

ABO Wind Oy

## Purmon tuulivoimahanke

Melu- ja varjostusmallinnusraportti

13.2.2023

---

## Sisällysluettelo

1	MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET .....	1
2	LÄHTÖTIEDOT JA MENETELMÄT .....	1
2.1	Melu.....	1
2.1.1	Melumallinnus ISO 9613-2 .....	1
2.1.2	Matalataajuinen melu.....	4
2.2	Varjostusmallinnus.....	5
2.3	Raja- ja ohjearvot .....	6
2.3.1	Melu .....	6
2.3.2	Varjostus.....	7
3	MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET .....	8
3.1	Melu.....	8
3.1.1	Nykytilanne .....	8
3.1.2	Melumallinnuksen laskentatulokset.....	10
3.1.3	Nykytilanne matalataajuinen melu .....	16
3.1.4	Matalataajuiset melutasot .....	Error! Bookmark not defined.
3.2	Varjostus.....	22
3.2.1	Nykytilanne .....	22
3.2.2	Varjostusmallinnus.....	24

13.2.2023

# Purmon tuulivoimahanke

## 1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Purmon tuulivoimahankkeen hankeomistaja ABO Wind Oy suunnittelee vaihtoehdossa 1 (VE1) 43 voimalan rakentamista, vaihtoehdossa 2 (VE2) 37 voimalan rakentamista ja vaihtoehdossa 3 (VE3) 9 voimalan rakentamista Pedersöreän. Mallinuksissa on huomioitu Purmon hankkeen eteläpuolella, alle viiden kilometrin etäisyydellä sijaitse Salo-Ylikosken tuulivoimapuisto, sillä kyseisellä hankkeella on lainvoimainen osayleiskaava. Purmon hankkeen läheisyyteen alle 5 kilometrin etäisyydelle sijoittuu myös suunniteltu Kaitsarin tuulivoimahanke. Mallinnusvaiheessa Kaitsarin hankkeesta ei ollut saatavilla voimalasijoittelua eikä voimalamallia, joten Kaitsarin hankkeen kanssa aiheutuvia yhteisvaikutuksia ei voitu mallintaa. Tämä melu- ja varjostusmallinnusraportti on laadittu Purmon hankkeen YVA-menettelyvaiheen sijoitussuunnitelmien perusteella.

Tuulivoimaloiden aiheuttamia meluvaikutuksia on arvioitu WindPRO-ohjelman DECIBEL-moduulilla. Tuulivoimaloiden aiheuttamat varjostusvaikutukset on mallinnettu WindPRO-ohjelman SHADOW-moduulilla. Melu- ja varjostusmallinnukset on laatinut Henna-Riikka Rintamäki ja laaduntarkastuksen on tehnyt Johanna Harju FCG Finnish Consulting Group Oy:stä.

## 2 LÄHTÖTIEDOT JA MENETELMÄT

### 2.1 Melu

#### 2.1.1 Melumallinnus ISO 9613-2

Tuulivoimaloiden aiheuttamat äänenpainetasot on mallinnettu WindPRO-laskentaohjelman Decibel-moduulilla ISO 9613-2 standardin mukaisesti. Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen 2/2014 mukaisesti tuulen nopeutena käytettiin 10 m korkeudella mitattuna 8 m/s, ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisenä kosteutena 70 % ja maanpinnan kovuutena arvoa 0,4. Laskenta on tehty 4,0 m maan pinnan tasosta.

Purmon tuulivoimaloiden äänenpainetasot on mallinnettu kaikissa vaihtoehdoissa voimalaitostyyppillä Vestas V150-6,0MW ja 225 metriä korkealla tornilla. Voimaloiden kokonaiskorkeus on näin ollen 300 m. Voimalaitoksen V150-6,0MW lähtömelutaso on ilman siipien melua vaimentavia sahalaitoja (STE) 107,7 dB(A). Voimalaitosvalmistajan mukaan V150-6,0MW melutaso vastaa ylempää luottamusväliä 95 % ja on valmistajan mukaan melun takuuarvo.

