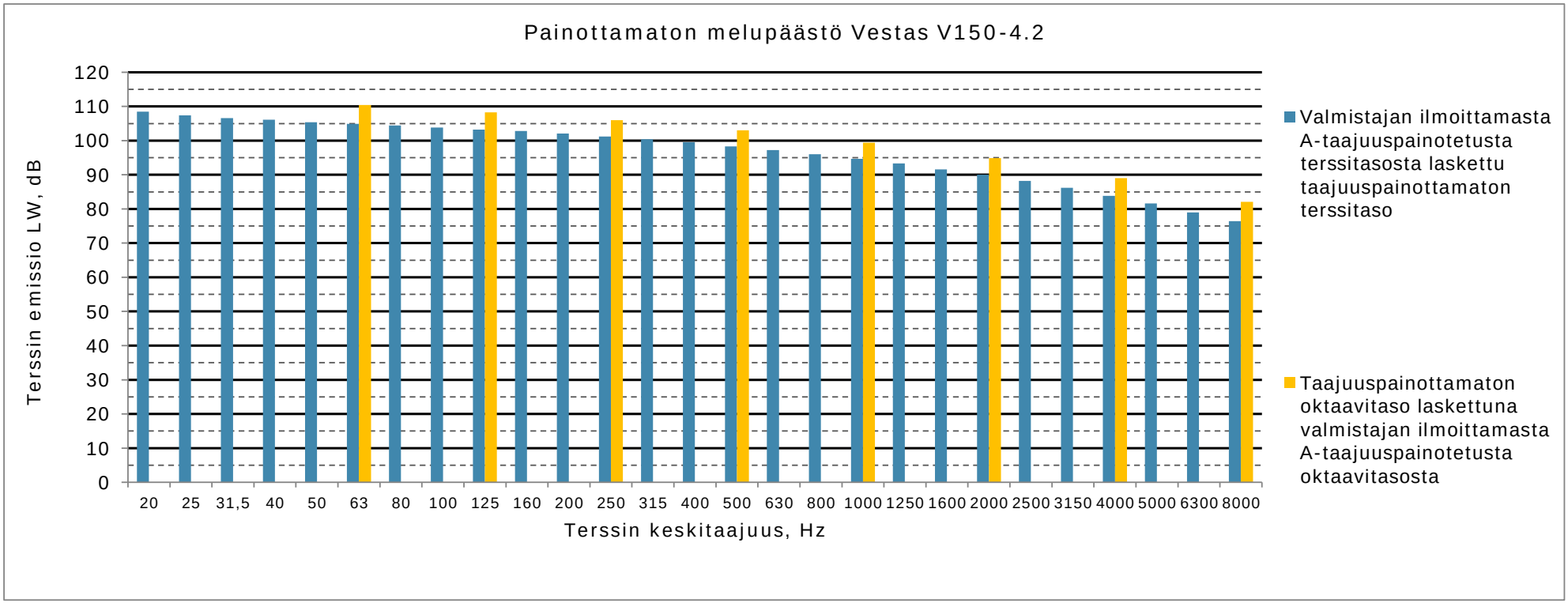

A-painotettu melupäästö NORDTANK 150
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lwa
Valmistajan ilmoittama oktaavitaso Generic data, Ramboll memo , 1.4.1989

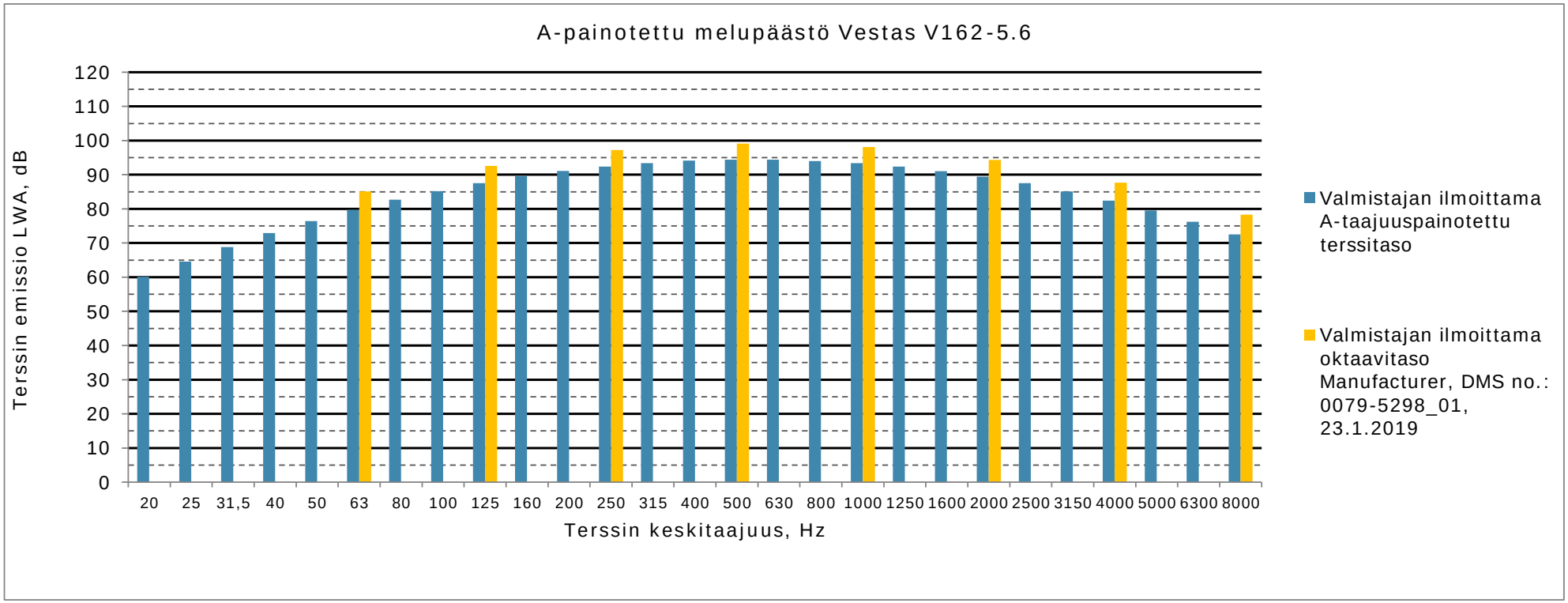

Painottamaton melupäästö NORDTANK 150
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Taajuuspainottamattomista oktaavitasoista lineaarisesti inter/ekstrapoloitu Lw
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

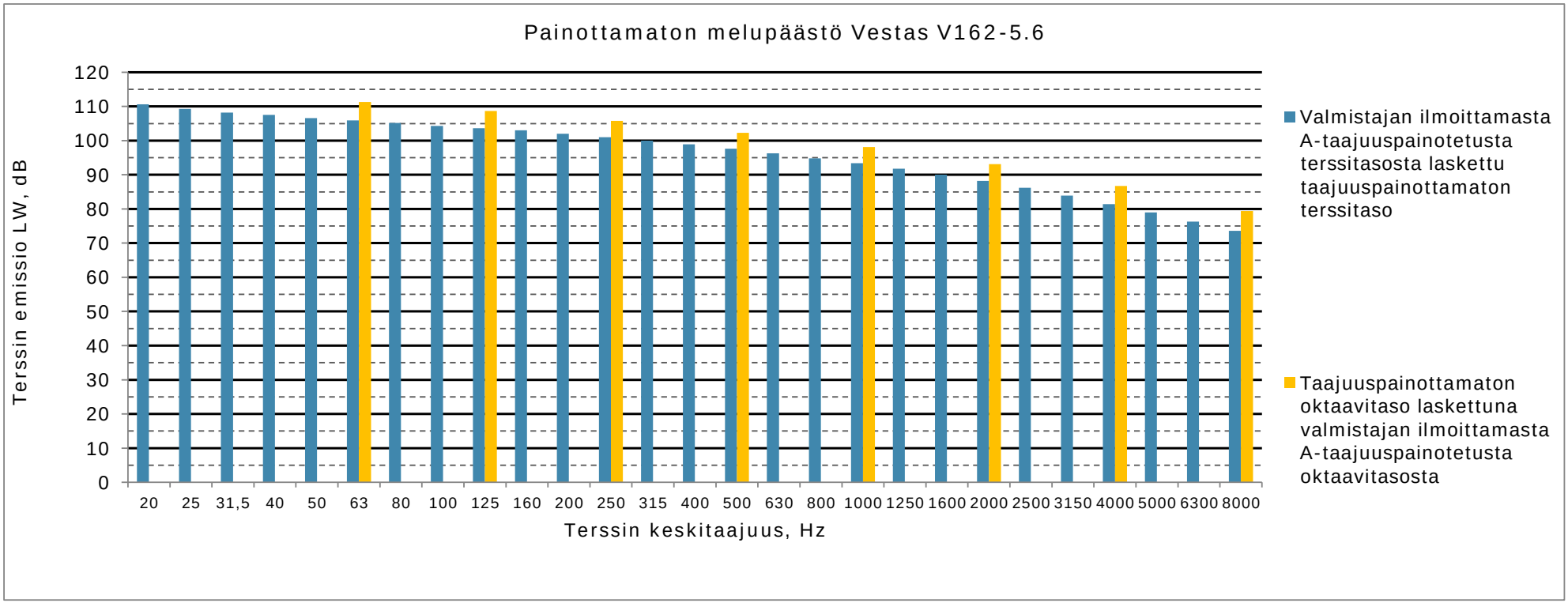

A-painotettu melupäästö SG 6.2-170
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, SGRE ON NE&ME TE SAS N-40-0000-046AC30-00, 26.5.2020

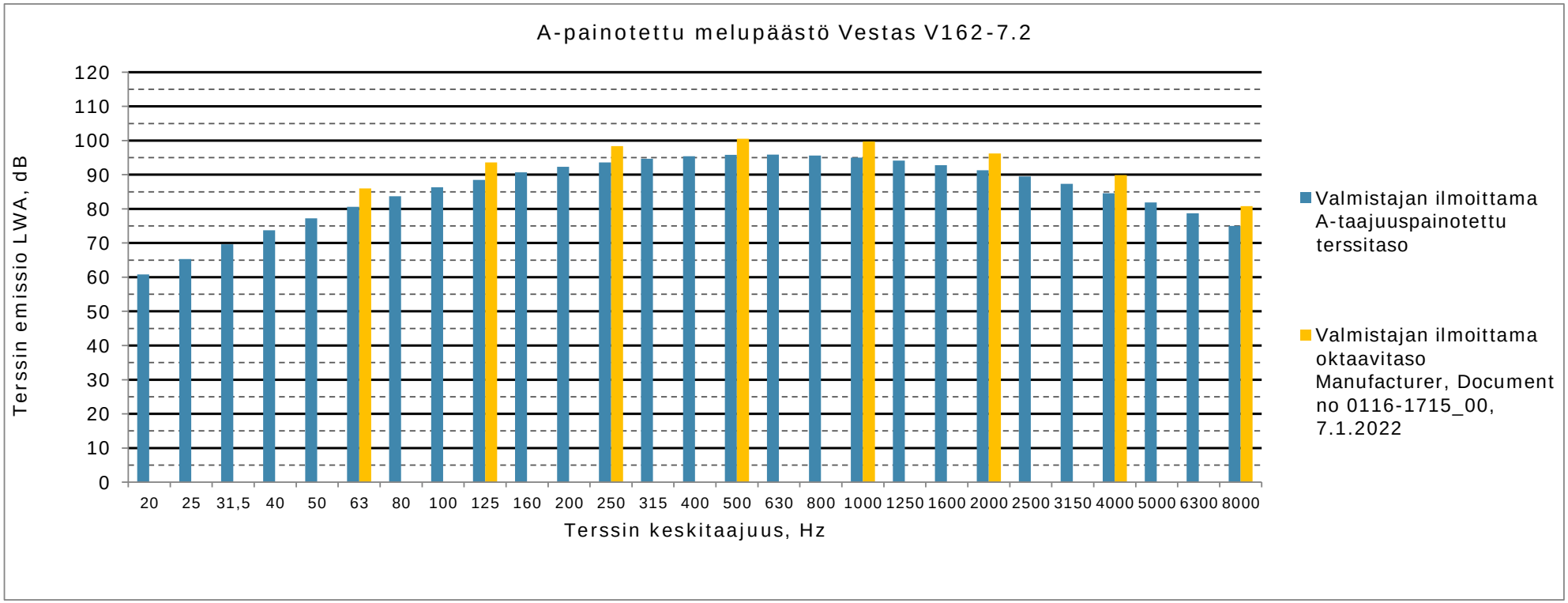

Painottamaton melupäästö SG 6.2-170
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

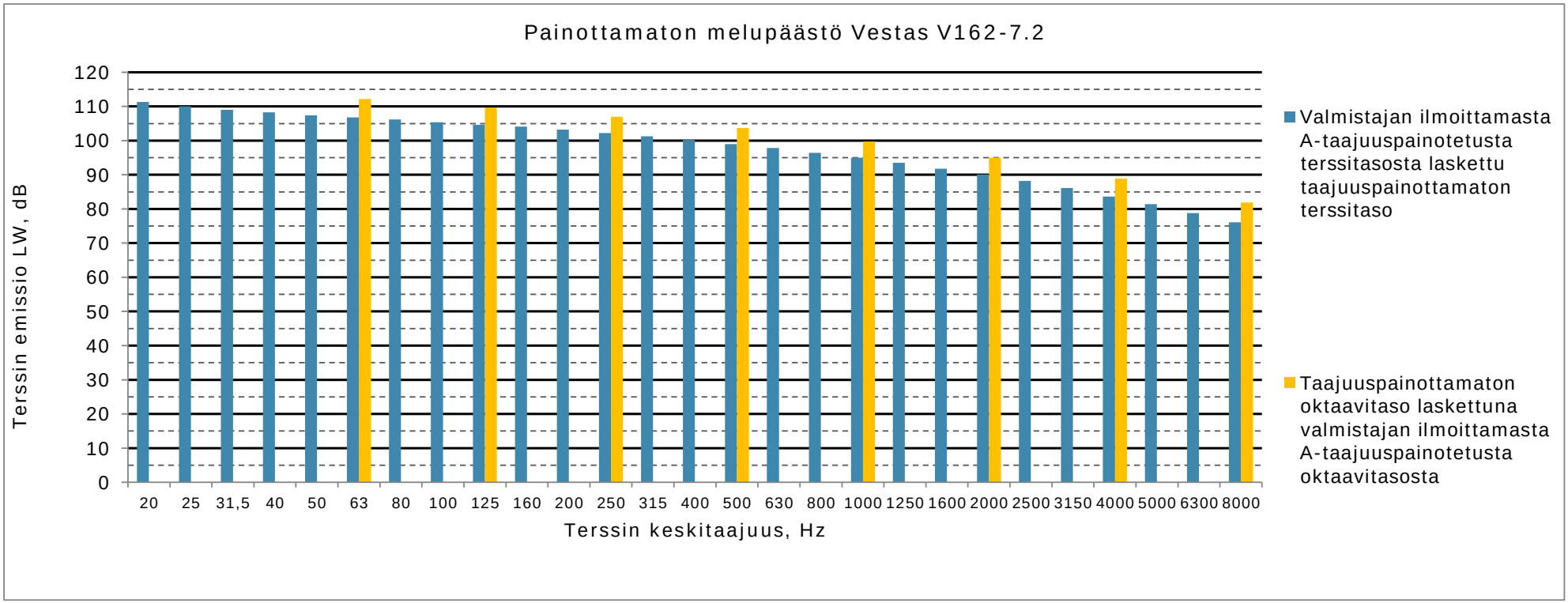

A-painotettu melupäästö Vestas V150-4.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0067-4767_06, 15.3.2018

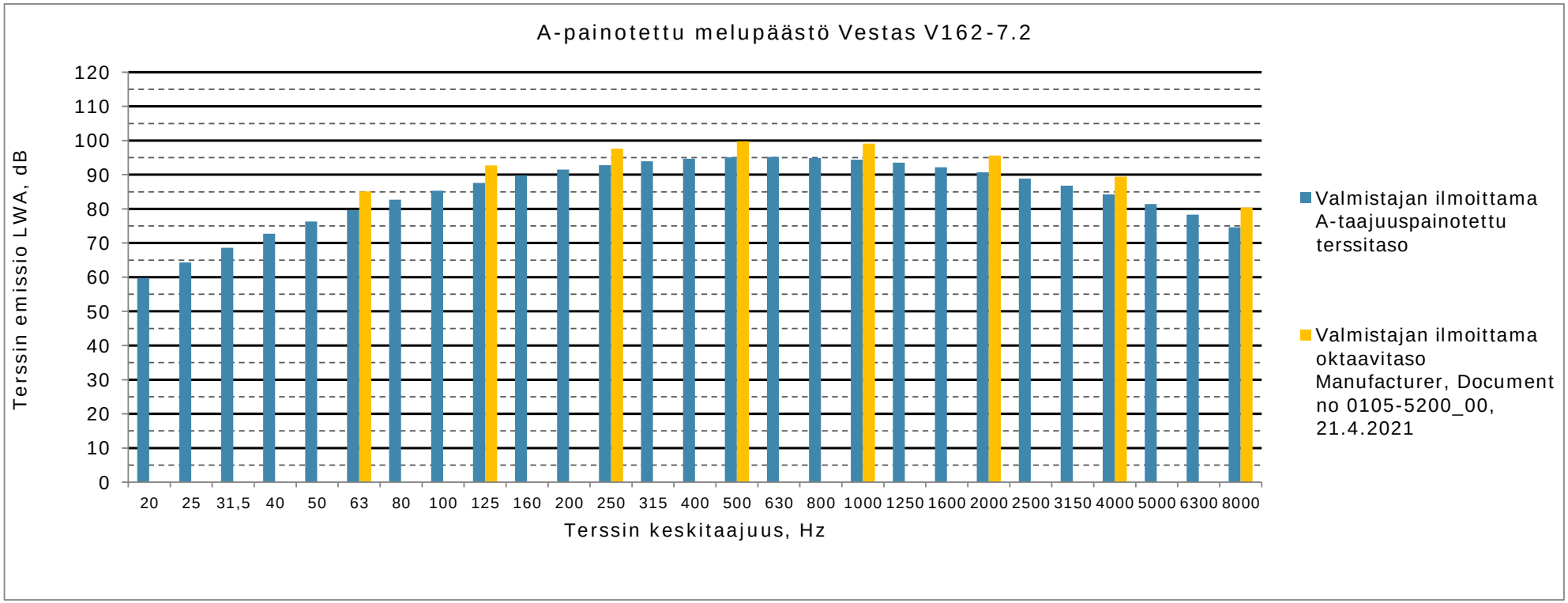

Painottamaton melupäästö Vestas V150-4.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

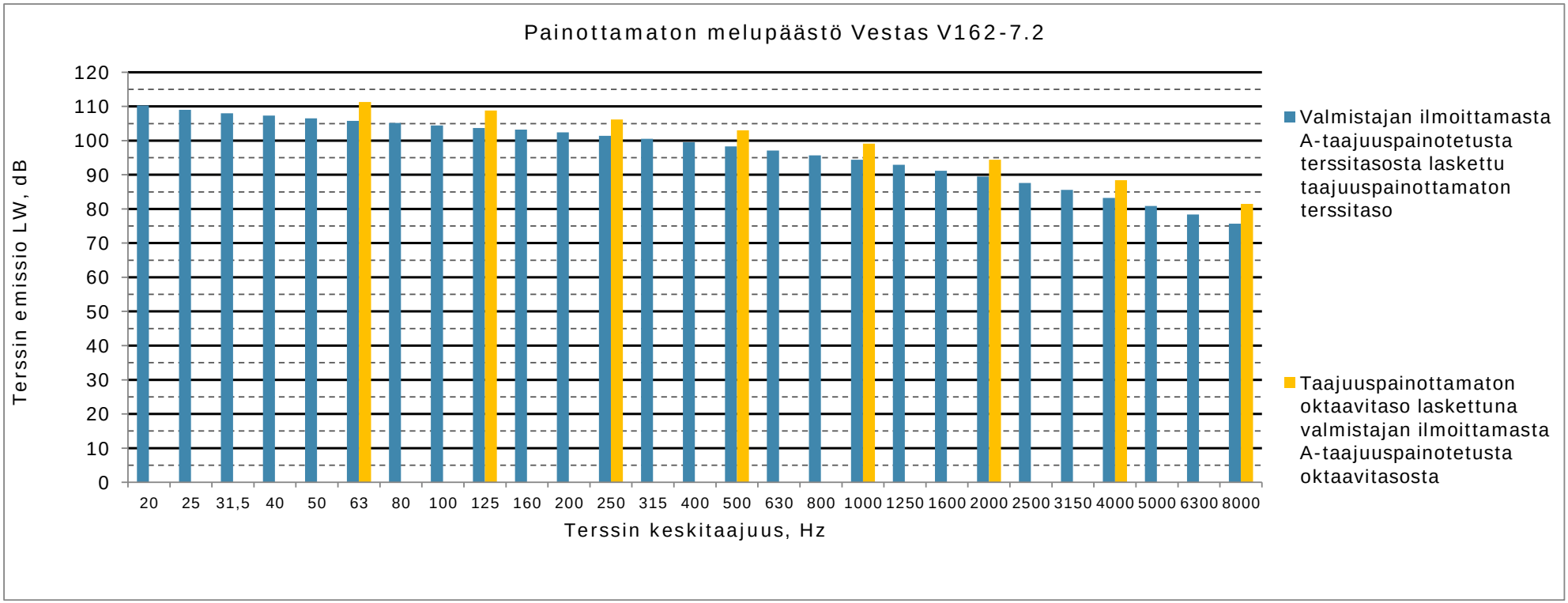

A-painotettu melupäästö Vestas V162-5.6
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, DMS no.: 0079-5298_01, 23.1.2019