Purmon hankkeen lähialueella sijaitsevan Salo-Ylikosken tuulivoimahankkeen kaava on lainvoimainen ja sen aiheuttamia melu- ja varjostusvaikutuksia Purmon hankkeen alueelle on käsitelty alueen nykytilamallinuksissa. Salo-Ylikosken tuulivoimaloiden äänenpainetasot on mallinnettu luodulla voimalaitostyyppillä V136-3.45MW ja 169 metriä korkealla tornilla. Voimaloiden kokonaiskorkeus on 237 metriä. Lähtömelutaso Salo-Ylikosken voimaloissa on 105,5 dB(A). Voimaloiden äänitehotaso vastaa takuuarvoa, mutta lähtömelutasoon on lisätty 2 dB.

Melumallinnusten laskentatuloksia on havainnollistettu ns. keskiäänitasokarttojen avulla. Keskiäänitasokartoissa on melun keskiäänitaso- eli ekvivalenttiäänitasokäyrät (LAeq) 5 dB välein.

13.2.2023

Taulukko 1. Purmon tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot voimalaitoksella V150-6,0MW sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT								
Mallinnusohjelma ja versio: WindPRO version 3.5.576				Mallinnusmenetelmä: ISO 9613-2				
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)								
Tuulivoimalan valmistaja: Vestas				Tyyppi: V150-6,0MW		Sarjanumero/ti-		
Nimellisteho: 6,0 MW		Napakorkeus: 225 m		Roottorin halkaisija: 150 m		Tornin tyyppi: te-		
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun								
Lapakulman säätö		Pyörimisnopeus		Muu, mikä				
Kyllä	- dB	Kyllä	- dB	Noise mode säätö: PO6000-0S, no STE				
Ei		Ei		Noise mode, lähtömelutaso			107,7 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT								
Third octave noise emission DMS no.: 0095-3747_01, Date 2020-11-03 Voimalaitosvalmistajan mukaan V150-6,0MW melutaso vastaa ylempää luottamusväliä 95 % ja on valmistajan mukaan melun takuuarvo.								
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz] LWA dB						
		20	57,9	200	94,0	1600	95,2	
63	86,1	25	63	250	95,6	2000	93,5	
125	94,8	31,5	67,9	315	96,8	2500	91,5	
250	100,4	40	72,6	400	97,7	3150	89,1	
500	102,8	50	76,6	500	98,2	4000	86,2	
1000	102,2	63	80,5	630	98,3	5000	83,2	
2000	98,4	80	84	800	98,1	6300	79,6	
4000	91,6	100	87	1000	97,5	8000	75,6	
8000	81,5	125	89,6	1250	96,6	10000	71,5	
107,7 dB(A)		160	92,1					
Melun erityispiirteiden mittaustulos ja havainnot:								
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)			Muu, Mikä:	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei	

13.2.2023

Taulukko 2. Purmon tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot hankkeessa Salo-Ylikoski voimalaitoksella V136-3.45MW sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: WindPRO version 3.5.576				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: Vestas				Tyyppi: V136-3.45MW		Sarjanumero/t: -	
Nimellisteho: 3.45 MW		Napakorkeus: 169,0 m		Roottorin halkaisija: 136 m		Tornin tyyppi: teras/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	-	dB	Kyllä	-	dB	Noise mode säätö: STE	
Ei			Ei			Noise mode, lähtömelutaso	
						105,5 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Third octave noise emission DMS no.: 0055-9919_01, Date 2016-03-02							
Voimalaitosvalmistajan mukaan V150-6,0MW melutaso vastaa ylempää luottamusväliä 95 % ja on valmistajan mukaan melun takuuarvo. Salo-Ylikosken mallinuksissa on käytetty varmuuskerrointa 2 dB lisättynä melun lähtöarvoihin.							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	64,6	200	90,7	1600	96,8
63	93,1	25	73,9	250	92,3	2000	93,8
125	99,8	31,5	80,1	315	94,1	2500	91,4
250	97,4	40	83,0	400	95,1	3150	88,6
500	100,6	50	85,4	500	95,6	4000	90,2
1000	102,1	63	88,5	630	96,7	5000	80,6
2000	99,3	80	89,9	800	97,2	6300	74,0
4000	92,8	100	90,7	1000	97,6	8000	68,2
8000	75,3	125	98,0	1250	97,3	10000	63,2
107,5 dB(A)		160	93,2				
Melun erityispiirteiden mittaust ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudi- modulaatio)		Muu, Mikä:	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei

13.2.2023

## 2.1.2 Matalataajuinen melu

Matalataajuinen melu laskettiin Ympäristöministeriön ohjeen 2/2014 mukaisin menetelmin käyttäen voimalavalmistajilta saatuja arvioita niiden äänitehotasoista.