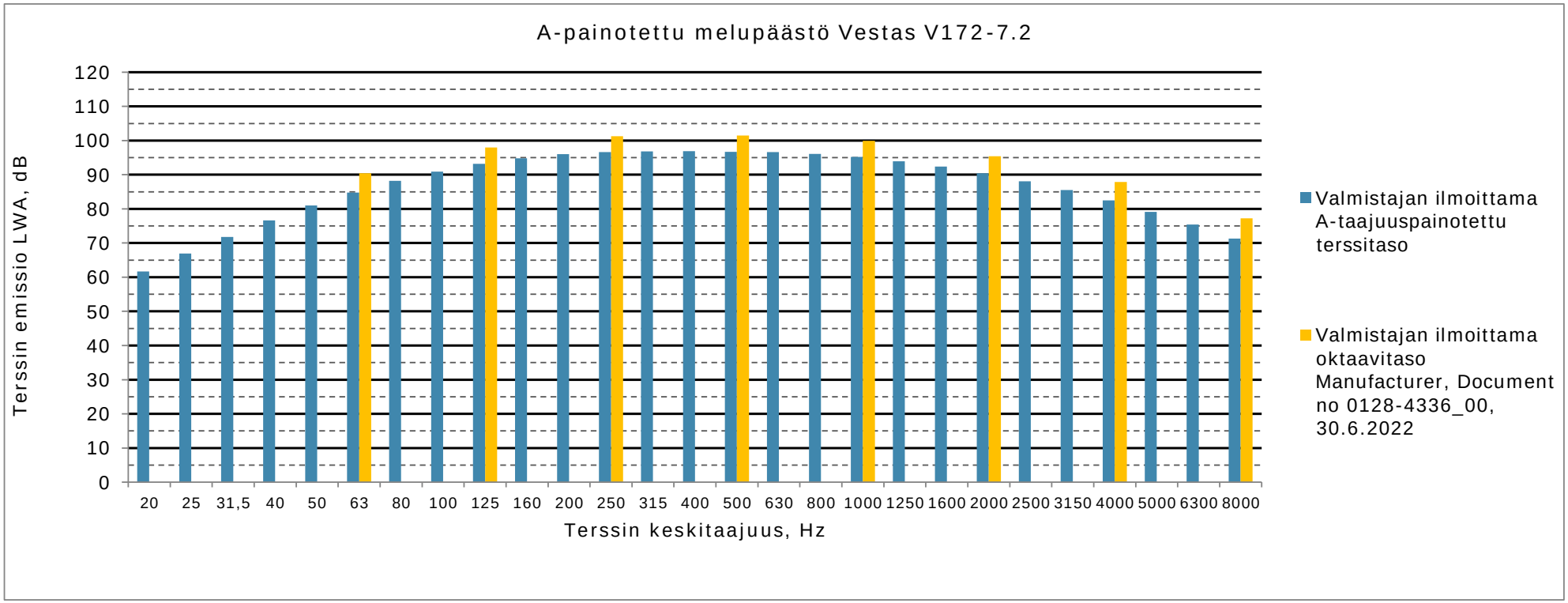

Painottamaton melupäästö Vestas V162-5.6
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

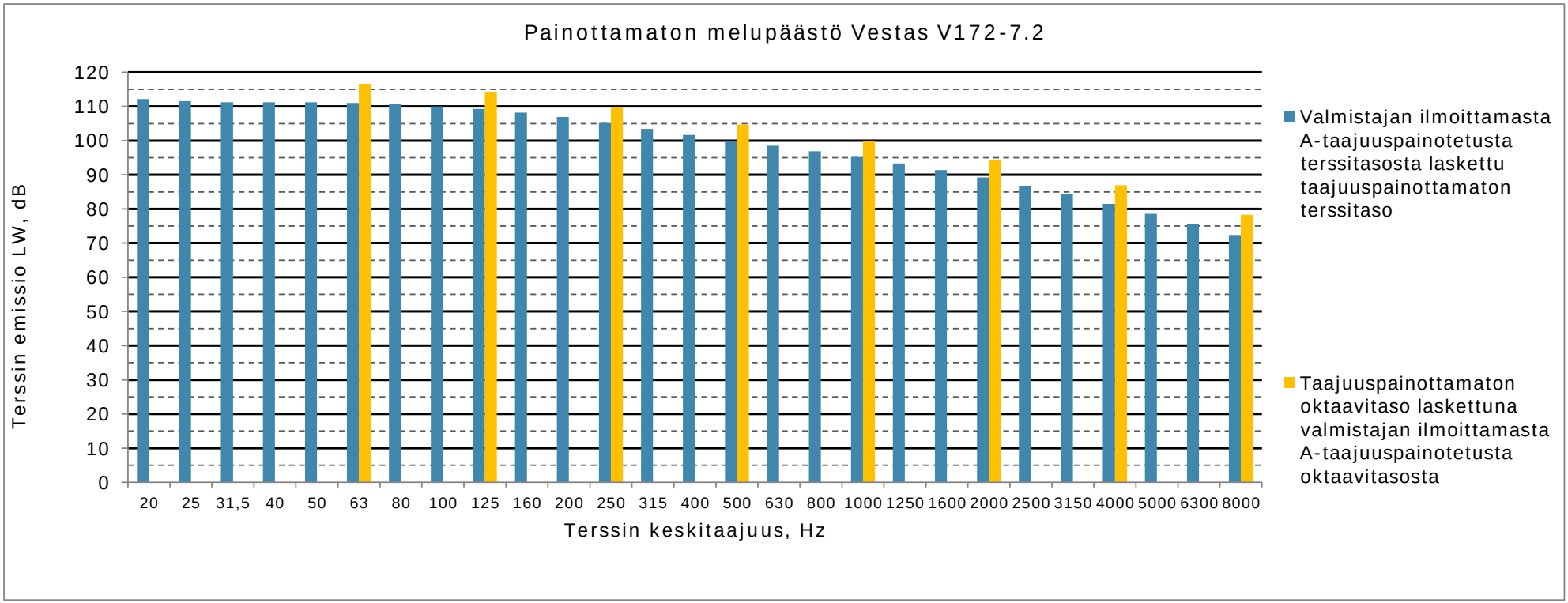

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0116-1715_00, 7.1.2022

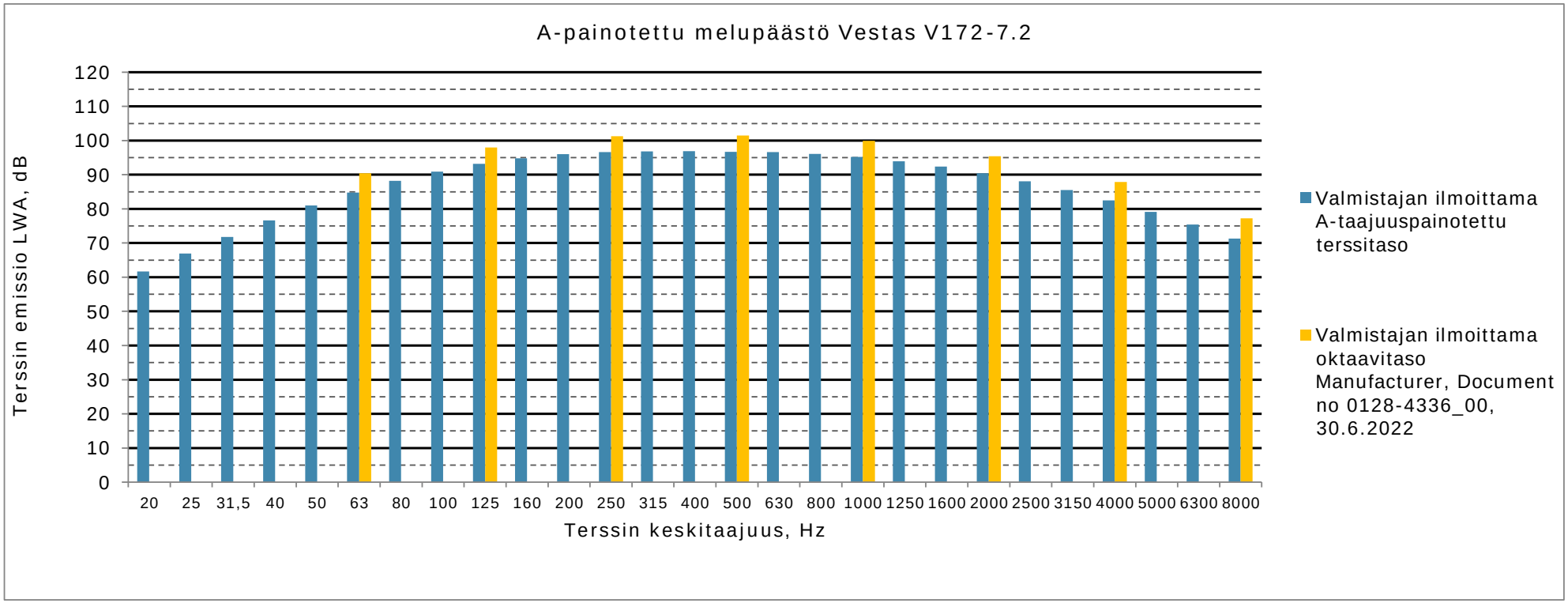

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

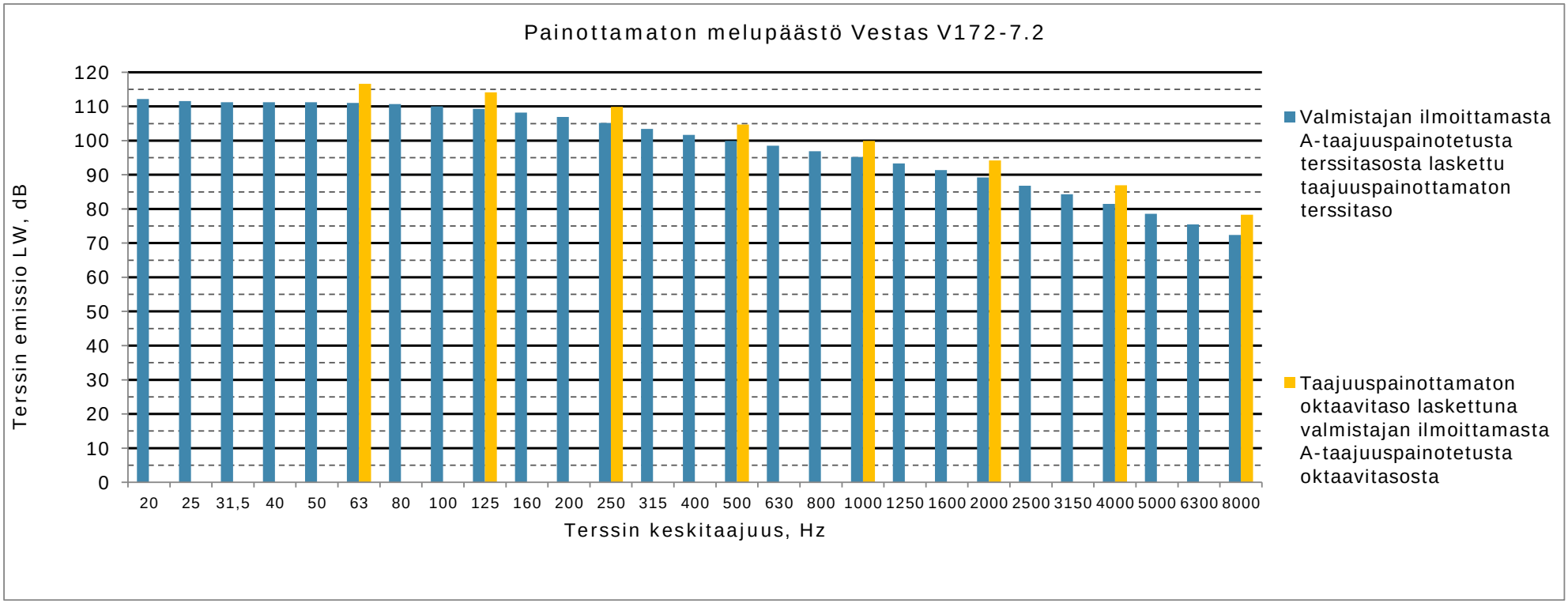

A-painotettu melupäästö Vestas V162-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0105-5200_00, 21.4.2021

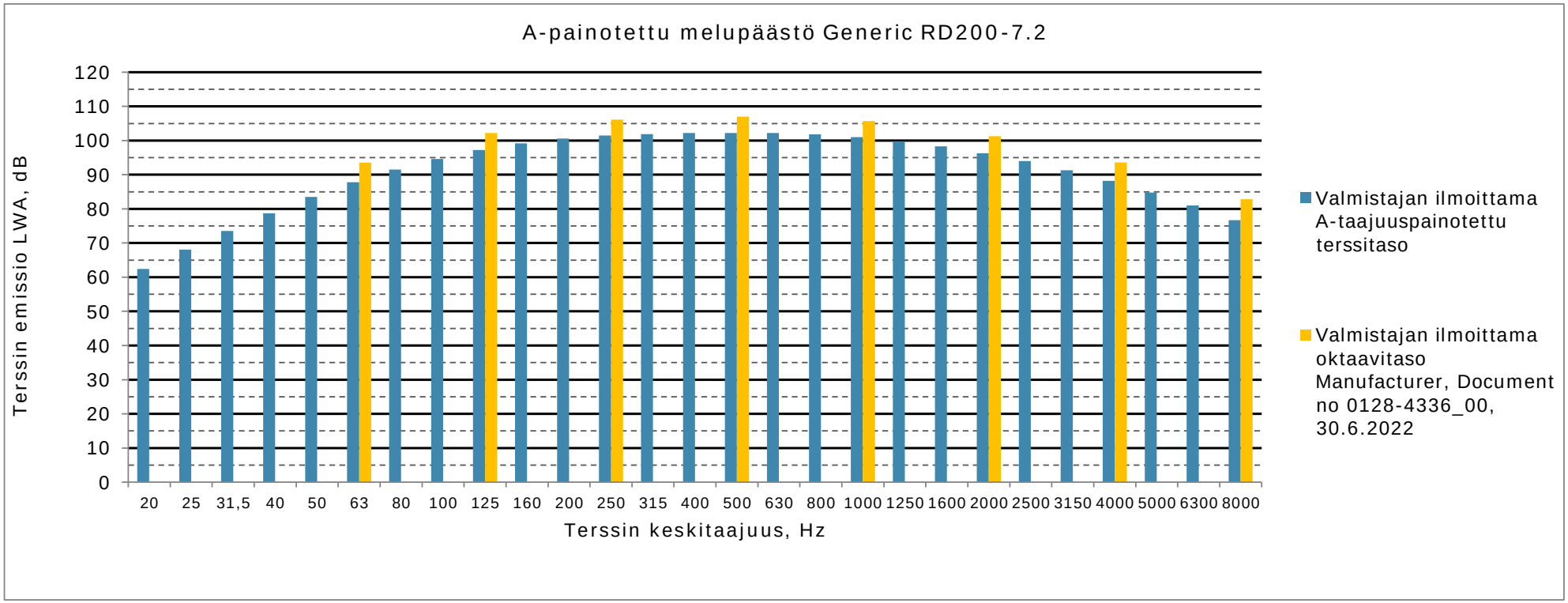

Painottamaton melupäästö Vestas V162-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

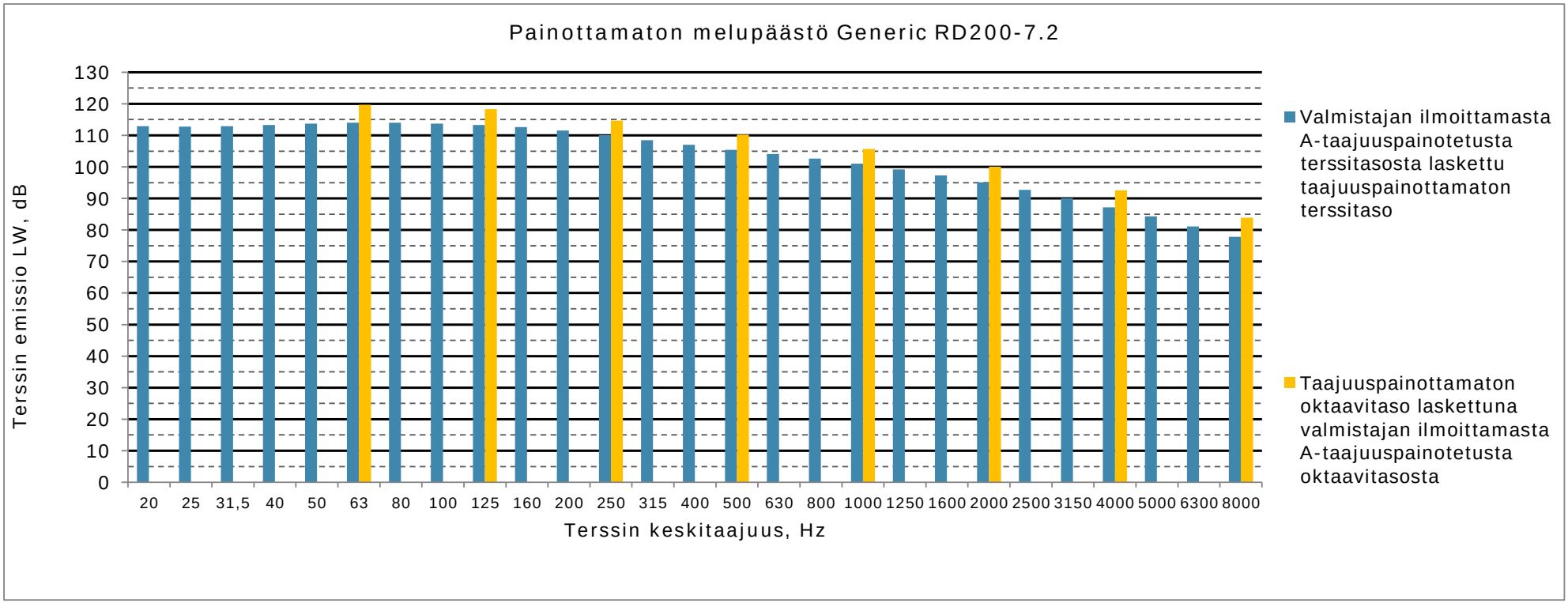

A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022

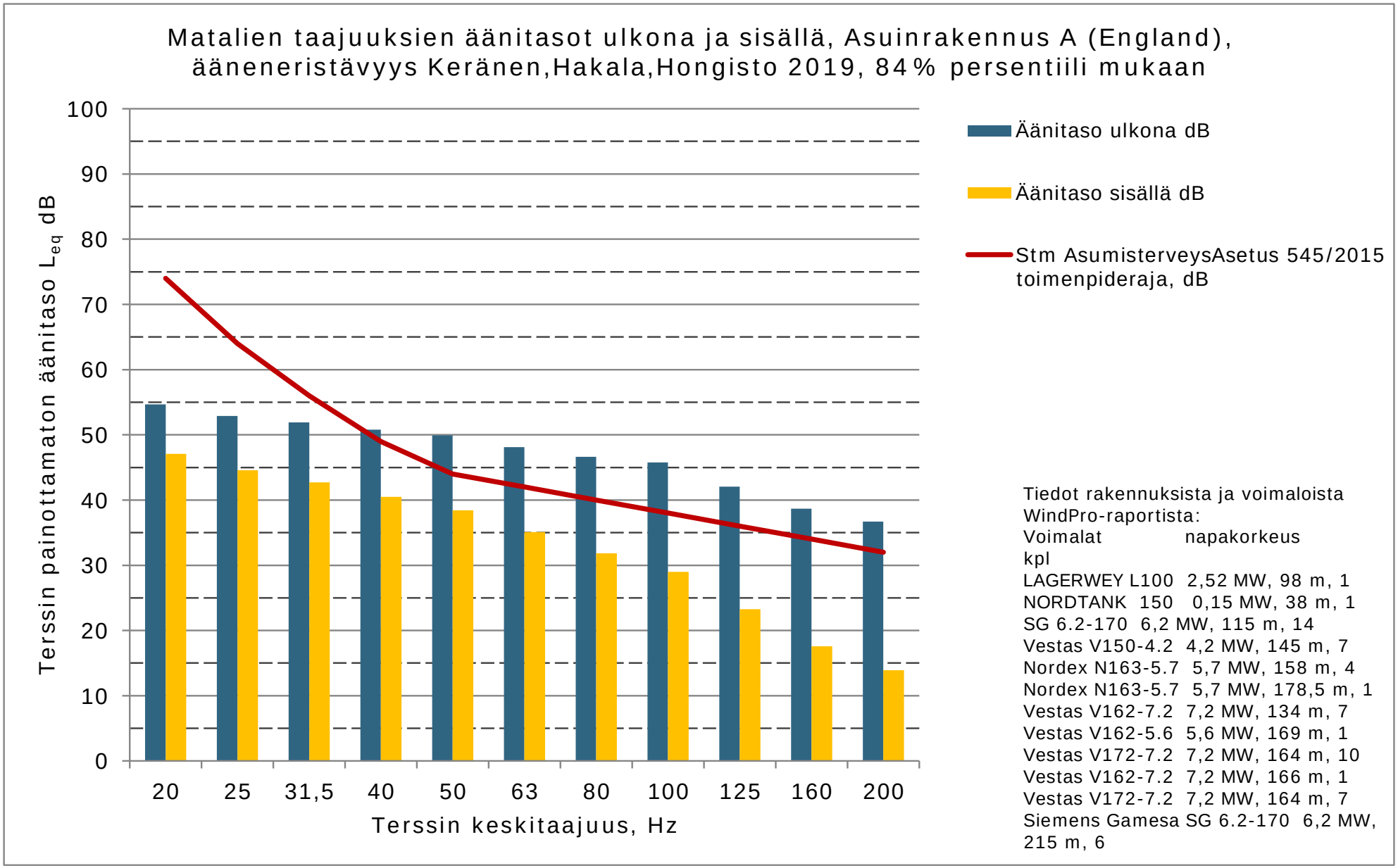

Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Vestas V172-7.2
Terssin emissio LW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