Ohje 2/2014 antaa menetelmän matalataajuisen melun laskentaan rakennusten ulkopuolelle. Sosiaali- ja terveysministeriön Asumisterveysasetus 2015 antaa matalataajuiselle melulle toimenpiderajat asuinhuoneissa. Rakennusten sisälle kantautuva äänitaso arvioitiin Turun AMK:n (Keränen, Hakala ja Hongisto, 2018) julkistamien Anojanssi projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

*Taulukko 3. Suomalaisen pientalon julkisivun äänitasoeron alalikiarvo Anojanssi projektin tulosten mukaisesti.*

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

Matalataajuisen melun laskelmassa huomioitiin maanpinnan muodon vaikutus ohjeen 4/2014 mukaisesti. Tulokset on esitetty taajuuskohtaisena taulukkona hankealuetta ympäröiville asuin- ja lomarakennuksille.

*Taulukko 4. Käytetyt mallinnusparametrit ISO 9613-2 laskelmissa sekä melulle altistuvat kohteet.*

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskenta korkeus		Laskentaruudun koko [m·m]	
ISO 9613-2: 4,0 m		25x25 m	
Suhteellinen kosteus		Lämpötila	
70 %	Muu, mikä ja miksi:	ISO 9613-2: 15 C°	
Maastomallin lähde ja tarkkuus			
Maastomallin lähde: MML maastotietokanta		Vaakaresoluutio: 1,0	Pystyresoluutio: 0,5
Maan- ja vedenpinnan absorptioon ja heijastuksen huomioiminen, käytetyt kertoimet			
ISO 9613-2	0,4		HUOM
Ilmakehän stabiilius laskennassa/meteorologinen korjaus			
Neutraali, (O): Neutraali		Muu, mikä ja miksi:	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus			
Tuulen suunta: 0-360°		Tuulen nopeus: 10 metrin korkeudella mitattuna 8 m/s	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä		Muu, mikä, miksi:	

13.2.2023

## 2.2 Varjostusmallinnus

*Taulukko 5. Purmon tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden koko varjostusmallinuksissa.*

MALLINNUSOHJELMAN TIEDOT			
Mallinnusohjelma ja versio: WindPRO version 3.5.576		Mallinnusmenetelmä: ISO 9613-2	
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: Generic		Tyyppi: RD200	Sarjanu- mero/t: -
Kokonaiskorkeus: 300 m	Napakorkeus: 200 m	Roottorin halkaisija: 200 m	Tornin tyyppi: teräs/hybridi

*Taulukko 6. Salo-Ylikosken tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden koko varjostusmallinuksissa.*

MALLINNUSOHJELMAN TIEDOT			
Mallinnusohjelma ja versio: WindPRO version 3.5.576		Mallinnusmenetelmä: ISO 9613-2	
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: Generic		Tyyppi: RD180	Sarjanu- mero/t: -
Kokonaiskorkeus: 240 m	Napakorkeus: 150 m	Roottorin halkaisija: 180 m	Tornin tyyppi: teräs/hybridi

Purmon tuulivoimaloiden varjostusvaikutukset on mallinnettu käyttäen roottorinhalkaisijaltaan 200 metristä voimalaitosta 200 metriä korkealla tornilla. Kokonaiskorkeudeltaan Purmon voimalat ovat mallinuksissa 300 metriä. Salo-Ylikosken tuulivoimalat on mallinnettu roottorinhalkaisijaltaan 150 metrin voimaloilla, joissa on 180 metriä korkea torni. Salo-Ylikosken voimaloiden kokonaiskorkeus varjostusmallinuksissa on 240 metriä.

Varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Laskennassa varjot huomioidaan, kun aurinko on yli 3 astetta horisontin yläpuolella. Varjoksi lasketaan tilanne, jossa siipi peittää vähintään 20 % auringosta.