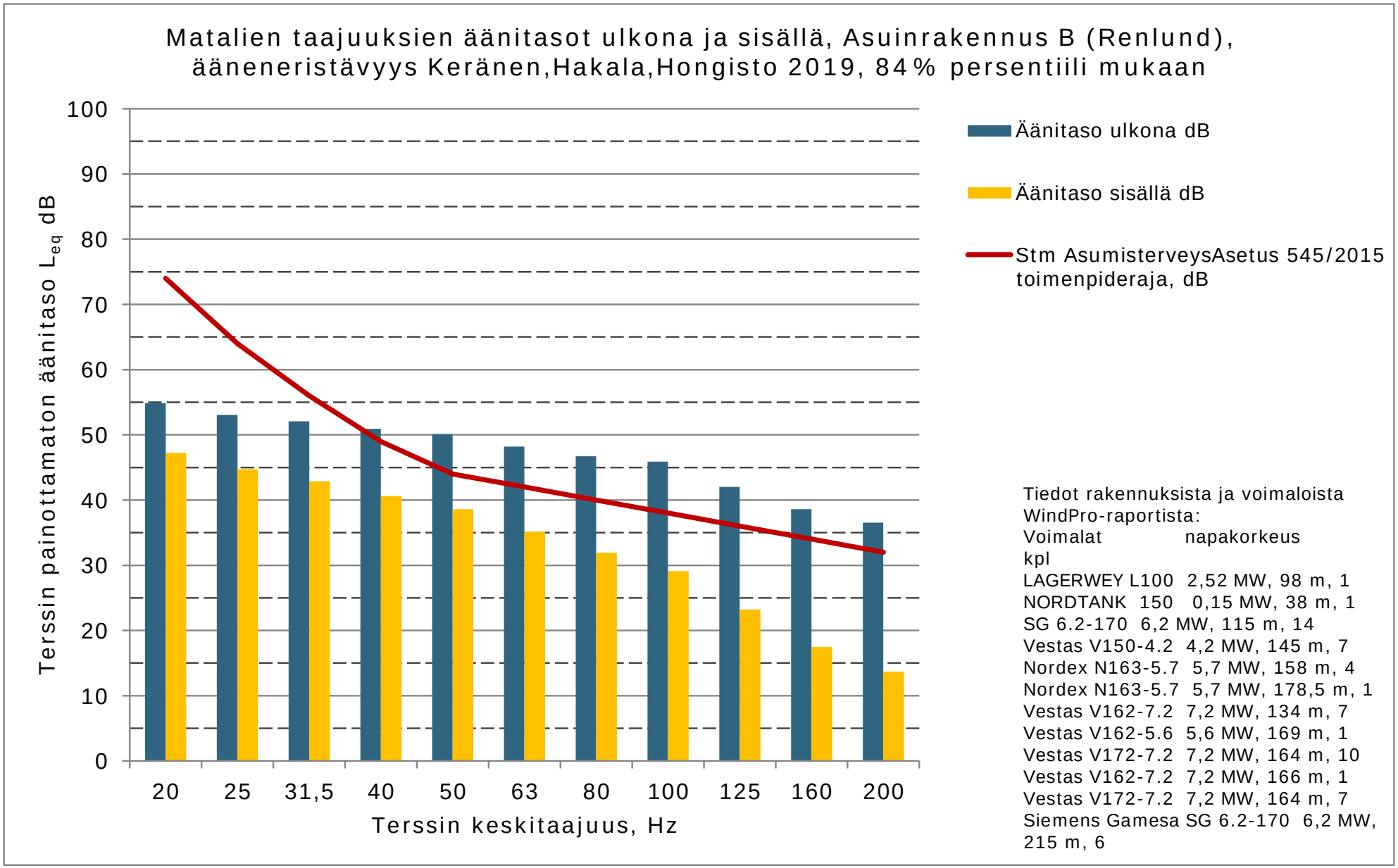

A-painotettu melupäästö Generic RD200-7.2
Terssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, Document no 0128-4336_00, 30.6.2022


Painottamaton melupäästö Generic RD200-7.2
Terssin emissio LW, dB
130
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta



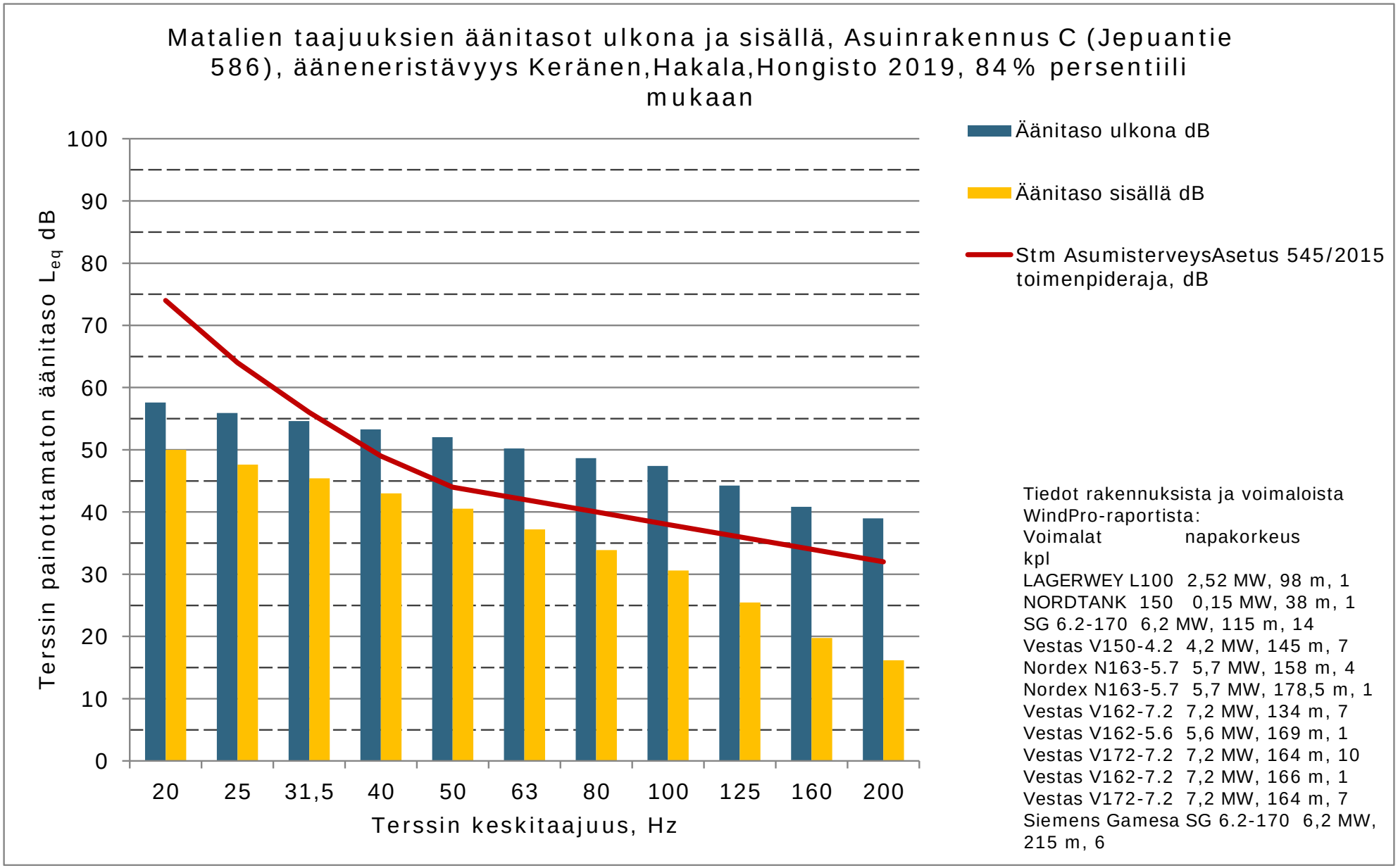
Tiedot rakennuksista ja voimaloista WindPro-raportista:

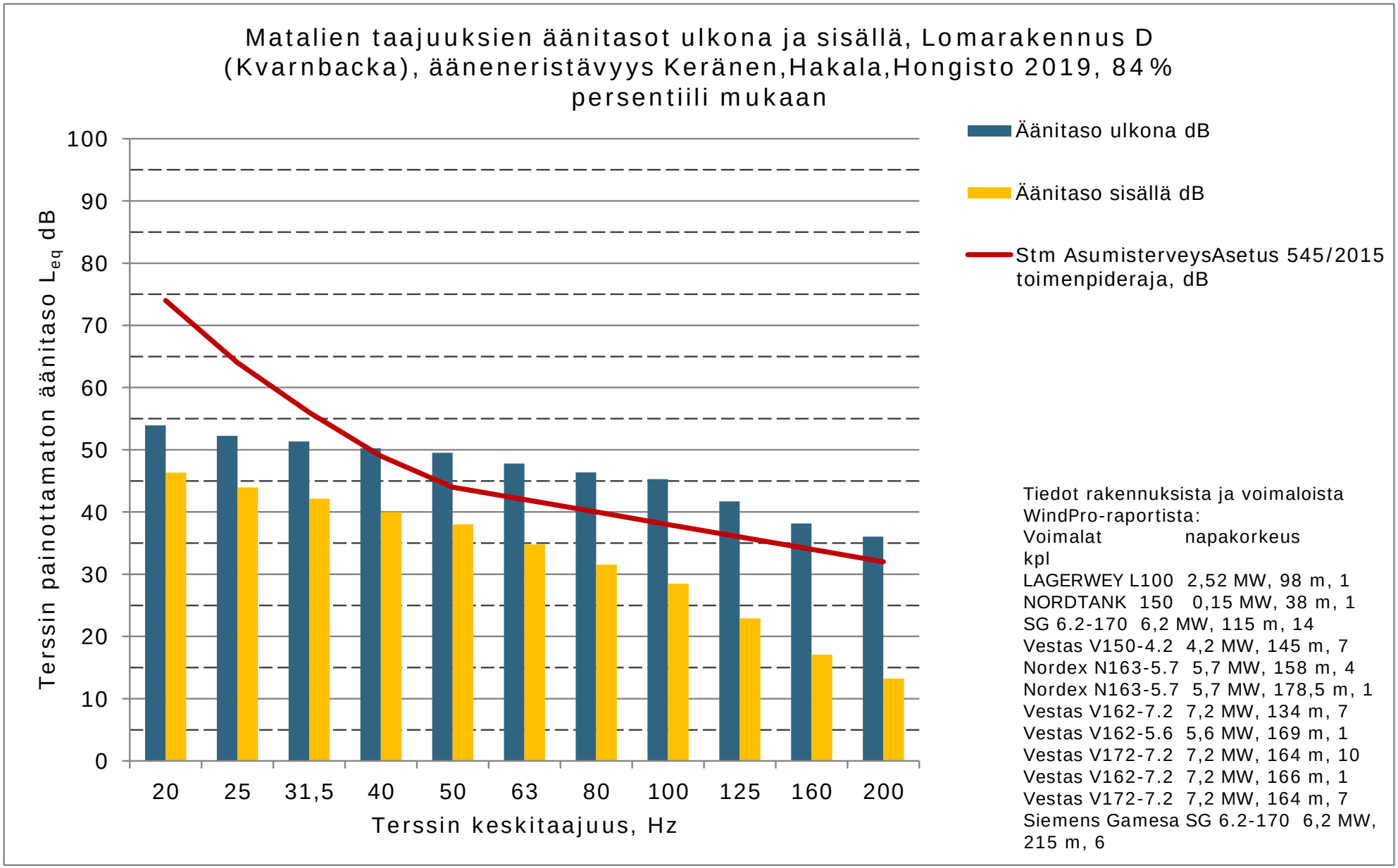
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	6

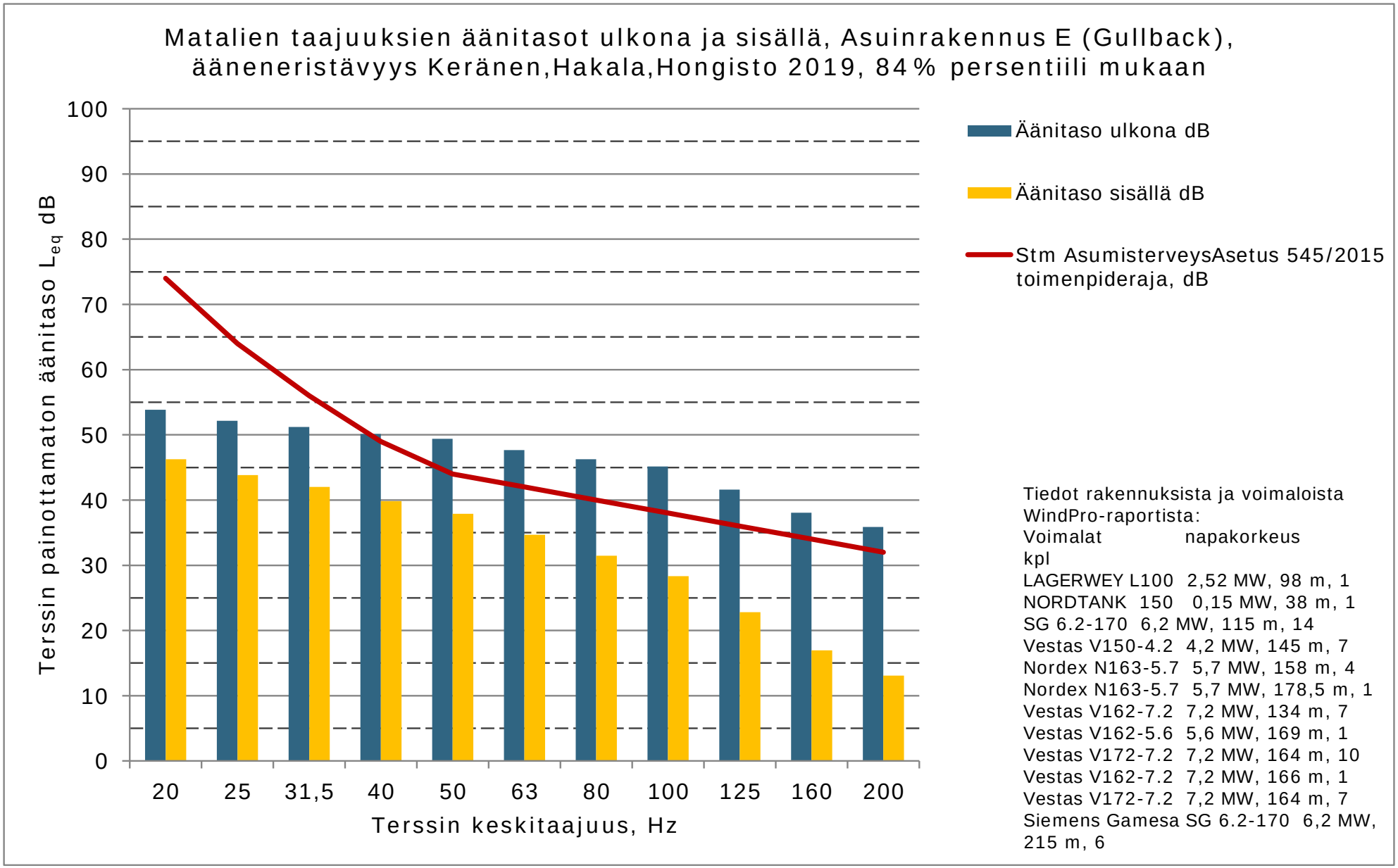


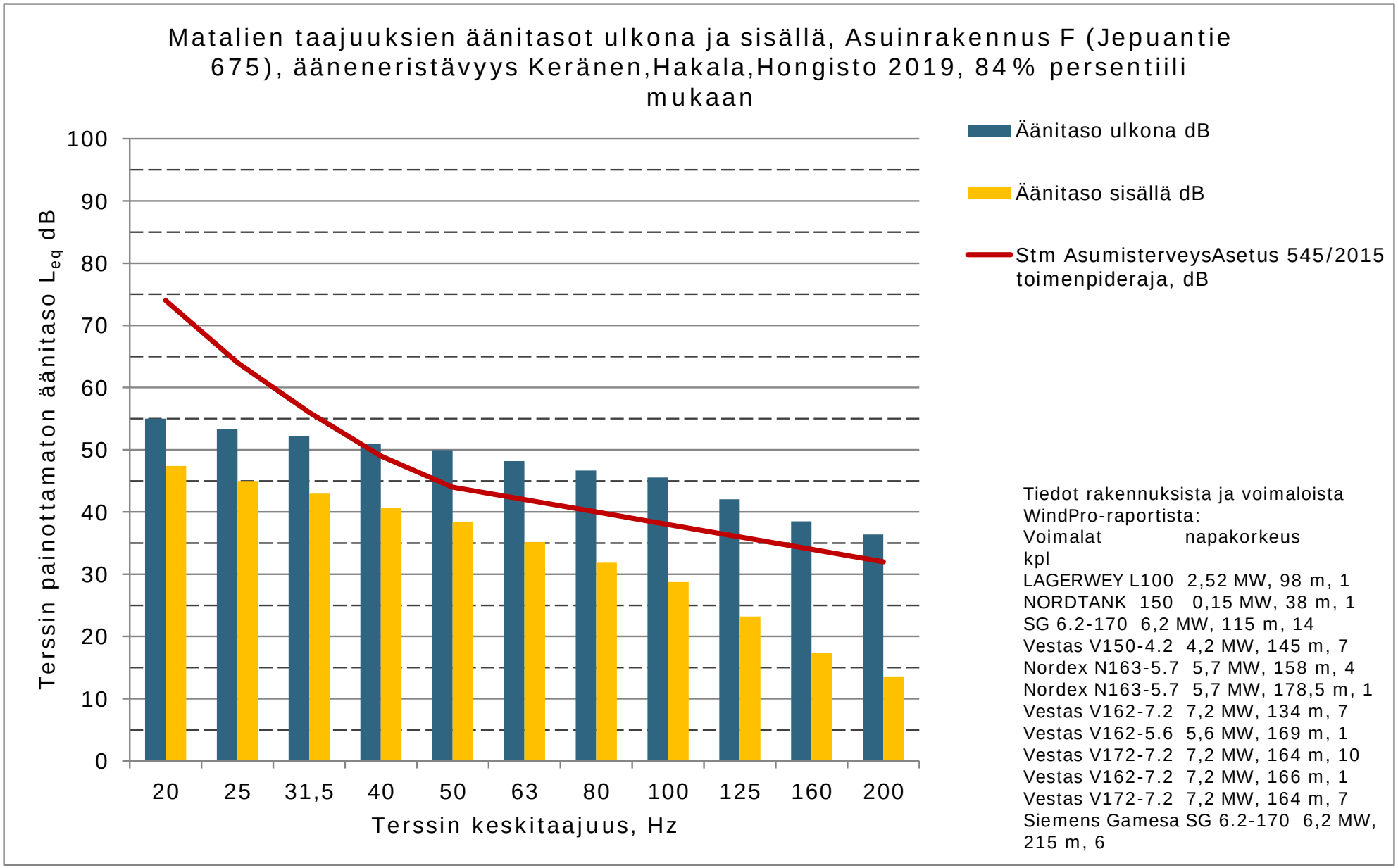
Tiedot rakennuksista ja voimaloista WindPro-raportista:

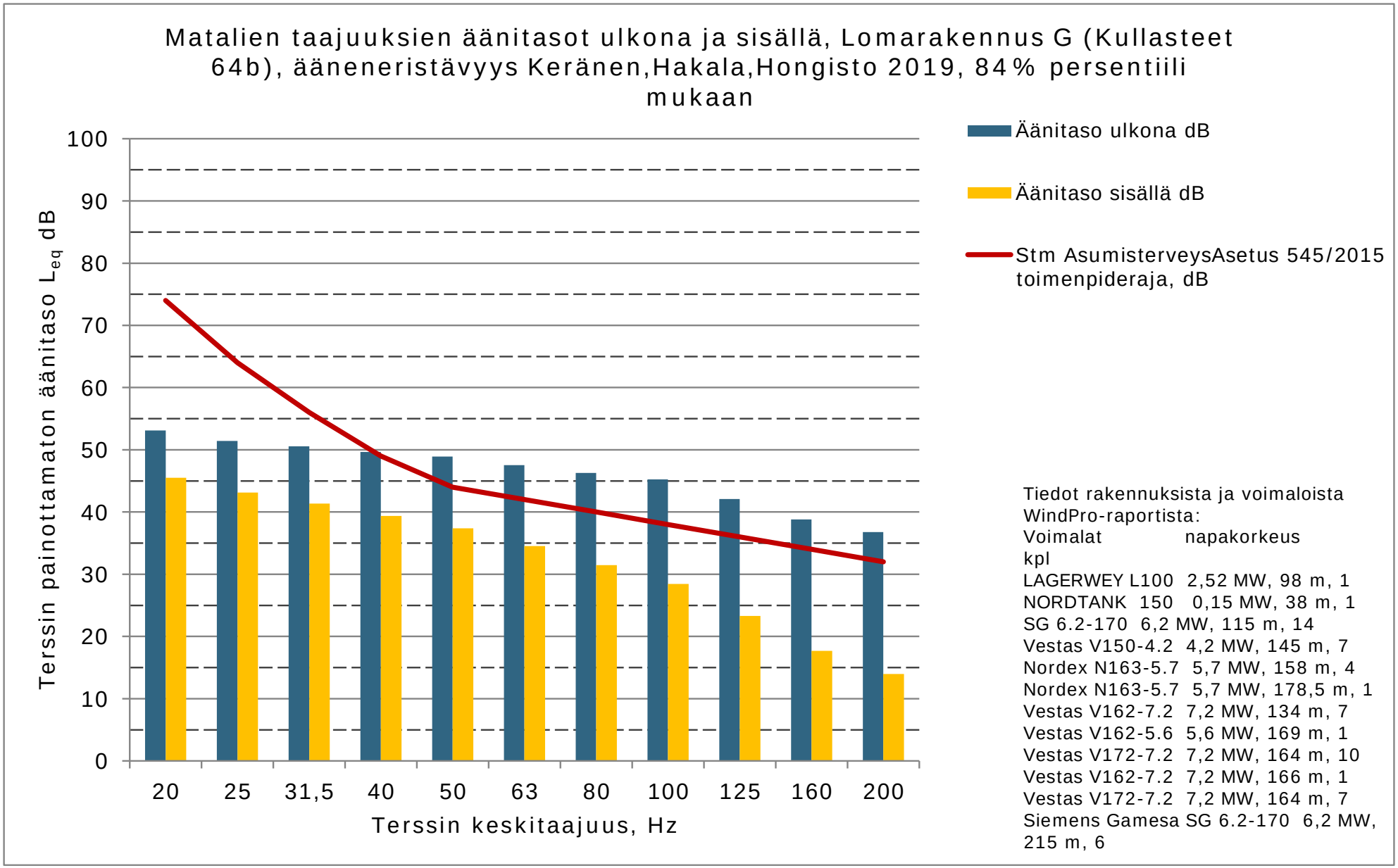
Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	6

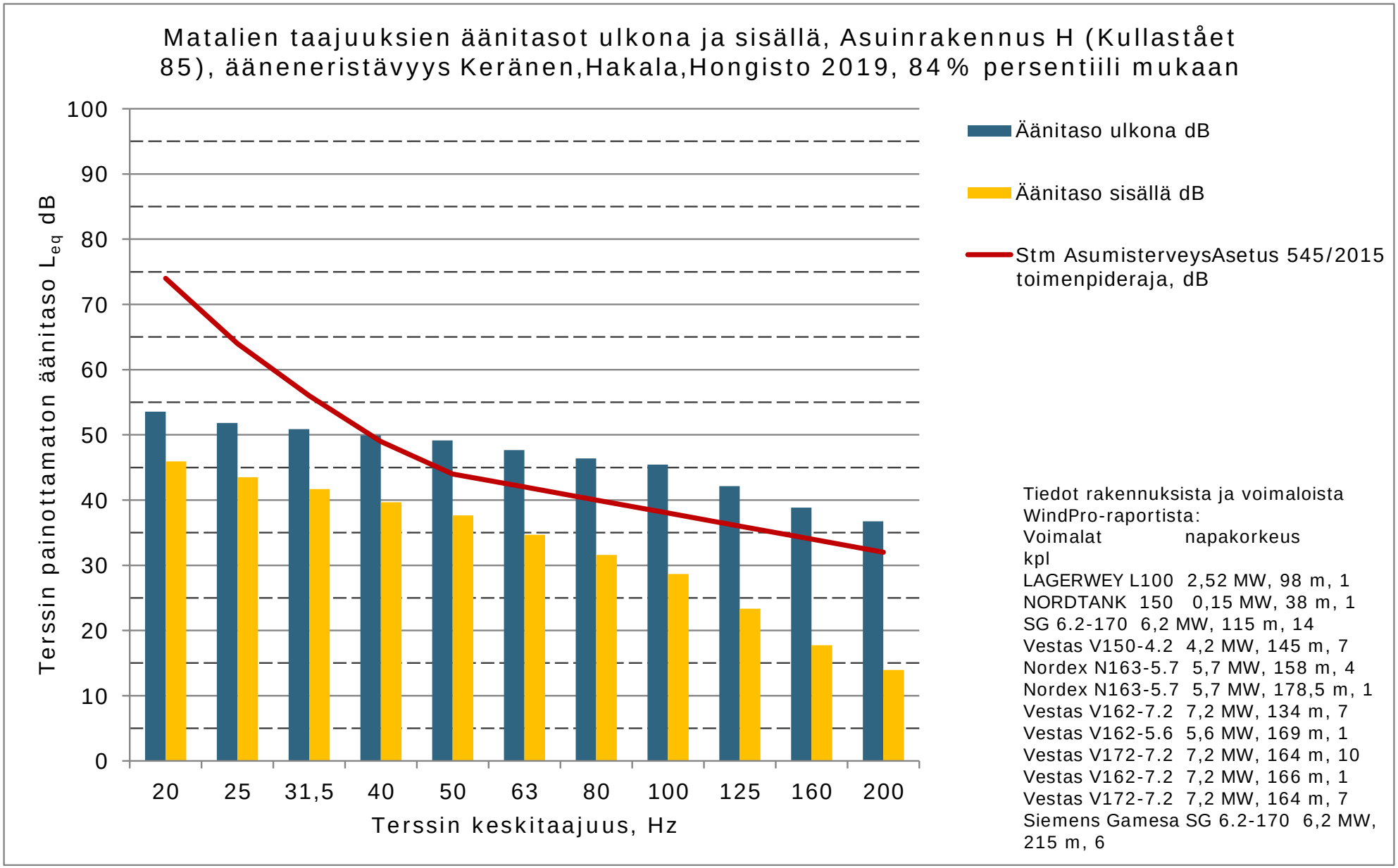

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Jepuantie 586), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

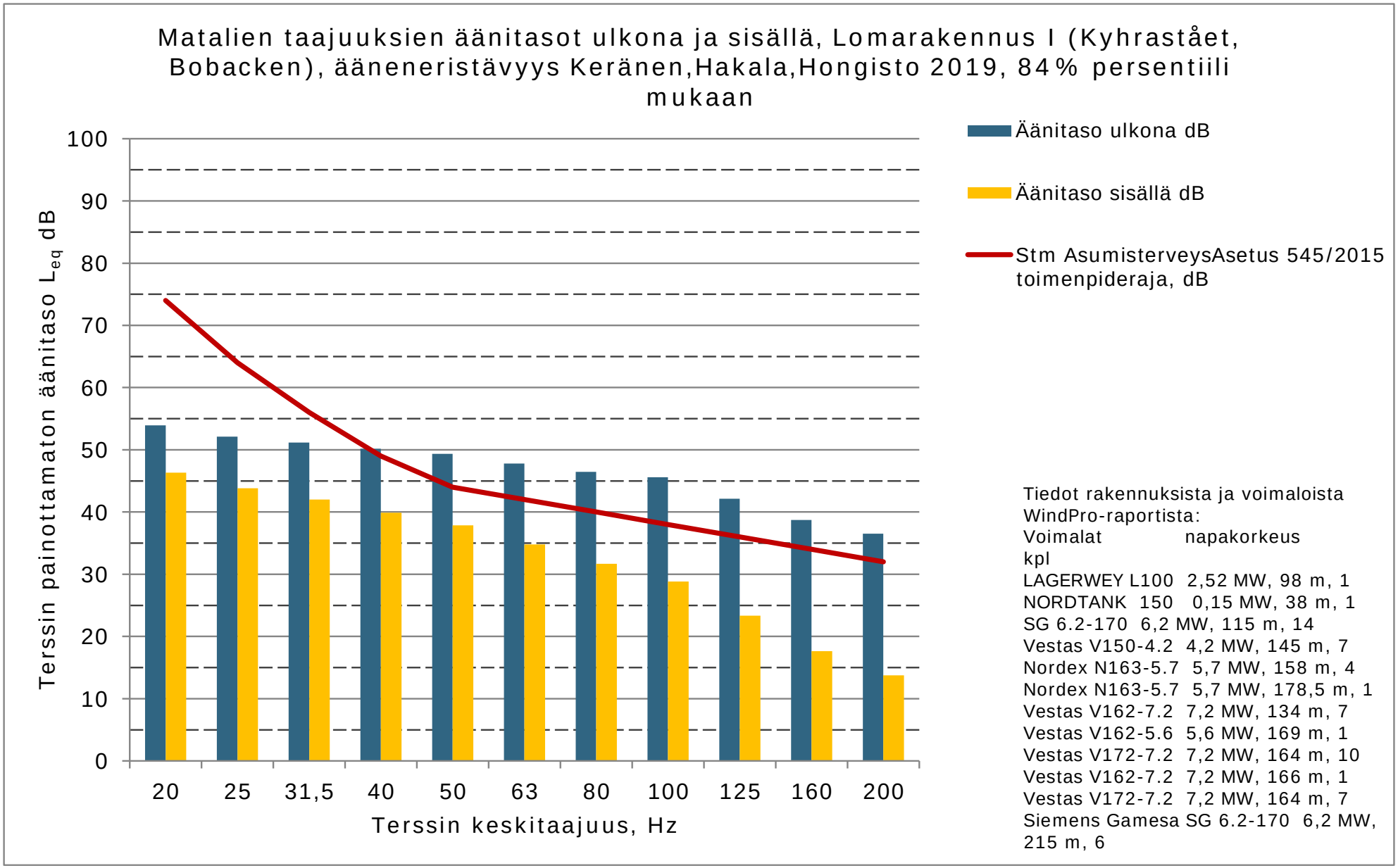

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D (Kvarnbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Gullback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

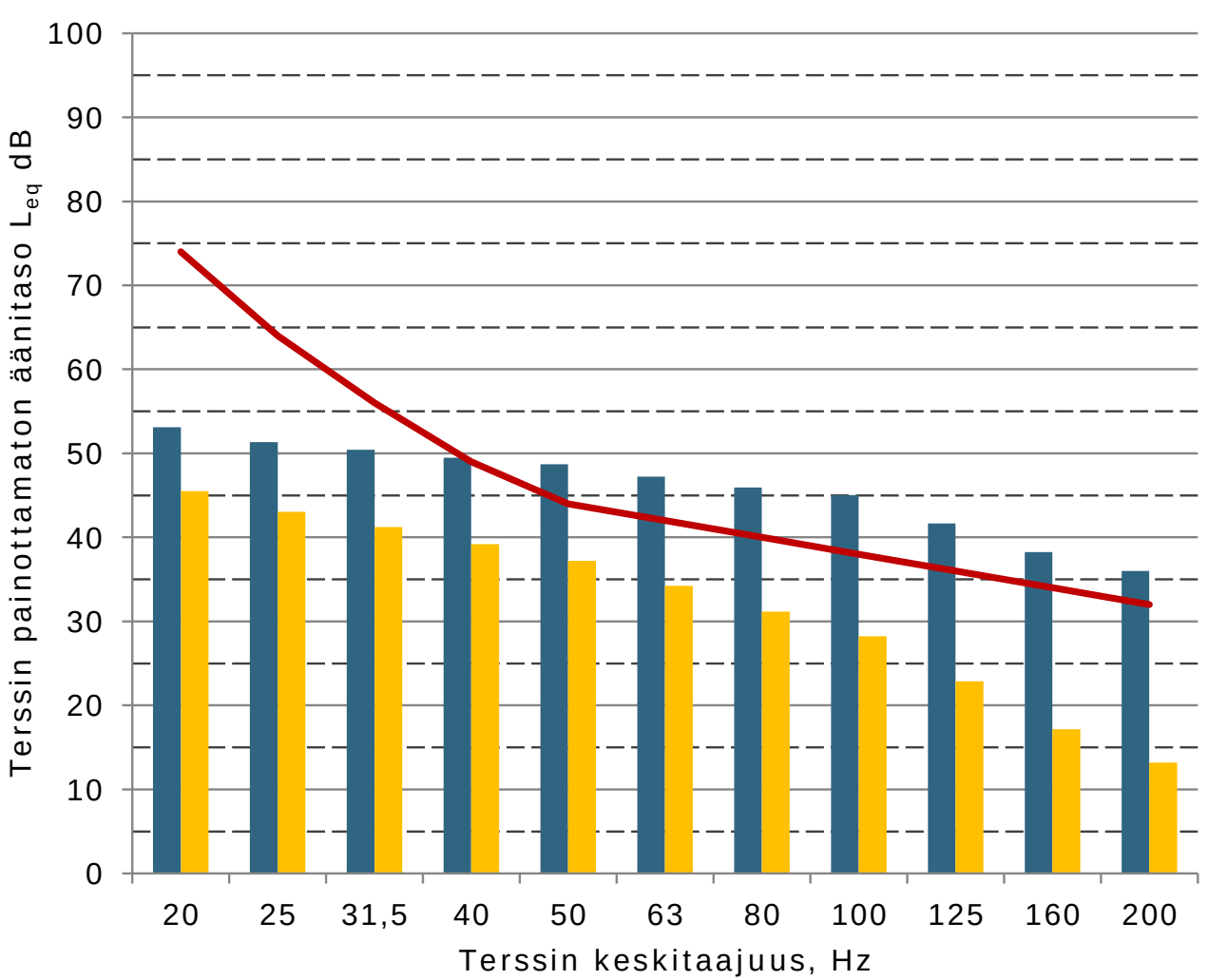

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Jepuantie 675), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

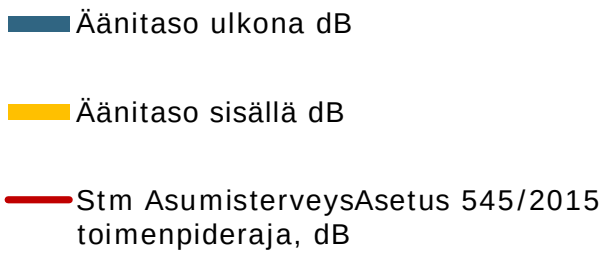

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Kullasteet 64b), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Kullastået 85), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Kyhrastået, Bobacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

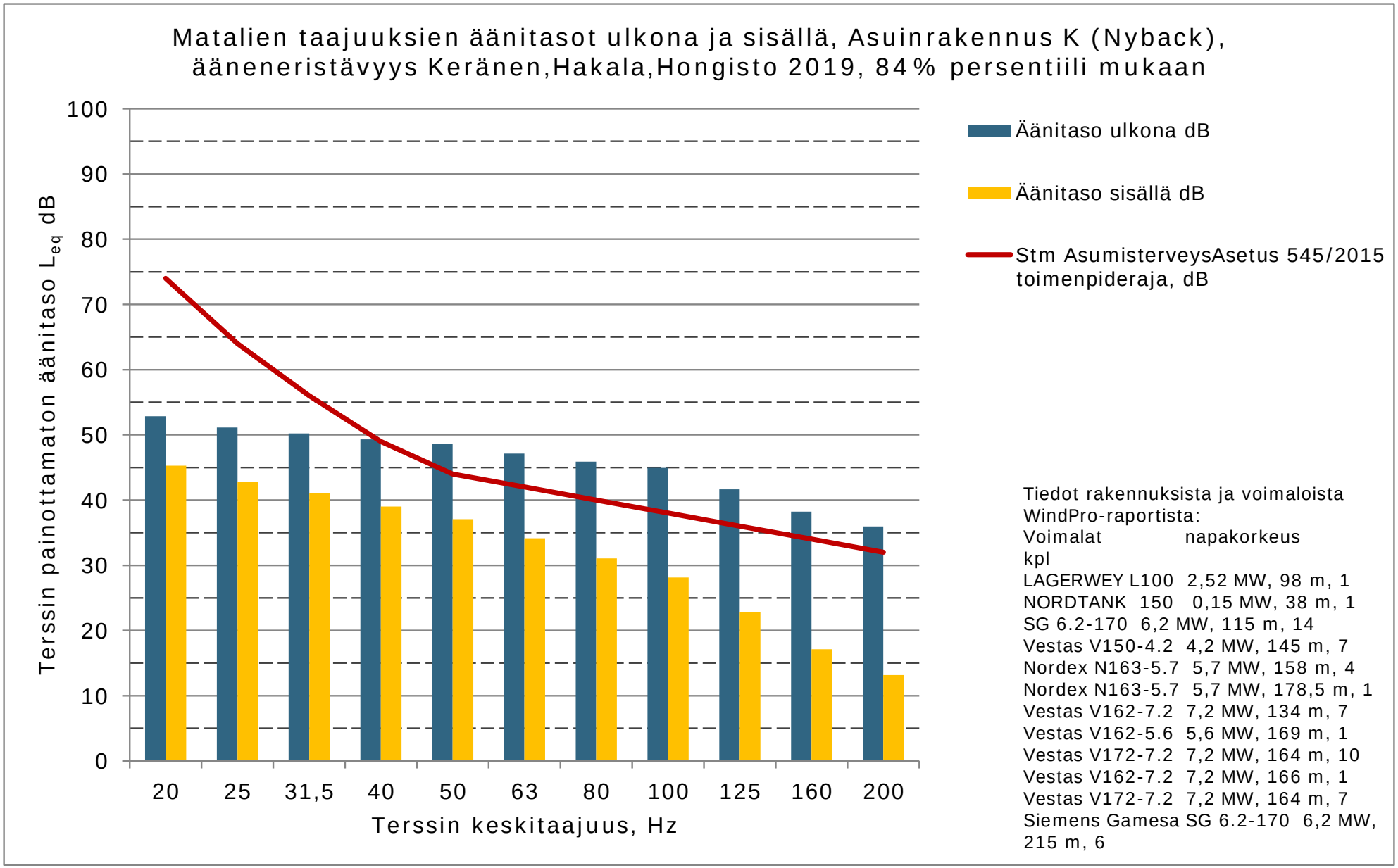
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Hagabacktået 71), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan



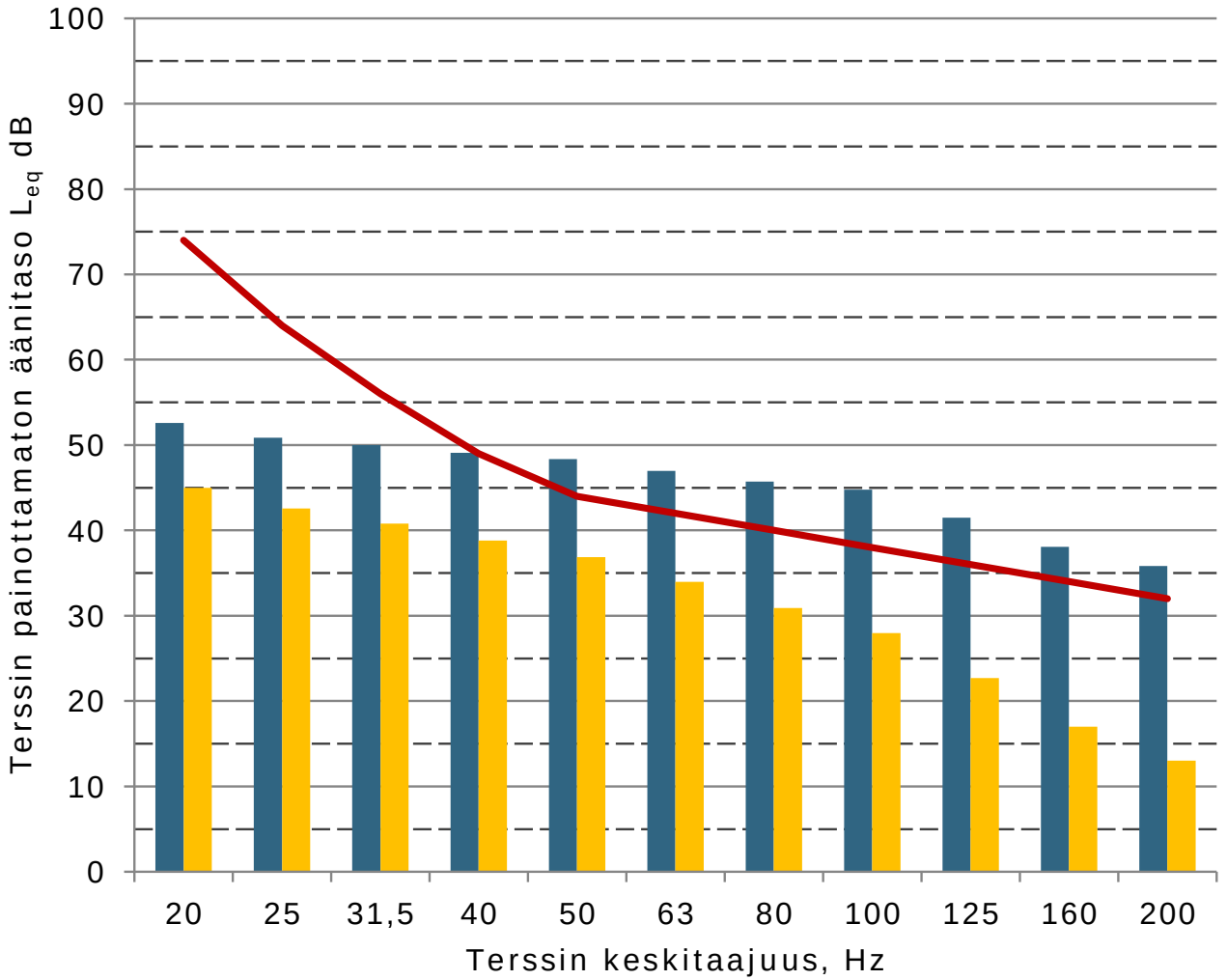


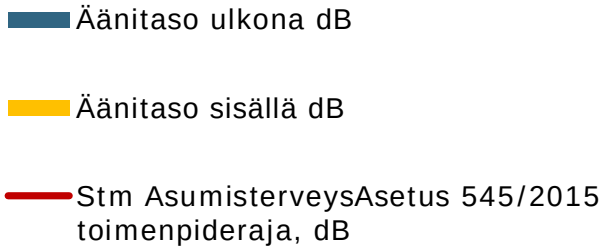
Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	6


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Nyback), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

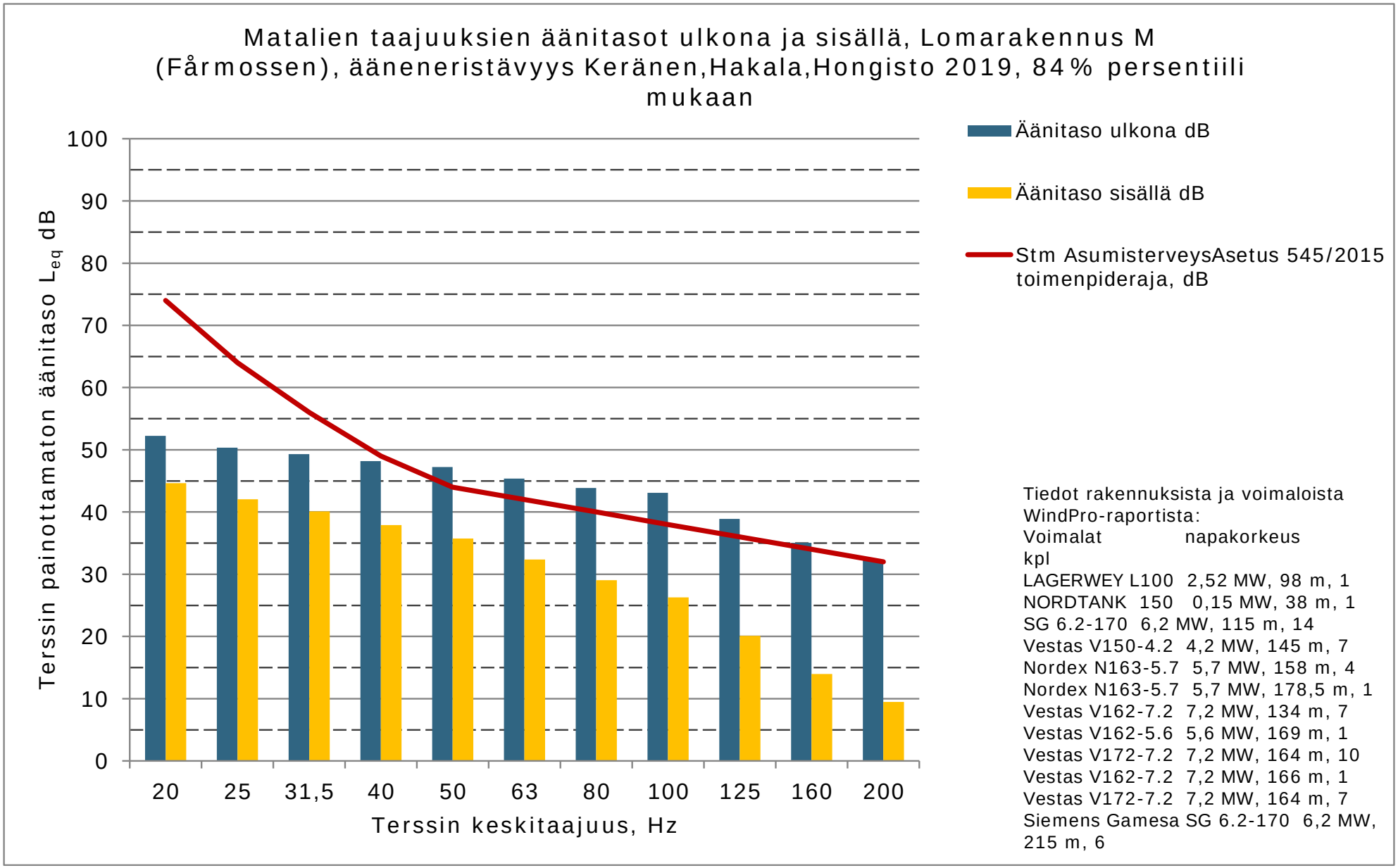
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Kimo Skogsbilvdg 55), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan

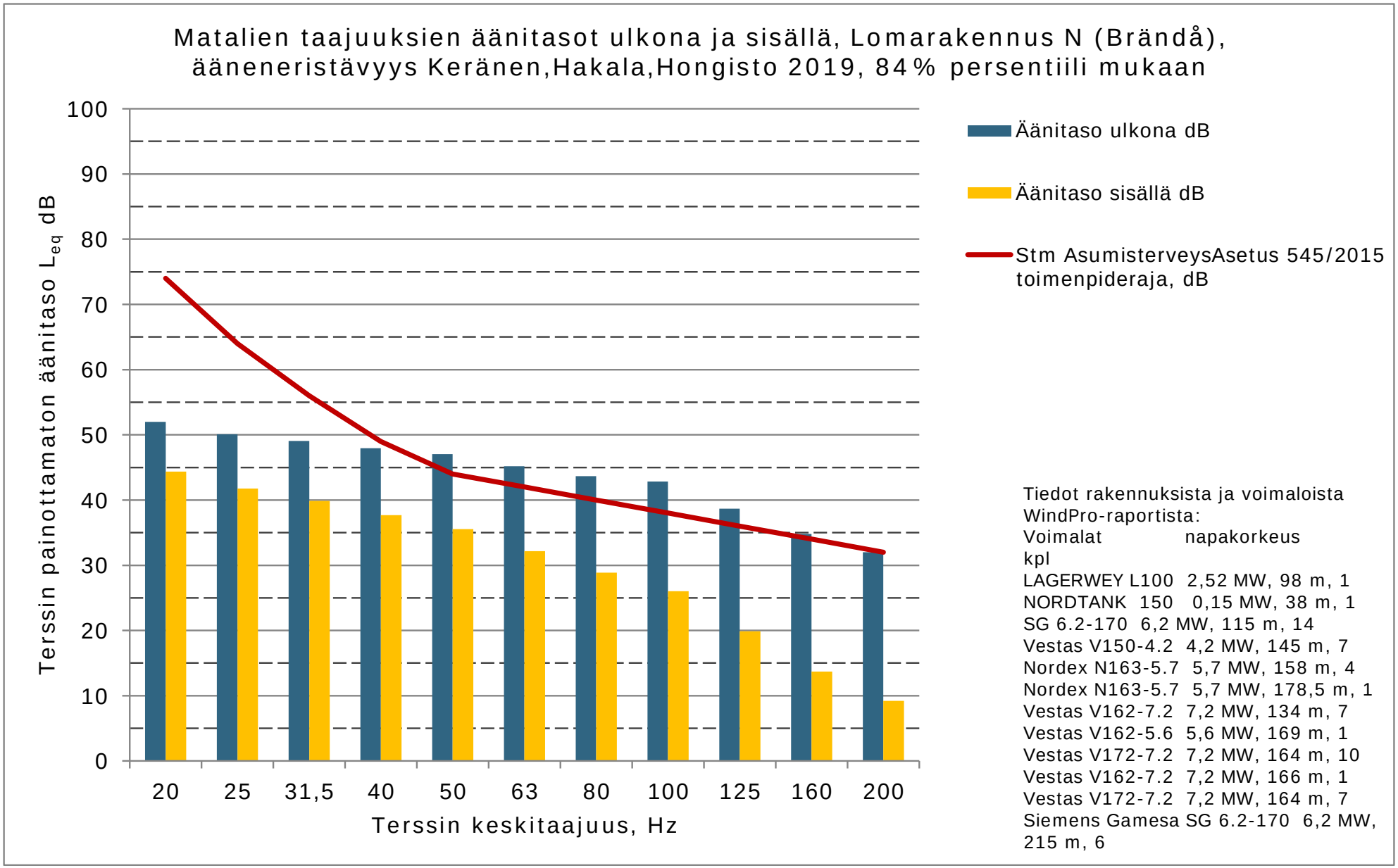




Tiedot rakennuksista ja voimaloista WindPro-raportista:

Voimalat	napakorkeus	kpl
LAGERWEY L100	2,52 MW, 98 m,	1
NORDTANK 150	0,15 MW, 38 m,	1
SG 6.2-170	6,2 MW, 115 m,	14
Vestas V150-4.2	4,2 MW, 145 m,	7
Nordex N163-5.7	5,7 MW, 158 m,	4
Nordex N163-5.7	5,7 MW, 178,5 m,	1
Vestas V162-7.2	7,2 MW, 134 m,	7
Vestas V162-5.6	5,6 MW, 169 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	10
Vestas V162-7.2	7,2 MW, 166 m,	1
Vestas V172-7.2	7,2 MW, 164 m,	7
Siemens Gamesa SG 6.2-170	6,2 MW, 215 m,	6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus M (Fårmossen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Brändå), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84 % persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
LAGERWEY L100 2,52 MW, 98 m, 1
NORDTANK 150 0,15 MW, 38 m, 1
SG 6.2-170 6,2 MW, 115 m, 14
Vestas V150-4.2 4,2 MW, 145 m, 7
Nordex N163-5.7 5,7 MW, 158 m, 4
Nordex N163-5.7 5,7 MW, 178,5 m, 1
Vestas V162-7.2 7,2 MW, 134 m, 7
Vestas V162-5.6 5,6 MW, 169 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 10
Vestas V162-7.2 7,2 MW, 166 m, 1
Vestas V172-7.2 7,2 MW, 164 m, 7
Siemens Gamesa SG 6.2-170 6,2 MW, 215 m, 6

Bilaga 17. Resultat av modellering av sammantagna skuggeffekter ”real case, no forest” – Projektalternativ 1 (ALT1).

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Calculated:
24.9.2024 14.10/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

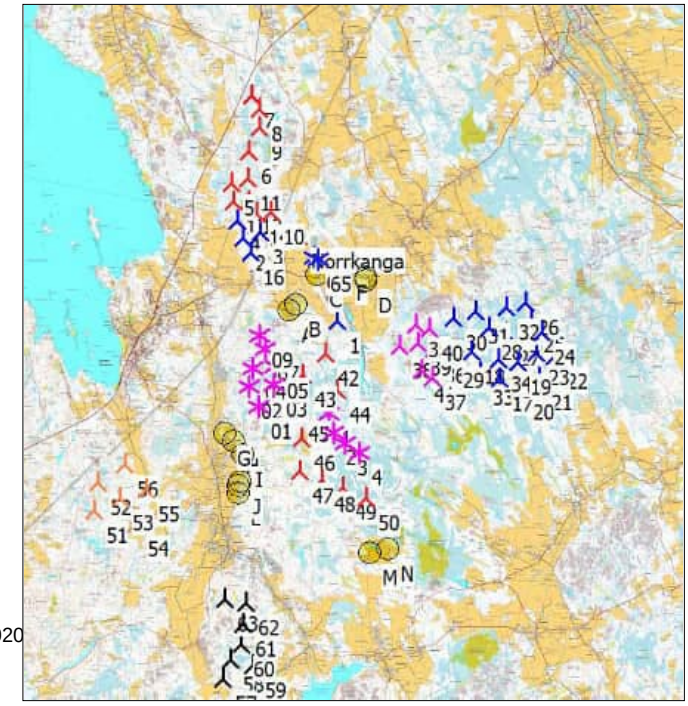
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
758	688	455	388	474	725	1 042	1 313	906	641	517	537	8 446

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:250 000

New WTG Existing WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 57...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
29	278 725	7 027 182	49,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
31	279 541	7 028 621	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 914	7 026 560	28,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	275 031	7 026 054	29,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
49	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
51	267 145	7 022 129	27,6	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
52	267 266	7 023 061	30,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
53	267 989	7 022 558	20,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
54	268 475	7 021 720	20,5	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
55	268 805	7 022 822	15,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
56	268 123	7 023 645	20,2	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
57	271 322	7 016 669	49,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
58	271 574	7 017 286	53,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
59	272 300	7 017 100	46,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
60	271 930	7 017 803	52,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
61	271 991	7 018 461	49,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
62	272 064	7 019 154	39,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
63	271 373	7 019 279	38,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
64	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
65	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V1...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	11:13
B	Asuinrakennus B (Renlund)	7:28
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	2:00
F	Asuinrakennus F (Jepuantie 675)	8:14
G	Lomarakennus G (Kullastået 64b)	6:36
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	1:39
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	6:36
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:38
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest

...continued from previous page

No.	Name	Expected [h/year]
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (249)	3:40
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (250)	0:00
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (251)	0:00
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (252)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)	1:54
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)	2:54
48	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (255)	0:00
49	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (256)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (257)	0:00
51	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (286)	0:00
52	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (287)	0:00
53	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (288)	0:00
54	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (289)	0:00
55	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (290)	0:00
56	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (291)	0:00
57	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (292)	0:00
58	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (293)	0:00
59	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (294)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
60	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (295)	0:00
61	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (296)	0:00
62	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (297)	0:00
63	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (298)	0:00
64	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:03
65	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:59

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

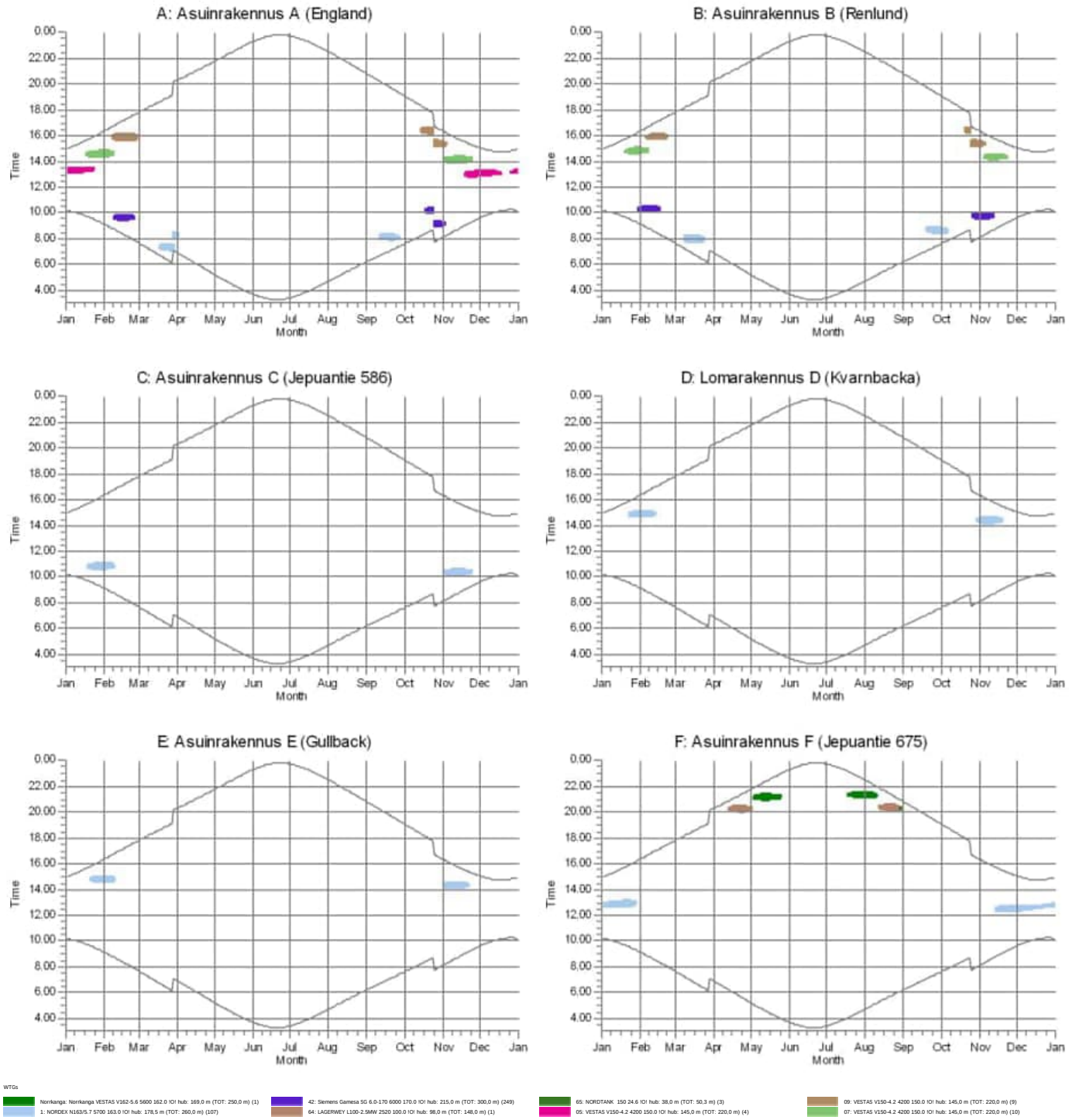
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
24.9.2024 14.10/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest



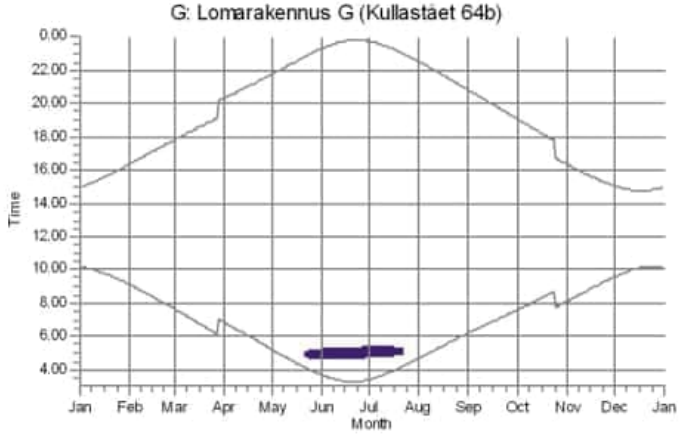
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Calculated:
24.9.2024 14.10/3.6.377

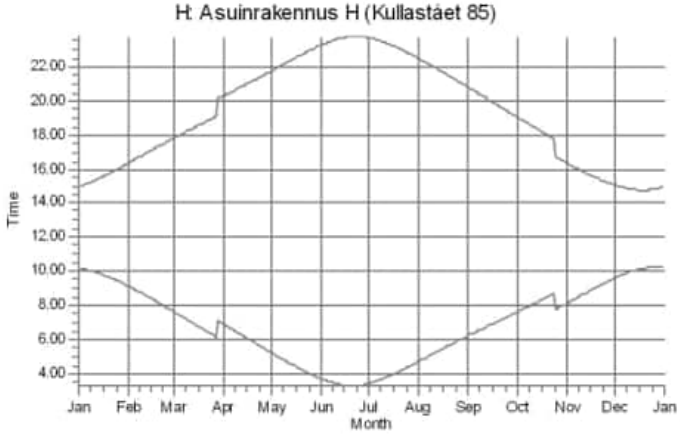
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest

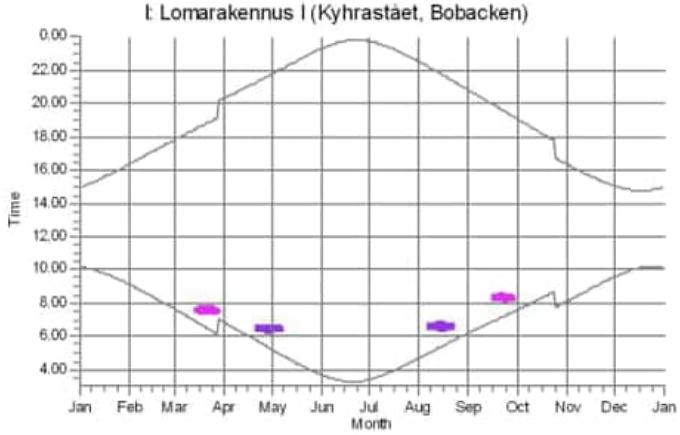
G: Lomarakennus G (Kullastäet 64b)



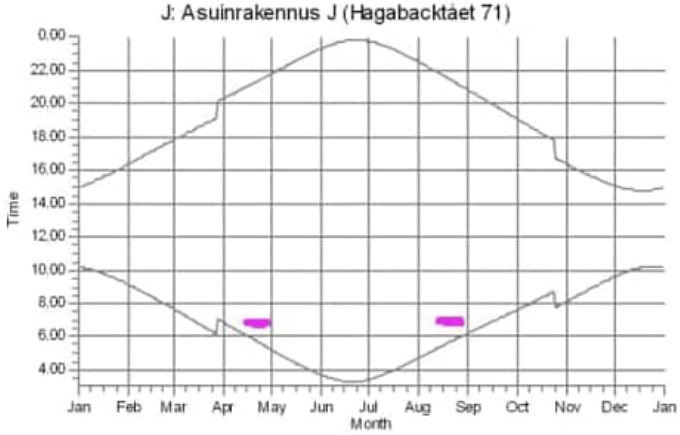
H: Asuinrakennus H (Kullastäet 85)



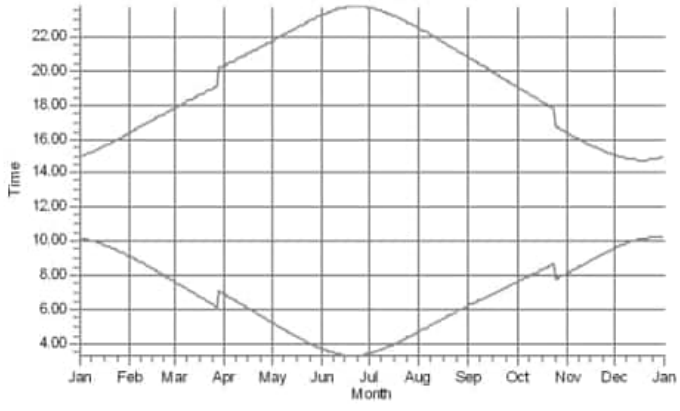
I: Lomarakennus I (Kyhrastäet, Bobacken)



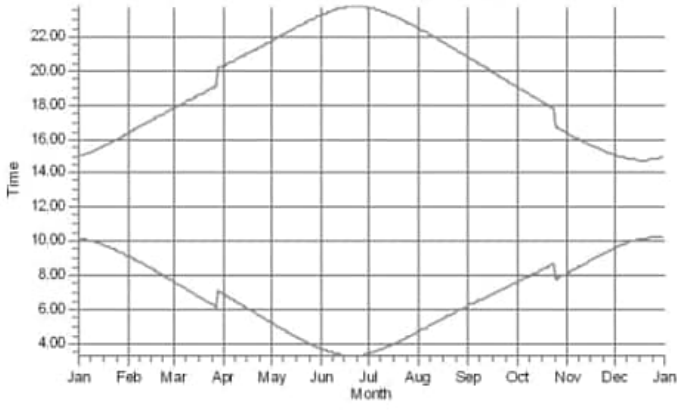
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



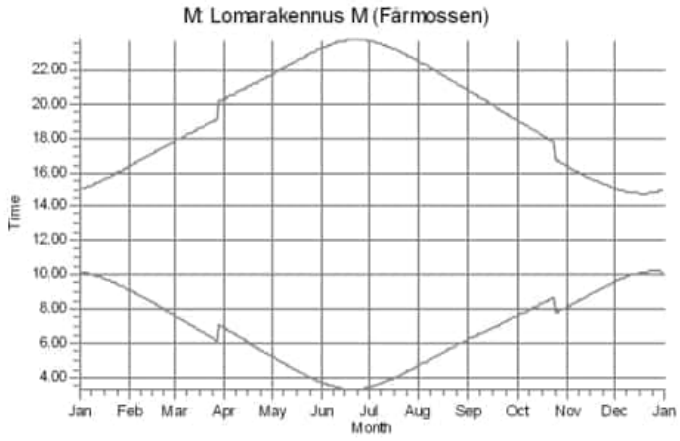
WTGs

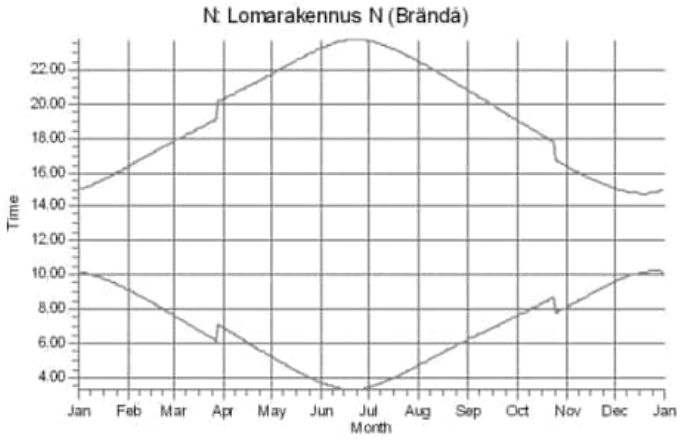
46: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (253)
47: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (254)
01: VESTAS V150-4.2 4200 150.0 IO! hub: 145,0 m (TOT: 220,0 m) (6)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest





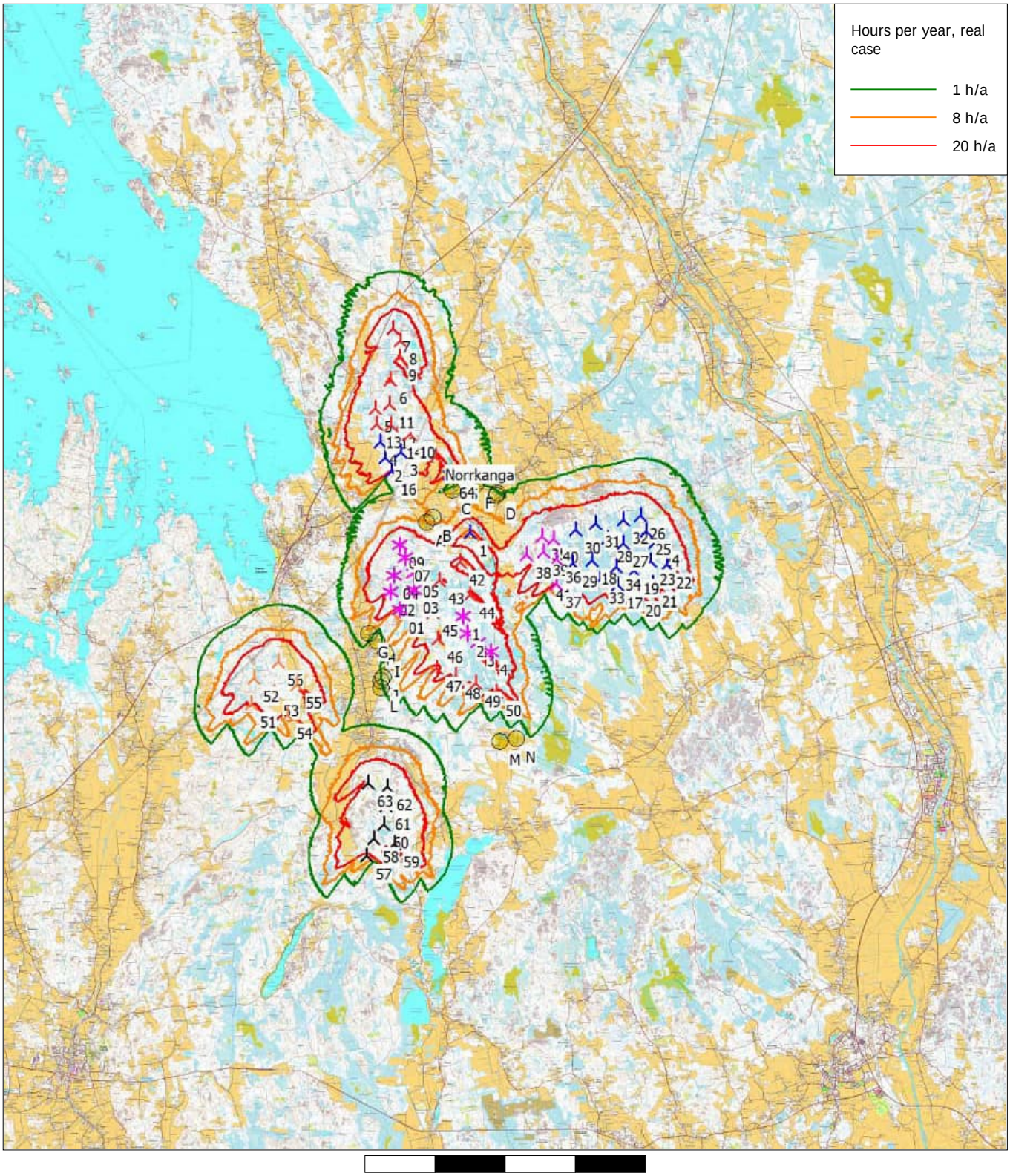
WTGs

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Calculated:
24.9.2024 14.10/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240924_No forest



Map: Peruskarttarasteri , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 140 North: 7 025 310

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 18. Resultat av modellering av sammantagna skuggeffekter ”real case, no forest” – Projektalternativ 2 (ALT2).