Varjostusmallinuksessa huomioidaan siiven lavan maksimileveys sekä siiven kärjen leveys 90 % etäisyydellä turbiinista. Mallinuksessa siiven oletetaan kapenevan lineaarisesti kohti kärjen leveysarvoa. Purmon varjostusmallinuksessa on käytetty siiven lavan maksimileveytenä 4,71 metriä ja siiven kärjen leveytenä 1,44 metriä. Salo-Ylikosken hankkeessa varjostusmallinuksessa on käytetty siiven lavan maksimileveytenä 5,07 metriä ja siiven kärjen leveytenä 1,59 metriä.

Varjostusmallin laskennassa on huomioitu hankealueen korkeustiedot, tuulivoimaloiden sijainnit, tuulivoimalan napakorkeudet ja roottorin halkaisija sekä hankealueen aikavyöhyke. Mallinuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, pilvisuus kuukausittain

13.2.2023

eli kuinka paljon aurinko paistaa ollessaan horisontin yläpuolella sekä tuulivoimalaitosten arvioitu vuotuinen käyntiaika.

Varjostuksen tarkastelukorkeutena lähialueen asuin- tai lomarakennusten pihapiirissä käytettiin 1,0 metriä ja laskenta-alueen kokoa 5,0 x 5,0 metriä. Laskentaikkunoiden suunnat asennettiin voimaloita kohti ns. "greenhouse mode".

Auringon keskimääräiset paistetunnit perustuvat Jokioisen sääaseman mitattuihin säätietoihin 1969 - 1993. Laskentojen tuulen suunta ja nopeusjakamana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Puuston huomioivassa varjostusmallinuksissa (Luke forest) on huomioitu puuston peittävyys käytämällä Luonnonvarakeskuksen vuoden 2019 puuston keskipituus aineistoa.

Varjostusmallinnuksen tuloksia on havainnollistettu kartan avulla. Kartalla esitetään varjostusvaikutuksen (1, 8 ja 20 tuntia vuodessa) laajuus. Sen lisäksi mallinnuksessa on erikseen laskettu vaikutus tuulivoimahankealueen ympäristössä oleviin herkkiin kohteisiin.

## 2.3 Raja- ja ohjearvot

### 2.3.1 Melu

Valtioneuvoston asetuksessa (1107/2015) tuulivoimaloille on määritelty suunnitteluvarvot päivä- ja yöajan keskiäänitasojen maksimiarvolle. Jos tuulivoimalan melu sisältää tonaalisia, kapeakaistaisia tai impulssimaisia komponentteja, tai se on selvästi amplitudimoduloitunutta, mallinnustuloksiin tulee ohjeen mukaan lisätä viisi desibeliä ennen ohjearvoon vertaamista. Koska ohjearvo sisältää jo tyypillisen tuulivoimamelun piirteet, edellä mainitut äänenpiirteiden tulee olla tuulivoimalalle epätyypillisen voimakkaita, jotta mallinnustuloksissa täytyy huomioida viiden desibelin lisä äänenvoimakkuuteen.

*Taulukko 7. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason toimenpiderajat (Valtioneuvoston asetus 27.8.2015).*

Vaikutuskohde	Päivä (7-22)	Yö (22-7)
Pysyvä asutus	45 dB	40 dB
Loma-asutus	45 dB	40 dB
Hoitolaitokset	45 dB	40 dB
Oppilaitokset	45 dB	—
Virkistysalueet	45 dB	—
Leirintäalueet	45 dB	40 dB
Kansallispuistot	40 dB	40 dB

Sosiaali- ja terveysministeriön asetuksessa (545/2015) on annettu matalataajuiselle melulle toimenpiderajoja. Toimenpiderajat koskevat asuinhuoneita ja ne on annettu taajuuspainottamattomina yhden tunnin keskiäänitasoina tersseittäin. Toimenpiderajat koskevat yöaikaa ja päivällä sallitaan 5 dB suuremmat arvot.