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Calculated:
24.9.2024 14.48/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

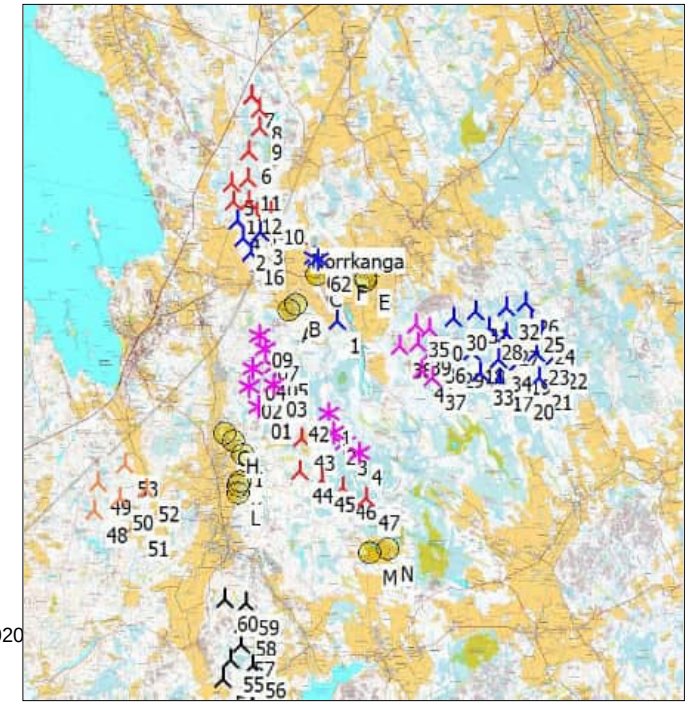
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
758	688	455	388	474	725	1 042	1 313	905	641	517	537	8 442

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:250 000

New WTG | Existing WTG | Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 57...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
29	278 725	7 027 182	49,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
31	279 541	7 028 621	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	267 145	7 022 129	27,6	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
49	267 266	7 023 061	30,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	267 989	7 022 558	20,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
51	268 475	7 021 720	20,5	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
52	268 805	7 022 822	15,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
53	268 123	7 023 645	20,2	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
54	271 322	7 016 669	49,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
55	271 574	7 017 286	53,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
56	272 300	7 017 100	46,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
57	271 930	7 017 803	52,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
58	271 991	7 018 461	49,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
59	272 064	7 019 154	39,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
60	271 373	7 019 279	38,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
61	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
62	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V1...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:22
B	Asuinrakennus B (Renlund)	5:37
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	2:00
F	Asuinrakennus F (Jepuantie 675)	8:14
G	Lomarakennus G (Kullastået 64b)	6:36
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	1:38
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	6:36
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:37
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest

...continued from previous page

No.	Name	Expected [h/year]
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (243)	0:00
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (244)	1:54
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (245)	2:53
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (246)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (247)	0:00
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (248)	0:00
48	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (286)	0:00
49	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (287)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (288)	0:00
51	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (289)	0:00
52	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (290)	0:00
53	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (291)	0:00
54	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (292)	0:00
55	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (293)	0:00
56	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (294)	0:00
57	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (295)	0:00
58	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (296)	0:00
59	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (297)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
60	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (298)	0:00
61	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
62	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:59

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

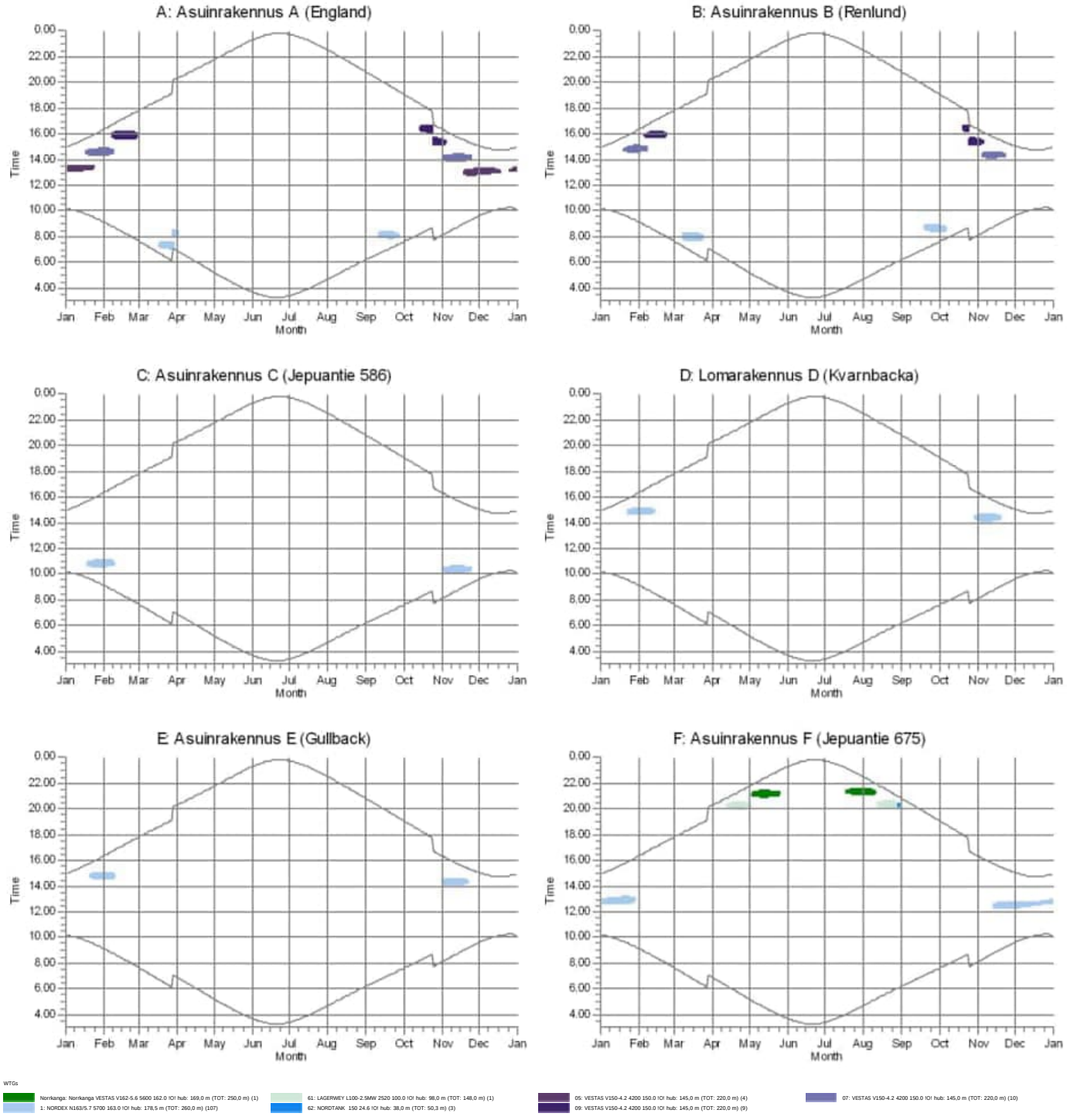
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
24.9.2024 14.48/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest



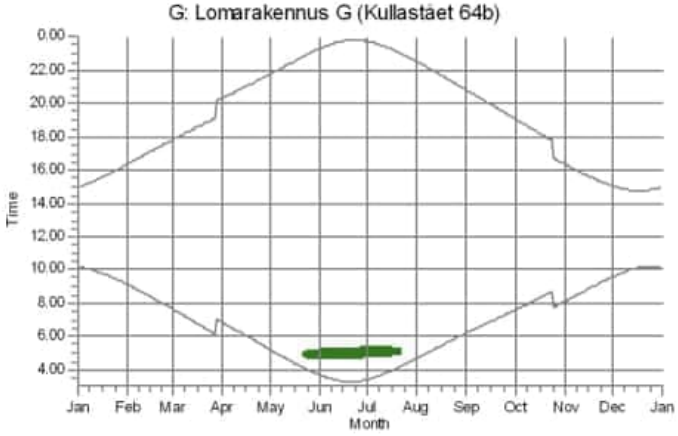
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Calculated:
24.9.2024 14.48/3.6.377

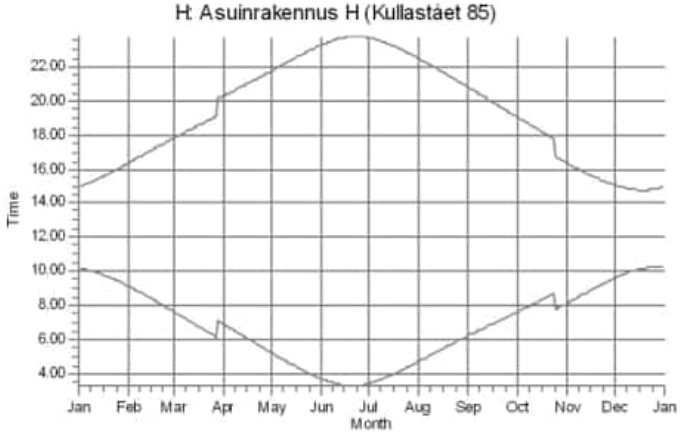
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest

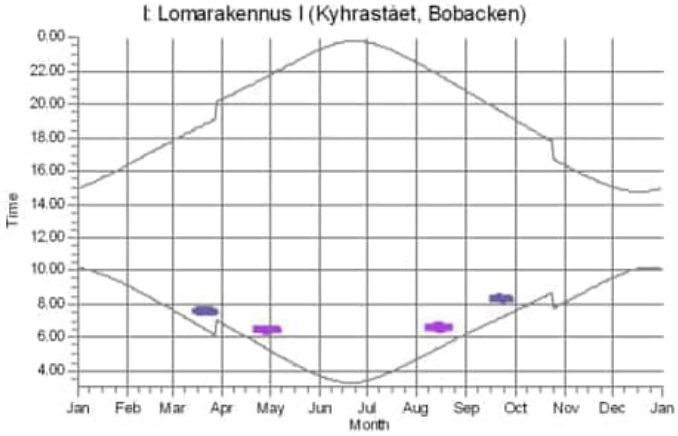
G: Lomarakennus G (Kullastäet 64b)



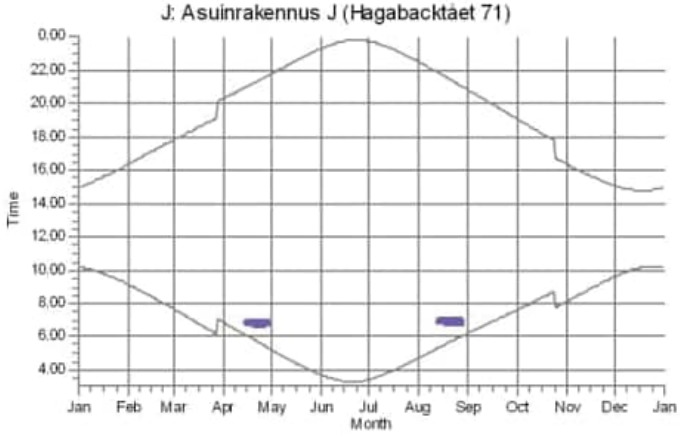
H: Asuinrakennus H (Kullastäet 85)



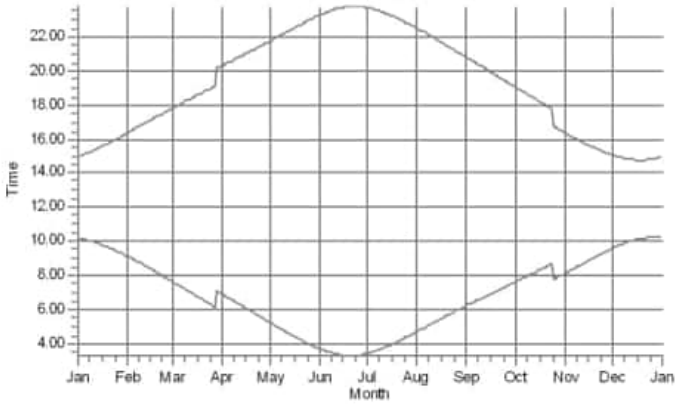
I: Lomarakennus I (Kyhrastäet, Bobacken)



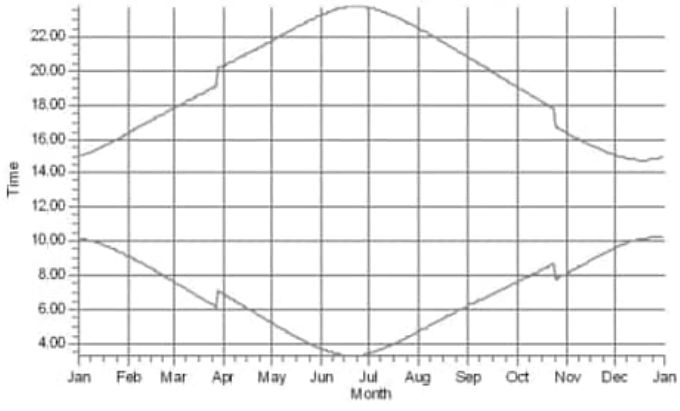
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)

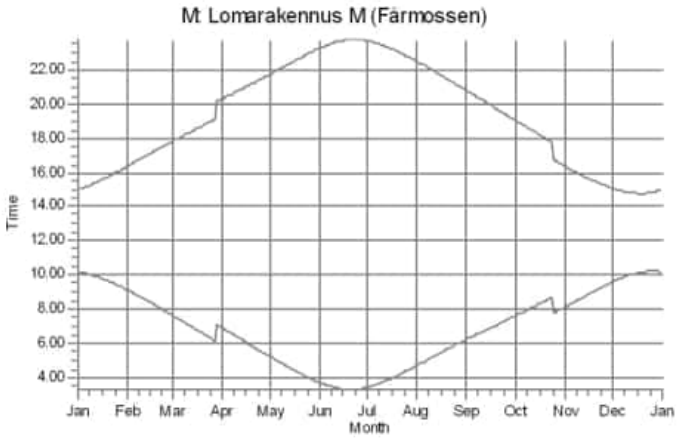


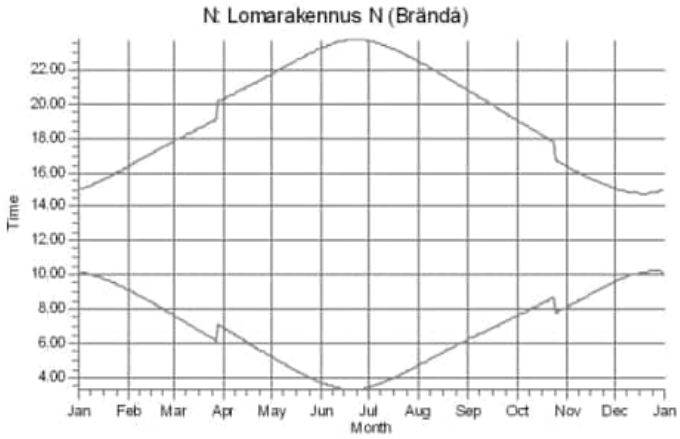


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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest





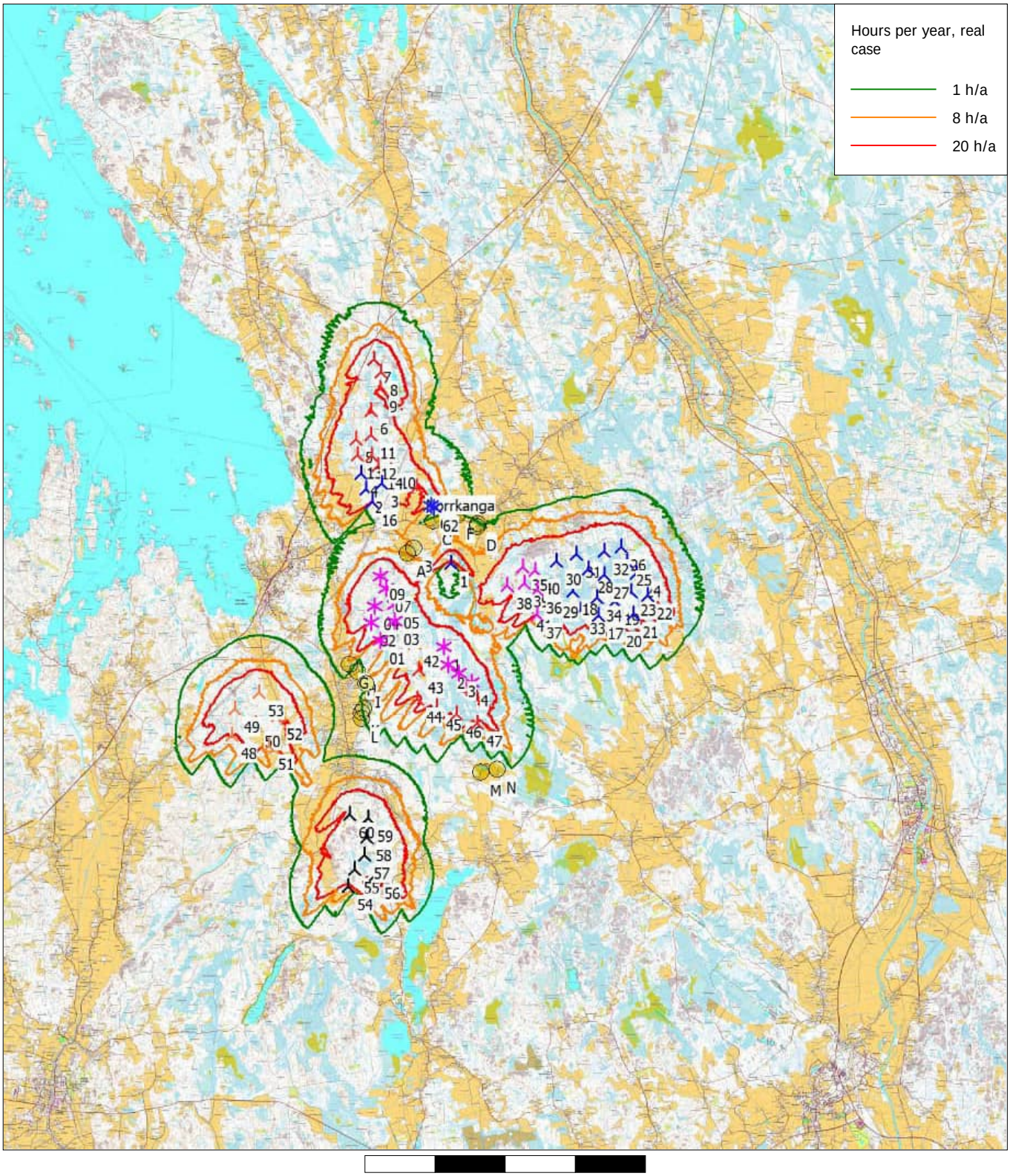
WTGs

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Calculated:
24.9.2024 14.48/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_No forest



Map: Peruskarttarasteri , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 830 North: 7 026 420

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 19. Resultat av modellering av sammantagna skuggeffekter ”real case, luke forest” – Projektalternativ 1 (ALT1).

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Calculated:
25.9.2024 10.13/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

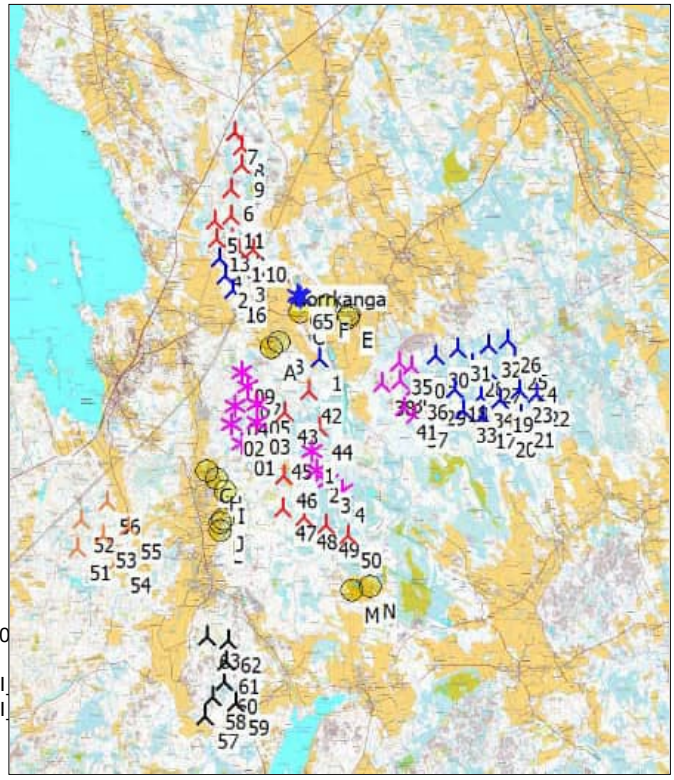
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
758	688	455	388	474	725	1 042	1 313	906	641	517	537	8 446

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI_
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI_
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 57...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
29	278 725	7 027 182	49,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	274 671	7 027 248	29,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 914	7 026 560	28,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	275 031	7 026 054	29,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
49	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
51	267 145	7 022 129	27,6	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
52	267 266	7 023 061	30,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
53	267 989	7 022 558	20,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
54	268 475	7 021 720	20,5	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
55	268 805	7 022 822	15,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
56	268 123	7 023 645	20,2	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
57	271 322	7 016 669	49,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
58	271 574	7 017 286	53,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
59	272 300	7 017 100	46,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
60	271 930	7 017 803	52,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
61	271 991	7 018 461	49,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
62	272 064	7 019 154	39,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
63	271 373	7 019 279	38,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
64	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
65	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V1...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...

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25.9.2024 10.13/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest

...continued from previous page

No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values: Shadow hours per year [h/year]
A	Asuinrakennus A (England)	11:13
B	Asuinrakennus B (Renlund)	7:28
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	2:00
F	Asuinrakennus F (Jepuantie 675)	8:14
G	Lomarakennus G (Kullastået 64b)	0:00
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	0:00
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:38
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest

...continued from previous page

No.	Name	Expected [h/year]
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (249)	3:40
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (250)	0:00
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (251)	0:00
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (252)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (253)	1:54
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (254)	1:14
48	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (255)	0:00
49	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (256)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (257)	0:00
51	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (286)	0:00
52	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (287)	0:00
53	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (288)	0:00
54	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (289)	0:00
55	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (290)	0:00
56	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (291)	0:00
57	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (292)	0:00
58	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (293)	0:00
59	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (294)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
60	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (295)	0:00
61	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (296)	0:00
62	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (297)	0:00
63	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (298)	0:00
64	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:03
65	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:59

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

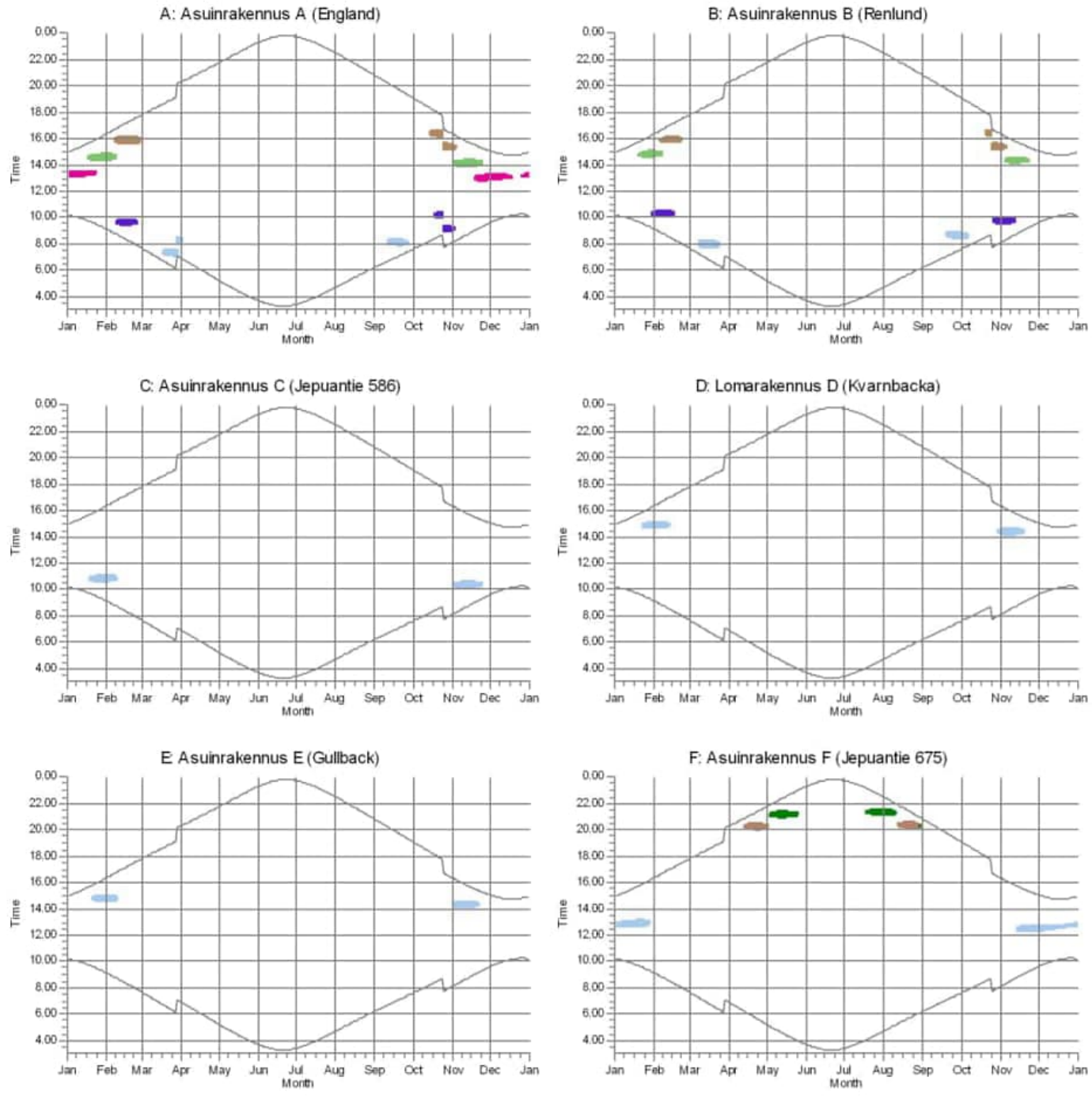
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest



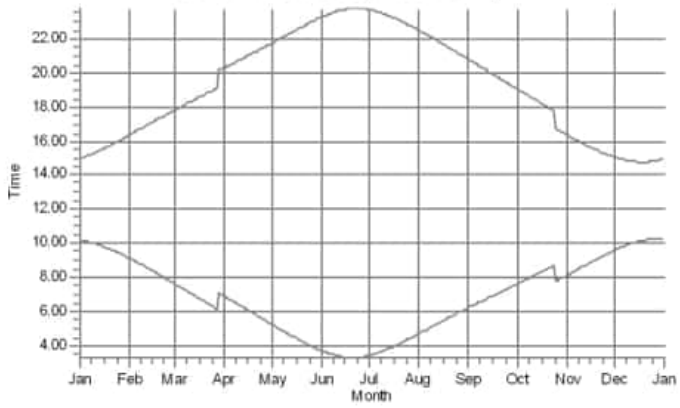
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25.9.2024 10.13/3.6.377

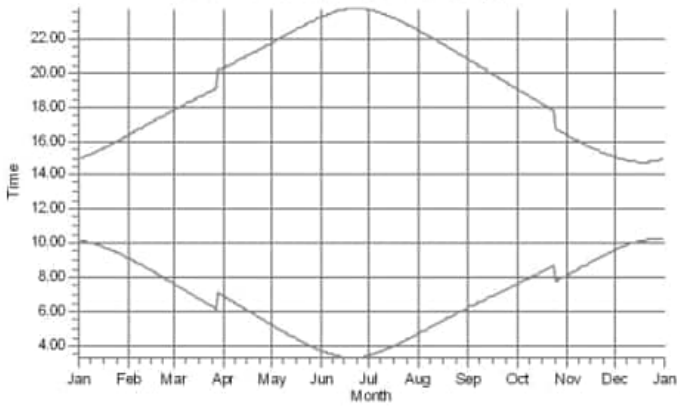
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest

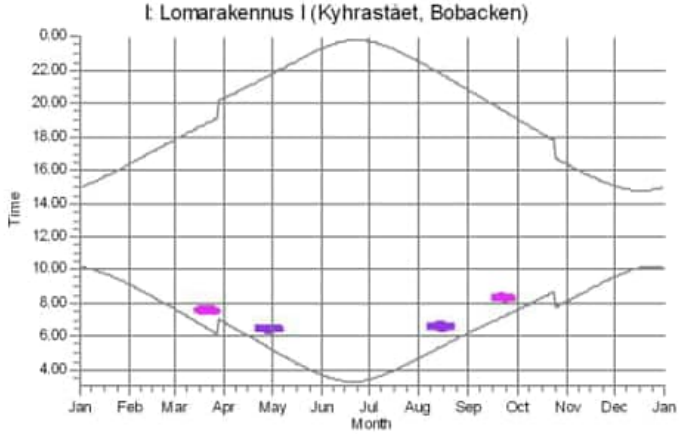
G: Lomarakennus G (Kullastäet 64b)



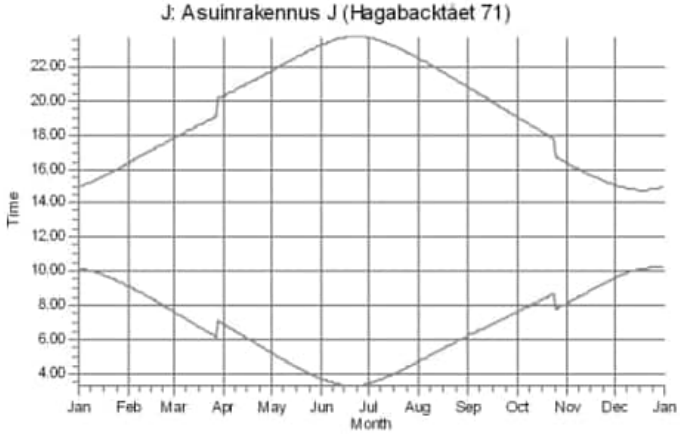
H: Asuinrakennus H (Kullastäet 85)



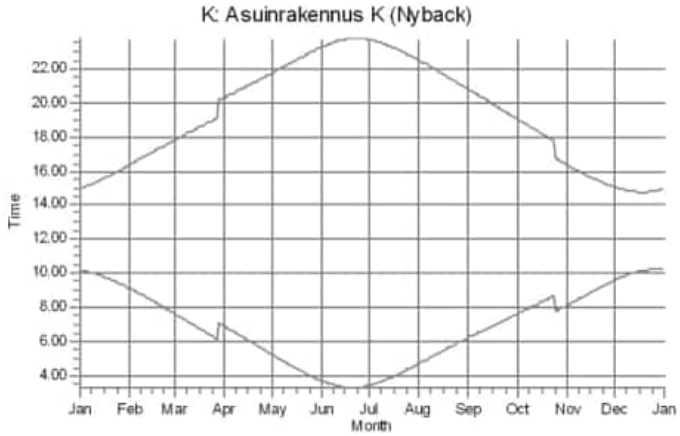
I: Lomarakennus I (Kyhrastäet, Bobacken)



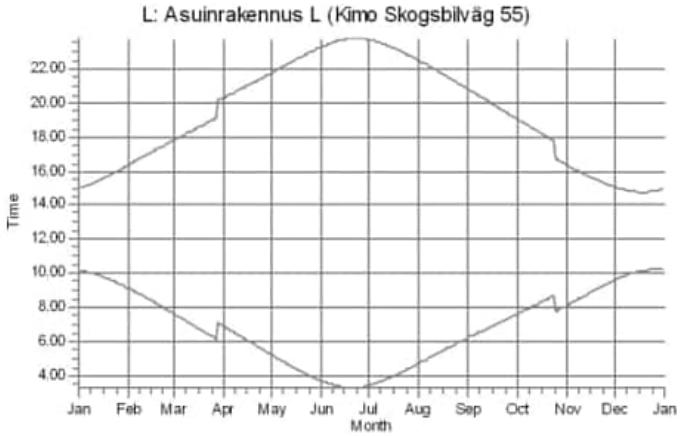
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



WTGs

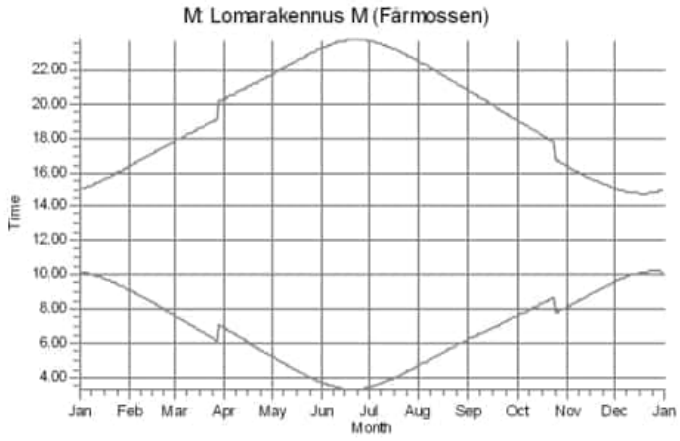
46: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (253)

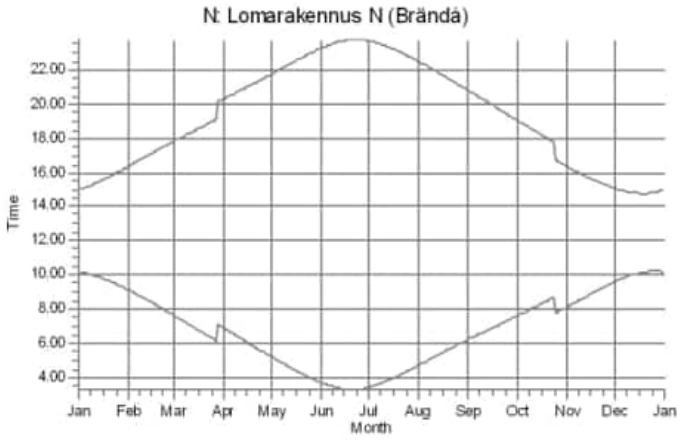
47: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (254)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest





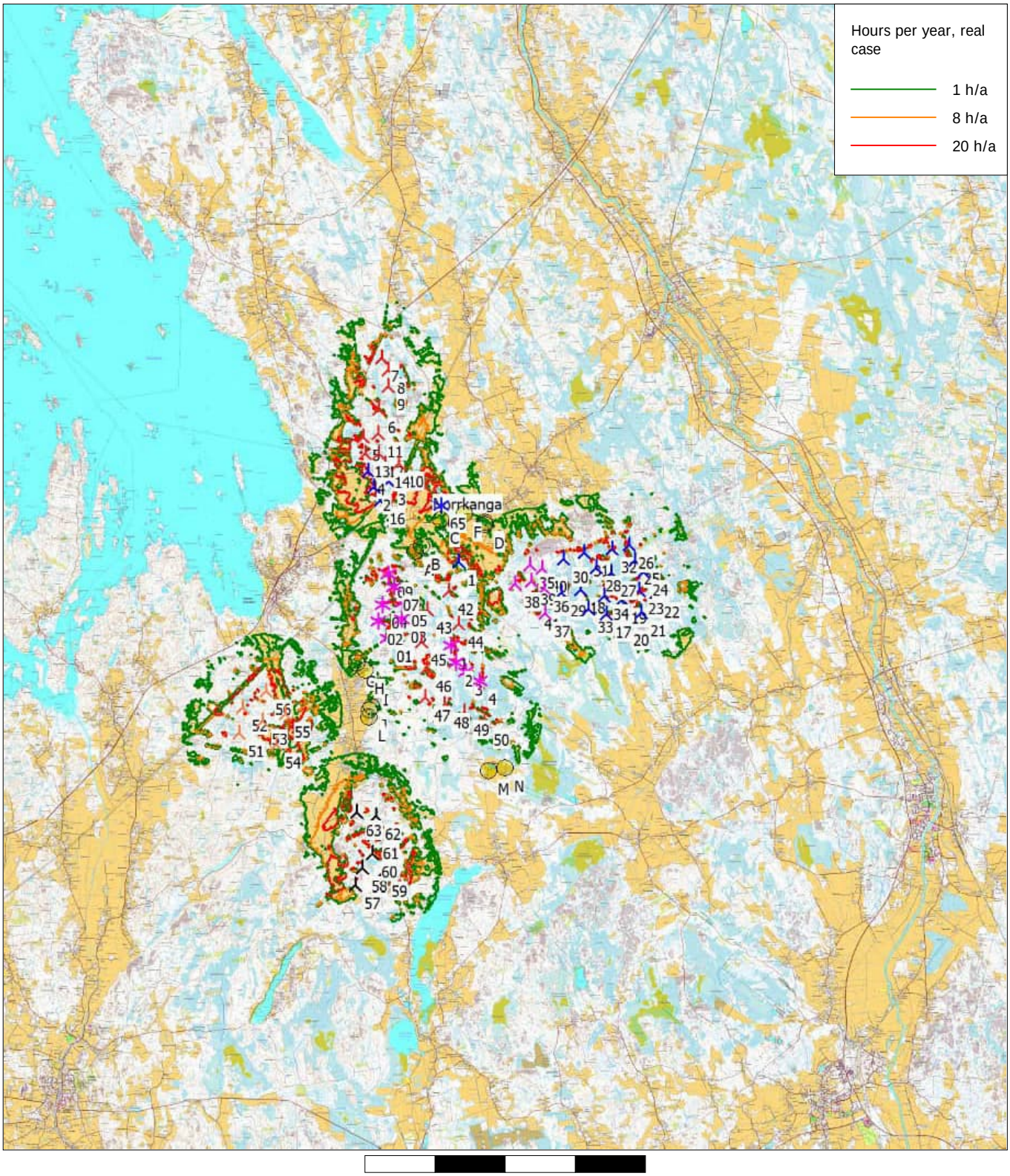
WTGs

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Calculated:
25.9.2024 10.13/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE1_Kaikki_yhteisvaikutukset_20240918_Luke forest



Map: Peruskarttarasteri , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 560 North: 7 026 360

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 20. Resultat av modellering av sammantagna skuggeffekter ”real case, luke forest” – Projektalternativ 2 (ALT2).

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25.9.2024 8.48/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

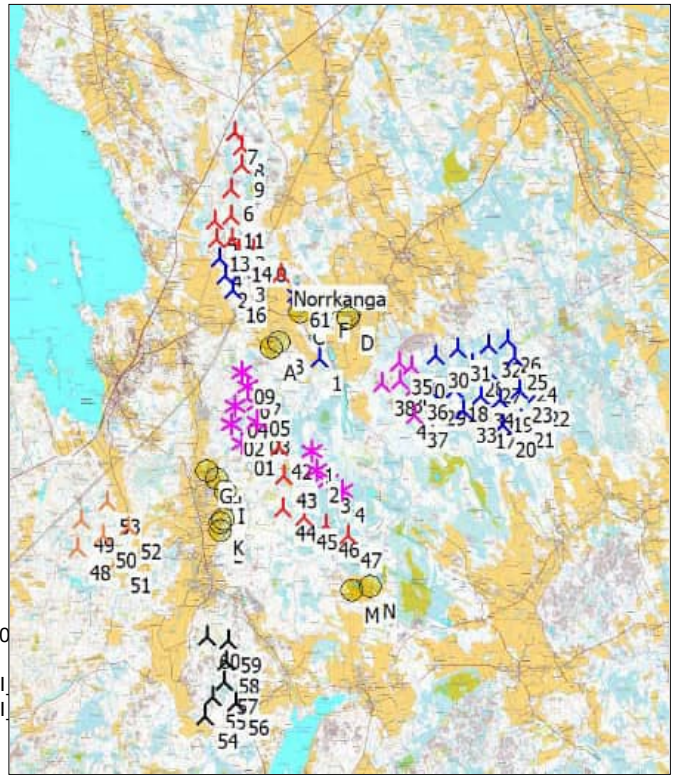
Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N63,50_E022,50 (87)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
758	688	455	388	474	725	1 042	1 313	905	641	517	537	8 442