13.2.2023

*Taulukko 8. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.*

Terssikaista Hz	20	25	31,5	40	50	63	80	100	125	160	200
Keskiäänitaso L <sub>Z</sub> eq,1h, dB	74	64	56	49	44	42	40	38	36	34	32
Edellisestä laskettu keski-äänitaso A-painotettuna L <sub>A</sub> eq,1h, dB	24	19	17	14	14	16	18	19	20	21	21

Lisäksi yöaikainen mahdollisesti unihäiriötä aiheuttava melu, joka erottuu selvästi taustamelusta, ei saa ylittää 25 dB yhden tunnin keskiäänitasona L<sub>A</sub>eq,1h mitattuna niissä tiloissa, jotka on tarkoitettu nukkumiseen.

### 2.3.2 Varjostus

Suomessa ei ole viranomaisten antamia yleisiä määräyksiä tuulivoimaloiden muodostaman varjostuksen enimmäiskestoista eikä varjonmuodostuksen arviointiperusteista. Ympäristöministeriön tuulivoimarakentamisen suunnitteluohjeistuksessa esitetään käytettäväksi muiden maiden suosituksia välkkeen rajoittamisesta (Ympäristöministeriö 2012).

Useissa maissa on annettu raja-arvoja tai suosituksia hyväksyttävän välkevaikutuksen määrästä. Esimerkiksi Ruotsissa suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä.

Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa ("real case") esiintyy vähintään kahdeksan tuntia vuodessa.

13.2.2023

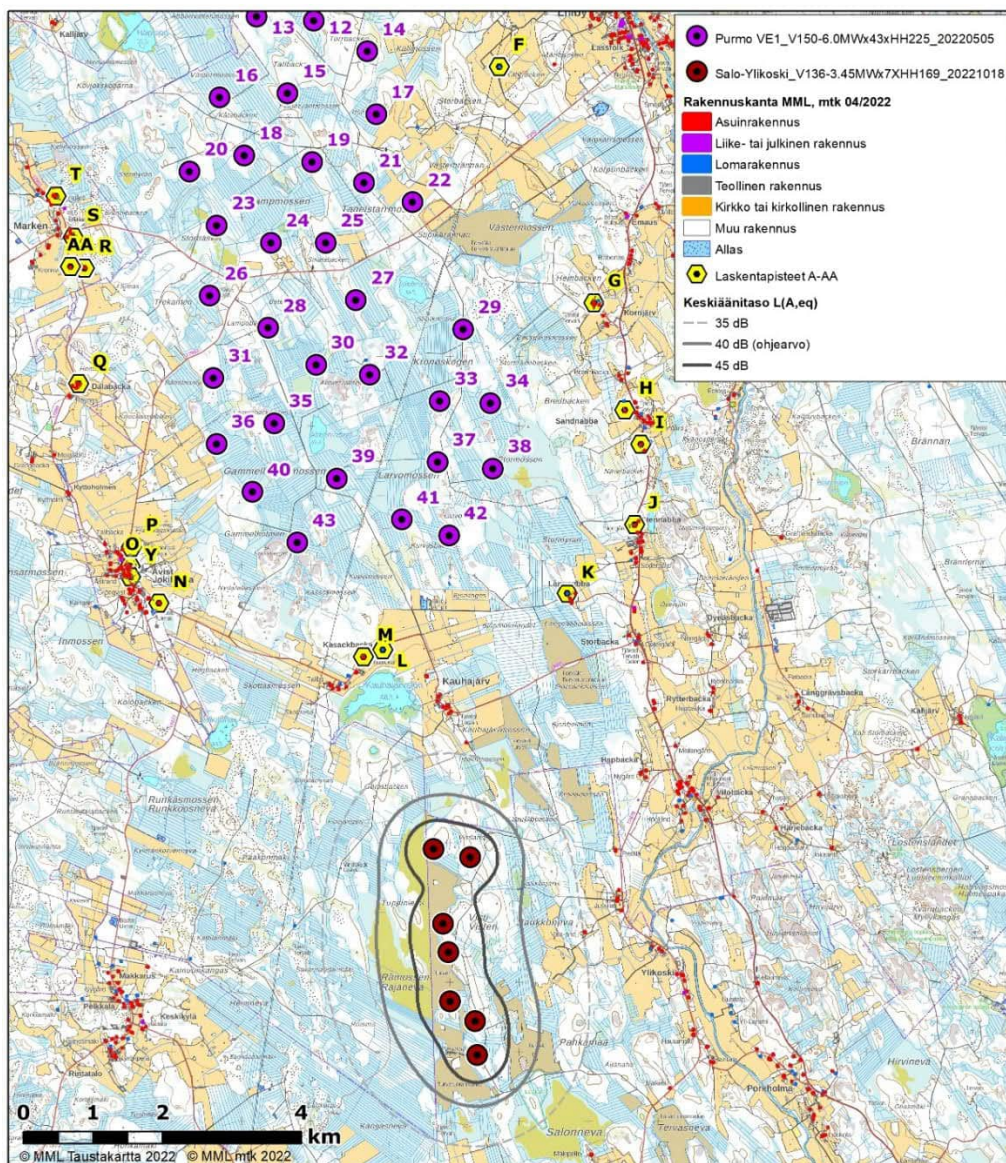
### 3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

#### 3.1 Melu

##### 3.1.1 Nykytilanne

Purmon suunnitellun tuulivoimapuiston eteläpuolella sijaitsee Salo-Ylikosken tuulivoimapuisto, jolla on lainvoimainen osayleiskaava. Näin ollen Salo-Ylikosken tuulivoimapuiston toiminnasta aiheutuvan melun voidaan katsoa kuvaavan tuulivoimamelun nykytilannetta. Salo-Ylikosken tuulivoimapuiston aiheuttama melu on esitetty alla olevassa kuvassa (Kuva 1) ja Purmon mallinnuspisteiden A-AA nykytilanteen melutasot taulukossa 9.

Nykytilan melumallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 1.



Kuva 1. Laskennalliset Salo-Ylikosken tuulivoimatuotannosta aiheutuvat melutasot Purmon tuulivoimahankkeen läheisyydessä nykytilanteessa standardin ISO 9613-2 mukaisesti.

13.2.2023

*Taulukko 9.* Laskennalliset tuulivoimatuotannosta aiheutuvat melutasot Purmon tuulivoimahankkeen ympäristössä nykytilanteessa standardin ISO 9613-2 mukaisesti.

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	4,0	9,1
Asuinrakennus B (Dallberga)	297952	7051163	25	4,0	9,9
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	4,0	10,8
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	4,0	11,7
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	4,0	12,7
Lomarakennus F (Källbacken)	299710	7044165	37,5	4,0	15,1
Asuinrakennus G (Kornjärv)	301071	7040772	55	4,0	18,3
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	4,0	20,0
Asuinrakennus I (Asp)	301749	7038736	54,4	4,0	20,5
Asuinrakennus J (Stennabba)	301661	7037581	55	4,0	22,1
Asuinrakennus K (Långnabba)	300689	7036583	55	4,0	24,7
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	4,0	27,5
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	4,0	27,6
Asuinrakennus N (Adler)	294812	7036441	45	4,0	22,2
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	4,0	21,1
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	4,0	20,9
Asuinrakennus Q (Dalabacka)	293652	7039610	40	4,0	17,9
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	4,0	16,5
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	4,0	16,1
Asuinrakennus T (Norrgård)	293326	7042304	31	4,0	15,5
Asuinrakennus U (Näpi)	294326	7045578	35	4,0	13,3
Asuinrakennus V (Skutas)	293741	7047247	32,1	4,0	11,9
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	4,0	10,2
Lomarakennus X (Dalbacka)	296008	7052686	20,5	4,0	8,8
Asuinrakennus Y (Åvist)	294403	7036830	41,6	4,0	21,3
Asuinrakennus Z (Nabba)	294257	7045675	35	4,0	13,2
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	4,0	16,4