Idle start wind speed: Cut in wind speed from power curve
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_Mörknässkogen_2020
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI_
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): ZVI_
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
01	272 483	7 025 533	30,3	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
02	272 153	7 026 165	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
03	272 991	7 026 229	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
04	272 290	7 026 759	26,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
05	273 002	7 026 818	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
07	272 700	7 027 390	30,0	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
09	272 494	7 027 846	25,1	VESTAS V150-4.2 420...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	145,0	1 899	10,4
1	275 027	7 028 285	22,6	NORDEX N163/5.7 57...	Yes	NORDEX	N163/5.7-5 700	5 700	163,0	178,5	1 783	10,7
1	274 763	7 025 285	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
10	272 876	7 031 835	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
11	272 142	7 032 911	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
12	272 176	7 032 174	25,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
13	271 677	7 032 186	20,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
14	272 407	7 031 814	22,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
16	272 217	7 030 505	17,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
17	280 336	7 026 417	51,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
18	279 422	7 027 294	47,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
19	280 918	7 026 942	43,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
2	271 975	7 030 974	19,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
2	274 926	7 024 666	32,5	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
20	280 996	7 026 139	45,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
21	281 600	7 026 467	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
22	282 102	7 027 147	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
23	281 524	7 027 270	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
24	281 681	7 027 926	43,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
25	281 366	7 028 337	44,7	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
26	281 165	7 028 894	38,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
27	280 535	7 027 893	42,5	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	164,0	1 904	10,4
28	279 986	7 028 096	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
29	278 725	7 027 182	49,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
3	272 536	7 031 182	18,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
3	275 298	7 024 342	35,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
30	278 813	7 028 386	45,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
31	279 541	7 028 621	42,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
32	280 544	7 028 746	40,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
33	279 701	7 026 603	52,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
34	280 279	7 027 063	50,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	9,5
35	277 608	7 028 174	38,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
36	278 121	7 027 346	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
37	278 137	7 026 442	44,6	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
38	277 063	7 027 491	34,4	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
39	277 660	7 027 585	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
4	271 789	7 031 536	17,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
4	275 772	7 024 008	40,0	NORDEX N163/5.X 57...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	158,0	1 785	10,7
40	278 041	7 028 049	43,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
41	277 778	7 026 710	45,0	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	162,0	134,0	2 043	9,5
42	273 706	7 025 416	34,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
43	273 877	7 024 480	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
44	273 828	7 023 413	40,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
45	274 526	7 023 150	36,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
46	275 242	7 022 891	37,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
47	275 965	7 022 551	42,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170-6 000	6 000	170,0	215,0	2 033	8,8
48	267 145	7 022 129	27,6	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
49	267 266	7 023 061	30,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
5	271 608	7 032 764	15,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
50	267 989	7 022 558	20,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
51	268 475	7 021 720	20,5	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
52	268 805	7 022 822	15,0	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
53	268 123	7 023 645	20,2	Generic RD200 7.2M...	Yes	Generic	RD200 7.2MW-7 200	7 200	200,0	200,0	2 034	10,4
54	271 322	7 016 669	49,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
55	271 574	7 017 286	53,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
56	272 300	7 017 100	46,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
57	271 930	7 017 803	52,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
58	271 991	7 018 461	49,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
59	272 064	7 019 154	39,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
6	272 158	7 033 787	24,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
60	271 373	7 019 279	38,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-10 000	10 000	200,0	200,0	2 089	10,4
61	274 303	7 030 363	16,9	LAGERWEY L100-2.5...	Yes	LAGERWEY	L100-2.5MW-2 520	2 520	100,0	98,0	1 530	15,2
62	274 404	7 030 306	17,5	NORDTANK 150 24.6...	No	NORDTANK	-150	150	24,6	38,0	100 000	38,0
7	272 266	7 035 627	26,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
8	272 507	7 035 178	27,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
9	272 494	7 034 589	30,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6 200	6 200	170,0	115,0	2 041	8,8
Norrkanga	273 791	7 031 042	14,7	Norrkanga VESTAS V1...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	169,0	1 993	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (England)	273 465	7 028 646	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Renlund)	273 705	7 028 841	18,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Jepuantie 586)	274 394	7 029 806	16,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Kvarnbacka)	275 975	7 029 617	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Gullback)	275 990	7 029 707	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Jepuantie 675)	275 245	7 030 019	18,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Kullastået 64b)	271 374	7 024 647	17,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kullastået 85)	271 670	7 024 391	18,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Kyhrastået, Bobacken)	271 978	7 023 969	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Hagabacktået 71)	271 898	7 023 073	24,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Nyback)	271 822	7 022 950	20,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Kimo Skogsbilväg 55)	271 811	7 022 704	20,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Fårmossen)	276 103	7 020 778	45,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Brändå)	276 693	7 020 888	47,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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Calculated:
25.9.2024 8.48/3.6.377

SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (England)	9:22
B	Asuinrakennus B (Renlund)	5:37
C	Asuinrakennus C (Jepuantie 586)	2:07
D	Lomarakennus D (Kvarnbacka)	2:13
E	Asuinrakennus E (Gullback)	2:00
F	Asuinrakennus F (Jepuantie 675)	8:14
G	Lomarakennus G (Kullastået 64b)	0:00
H	Asuinrakennus H (Kullastået 85)	0:00
I	Lomarakennus I (Kyhrastået, Bobacken)	3:08
J	Asuinrakennus J (Hagabacktået 71)	0:00
K	Asuinrakennus K (Nyback)	0:00
L	Asuinrakennus L (Kimo Skogsbilväg 55)	0:00
M	Lomarakennus M (Fårmossen)	0:00
N	Lomarakennus N (Brändå)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
01	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (6)	0:00
02	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (5)	0:00
03	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (7)	0:00
04	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (8)	0:00
05	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (4)	2:02
07	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (10)	3:19
09	VESTAS V150-4.2 4200 150.0 !O! hub: 145,0 m (TOT: 220,0 m) (9)	3:16
1	NORDEX N163/5.7 5700 163.0 !O! hub: 178,5 m (TOT: 260,0 m) (107)	11:37
1	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (11)	0:00
10	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (12)	0:00
11	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (13)	0:00
12	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (14)	0:00
13	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (15)	0:00
14	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (16)	0:00
16	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (110)	0:00
17	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (131)	0:00
18	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (132)	0:00
19	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (133)	0:00
2	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (4)	0:00
2	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (12)	0:00
20	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (134)	0:00
21	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (135)	0:00
22	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (136)	0:00
23	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (137)	0:00
24	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (138)	0:00
25	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (139)	0:00
26	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (140)	0:00
27	VESTAS V172-7.2 7200 172.0 !O! hub: 164,0 m (TOT: 250,0 m) (141)	0:00
28	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (142)	0:00
29	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (143)	0:00
3	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (5)	0:00
3	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (13)	0:00
30	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (144)	0:00
31	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (145)	0:00
32	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (146)	0:00
33	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (147)	0:00
34	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (148)	0:00
35	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (149)	0:00
36	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (150)	0:00
37	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (151)	0:00
38	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (152)	0:00
39	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (153)	0:00
4	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (6)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest

...continued from previous page

No.	Name	Expected [h/year]
4	NORDEX N163/5.X 5700 163.0 !O! hub: 158,0 m (TOT: 239,5 m) (14)	0:00
40	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (154)	0:00
41	VESTAS V162-7.2 7200 162.0 !O! hub: 134,0 m (TOT: 215,0 m) (155)	0:00
42	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (243)	0:00
43	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (244)	1:54
44	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (245)	1:14
45	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (246)	0:00
46	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (247)	0:00
47	Siemens Gamesa SG 6.0-170 6000 170.0 !O! hub: 215,0 m (TOT: 300,0 m) (248)	0:00
48	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (286)	0:00
49	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (287)	0:00
5	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (7)	0:00
50	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (288)	0:00
51	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (289)	0:00
52	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (290)	0:00
53	Generic RD200 7.2MW 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (291)	0:00
54	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (292)	0:00
55	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (293)	0:00
56	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (294)	0:00
57	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (295)	0:00
58	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (296)	0:00
59	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (297)	0:00
6	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (8)	0:00
60	Generic RD200 HH200 10000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (298)	0:00
61	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 98,0 m (TOT: 148,0 m) (1)	2:02
62	NORDTANK 150 24.6 !O! hub: 38,0 m (TOT: 50,3 m) (3)	0:00
7	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (9)	0:00
8	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (10)	0:00
9	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (11)	0:00
Norrkanga	Norrkanga VESTAS V162-5.6 5600 162.0 !O! hub: 169,0 m (TOT: 250,0 m) (1)	2:59

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

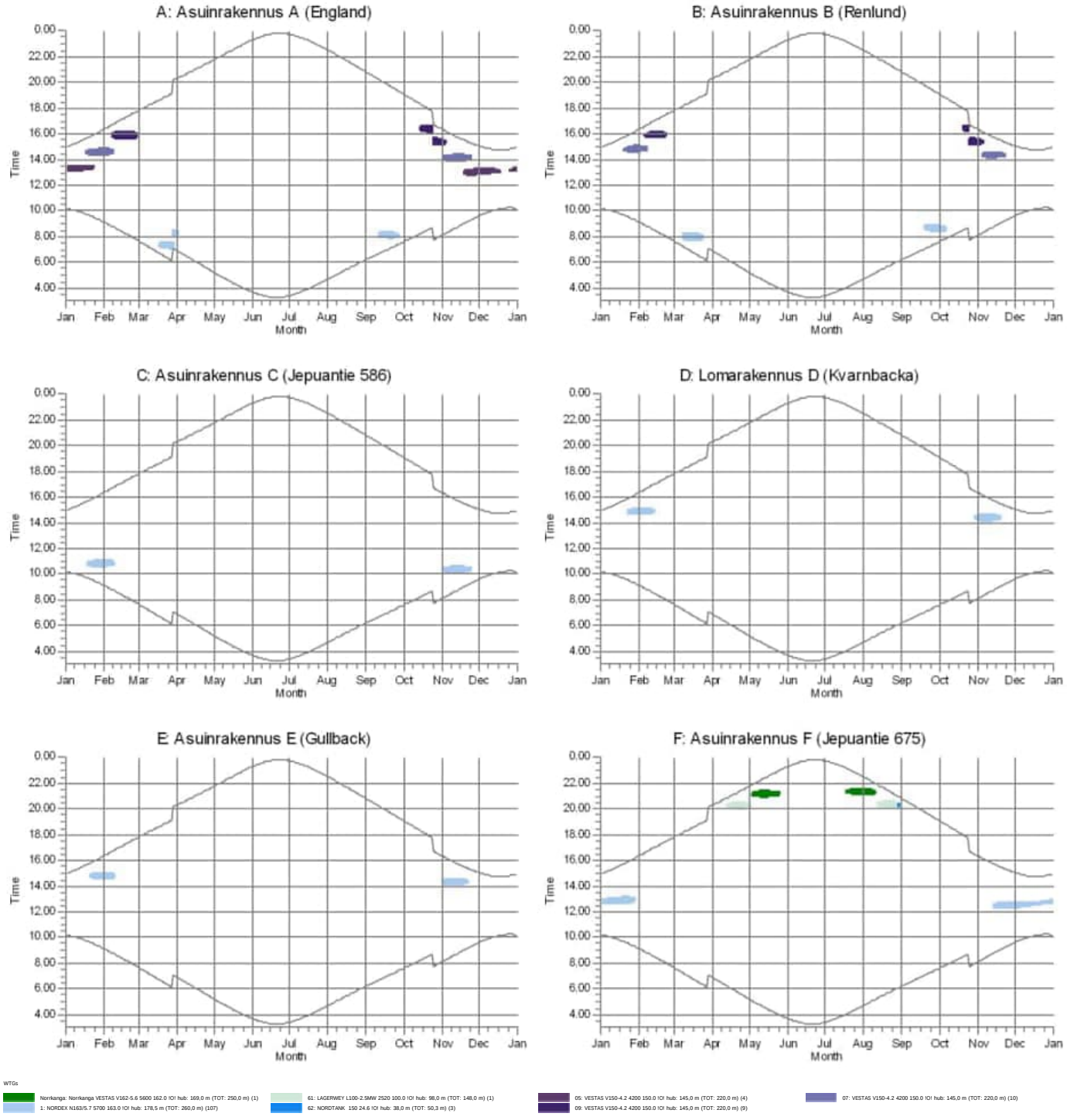
The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Calculated:
25.9.2024 8.48/3.6.377

SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest



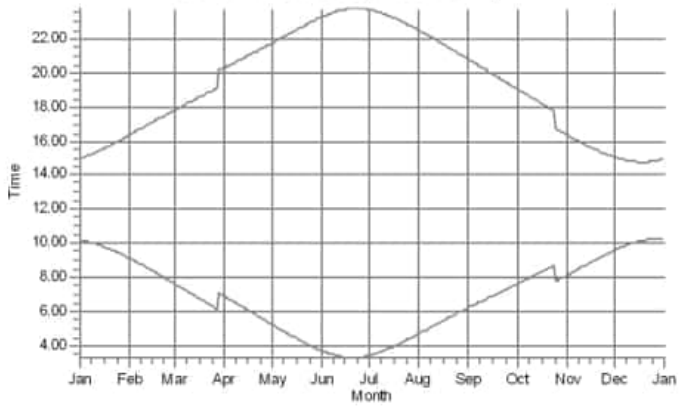
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25.9.2024 8.48/3.6.377

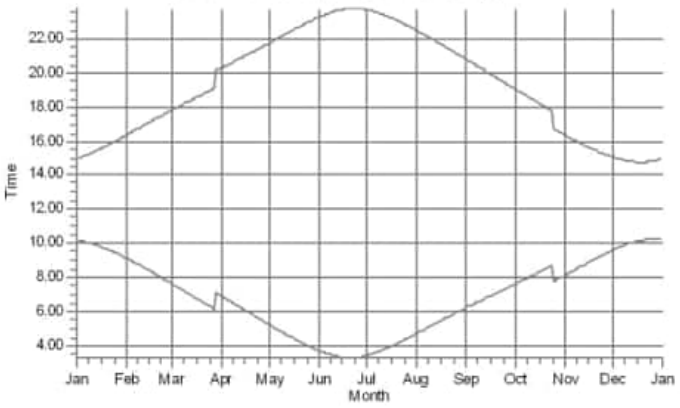
SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest

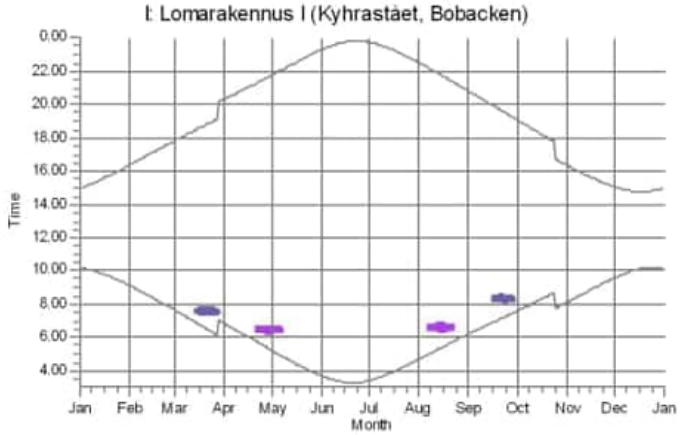
G: Lomarakennus G (Kullastäet 64b)



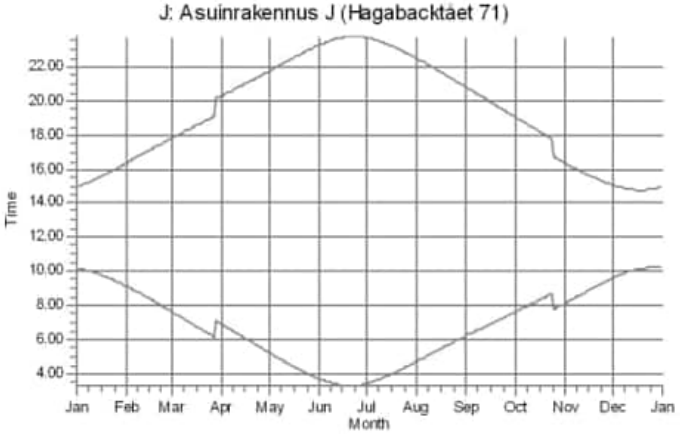
H: Asuinrakennus H (Kullastäet 85)



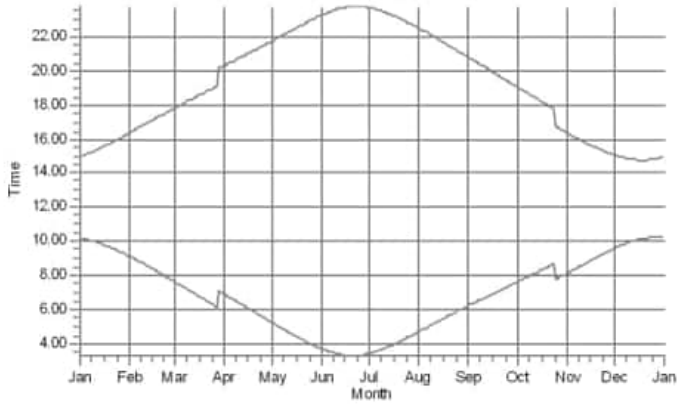
I: Lomarakennus I (Kyhrastäet, Bobacken)



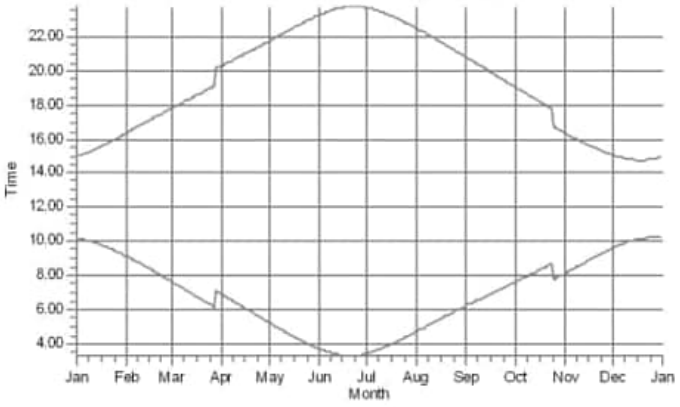
J: Asuinrakennus J (Hagabacktäet 71)



K: Asuinrakennus K (Nyback)



L: Asuinrakennus L (Kimo Skogsbilväg 55)



WTGs

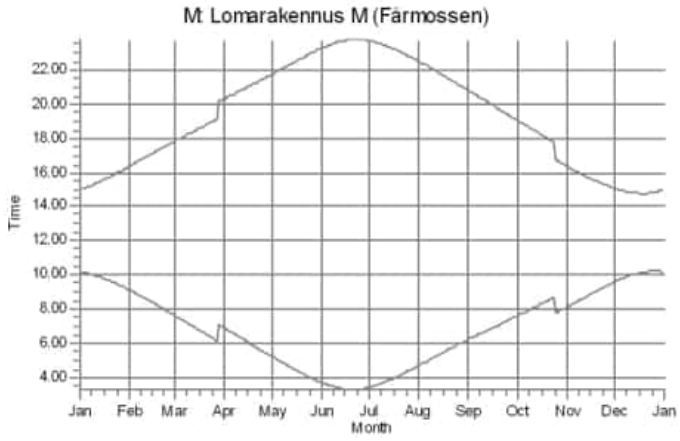
43: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (244)

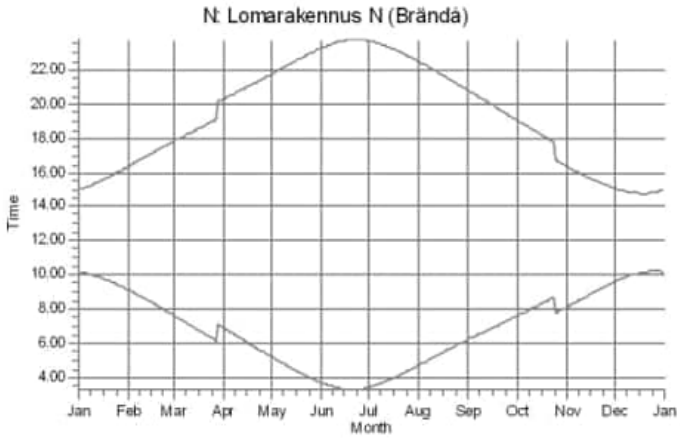
44: Siemens Gamesa SG 6.0-170 6000 170.0 IO! hub: 215,0 m (TOT: 300,0 m) (245)

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SHADOW - Calendar, graphical

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest





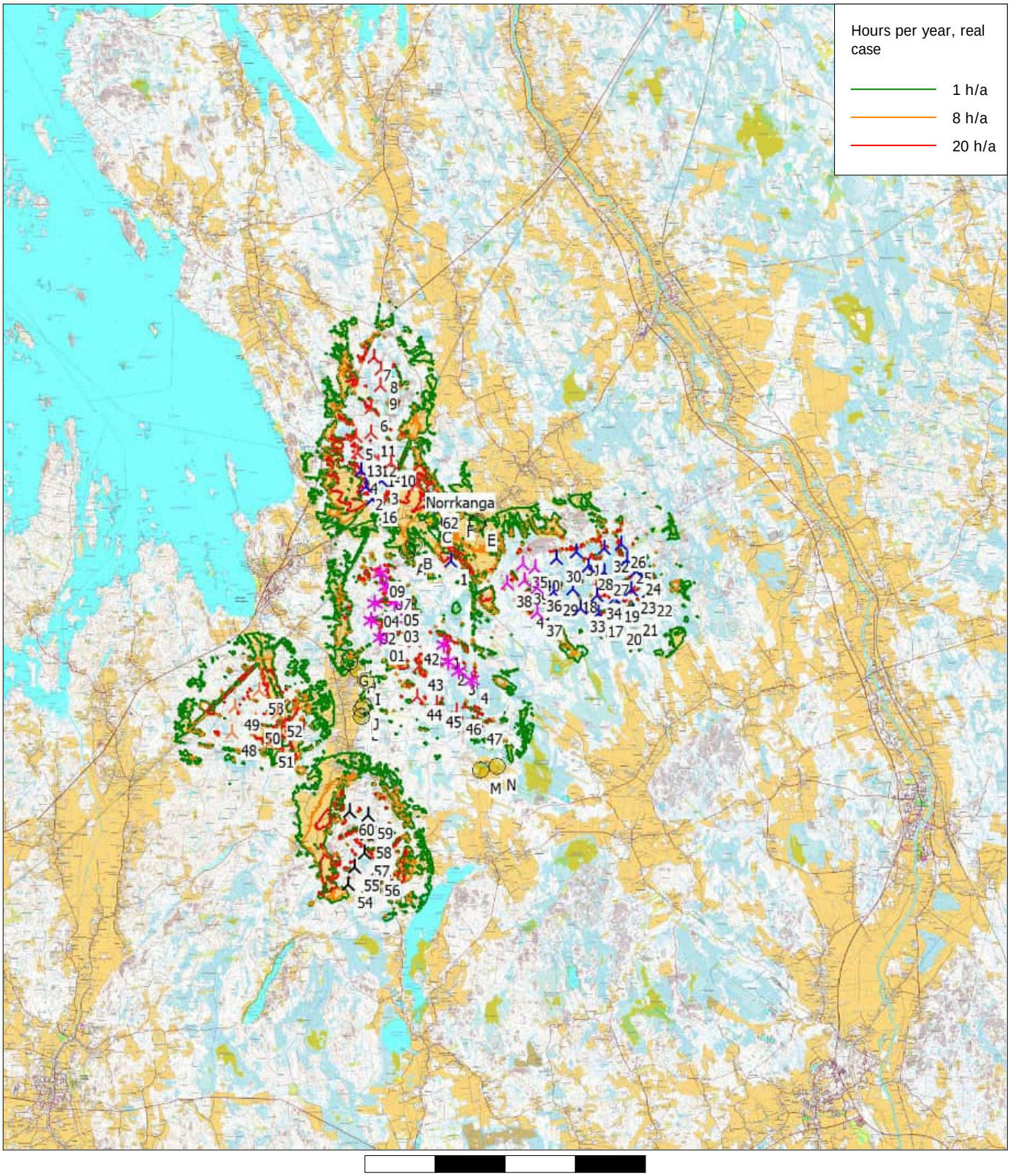
WTGs

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Calculated:
25.9.2024 8.48/3.6.377

SHADOW - Map

Calculation: Vargitmossen_VE2_Kaikki_yhteisvaikutukset_20240918_Luke forest



Map: Peruskarttarasteri , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 274 830 North: 7 026 330

New WTG Existing WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Mörknässkogen_2020_1.wpo (3)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m