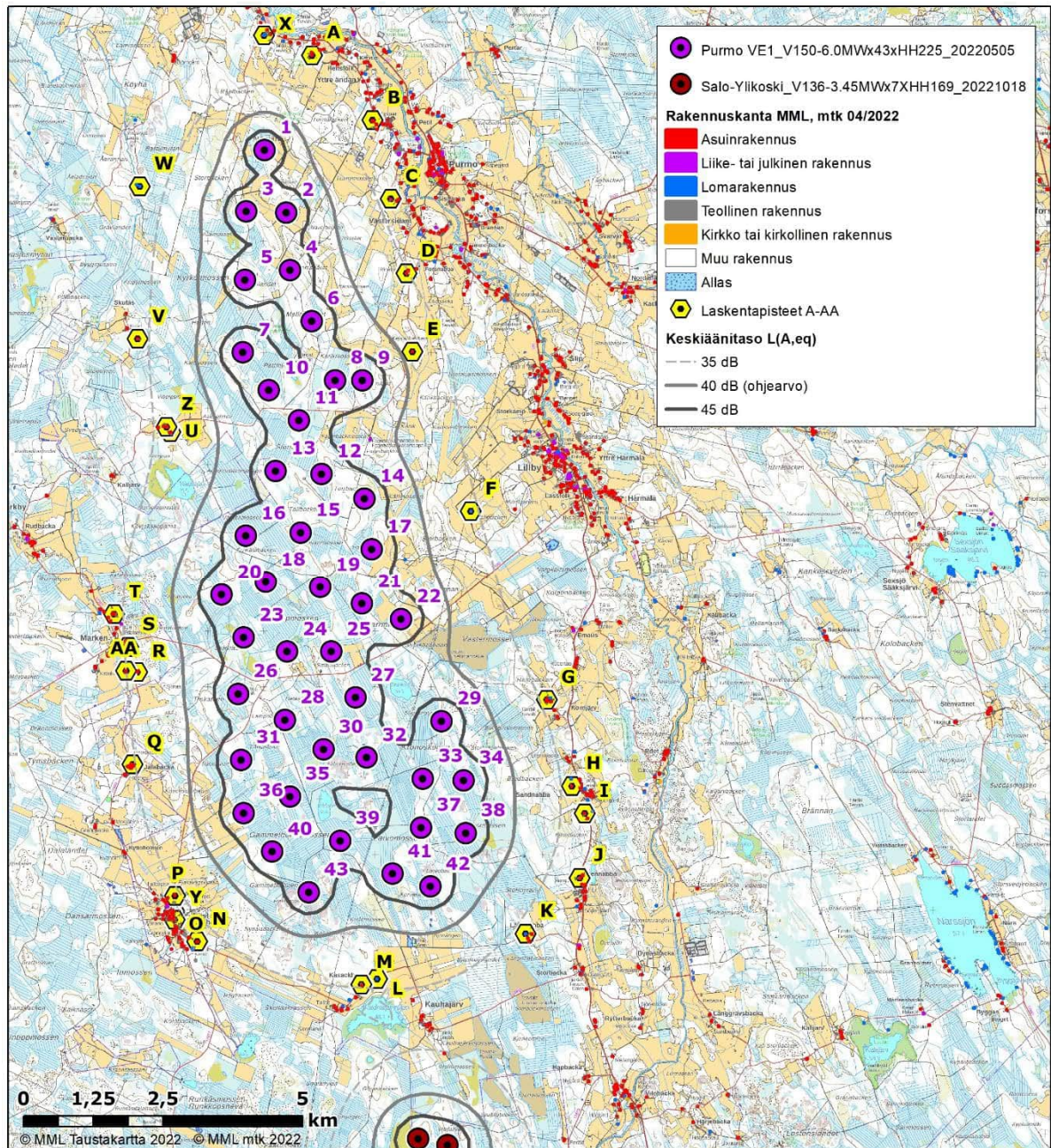
13.2.2023

### 3.1.2 Purmon tuulivoimahankkeen melumallinnuksen laskentatulokset (VE 1, VE 2 ja VE 3)

Hankevaihtoehdossa 1 (VE 1) Purmon hankkeen lähimpien asuin- ja lomarakennusten pihapiirissä melutasot alittavat laskelmien mukaan 40 dB. Purmon tuulivoimapuiston aiheuttamat melutasot hankevaihtoehdossa 1 on esitetty kuvassa 2 ja mallinnuspisteiden A-AA melutasot taulukossa 10.

Mallinnuksessa on huomioitu myös lainvoimaisen kaavan omaavan Salo-Ylikosken tuulivoimapuiston tuulivoimalat.

Hankevaihtoehdon 1 melumallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 2.



Kuva 2. Melumallinnuksen ISO 9613-2 tulos Purmon VE1 Salo-Ylikosken hankkeen kanssa.

13.2.2023

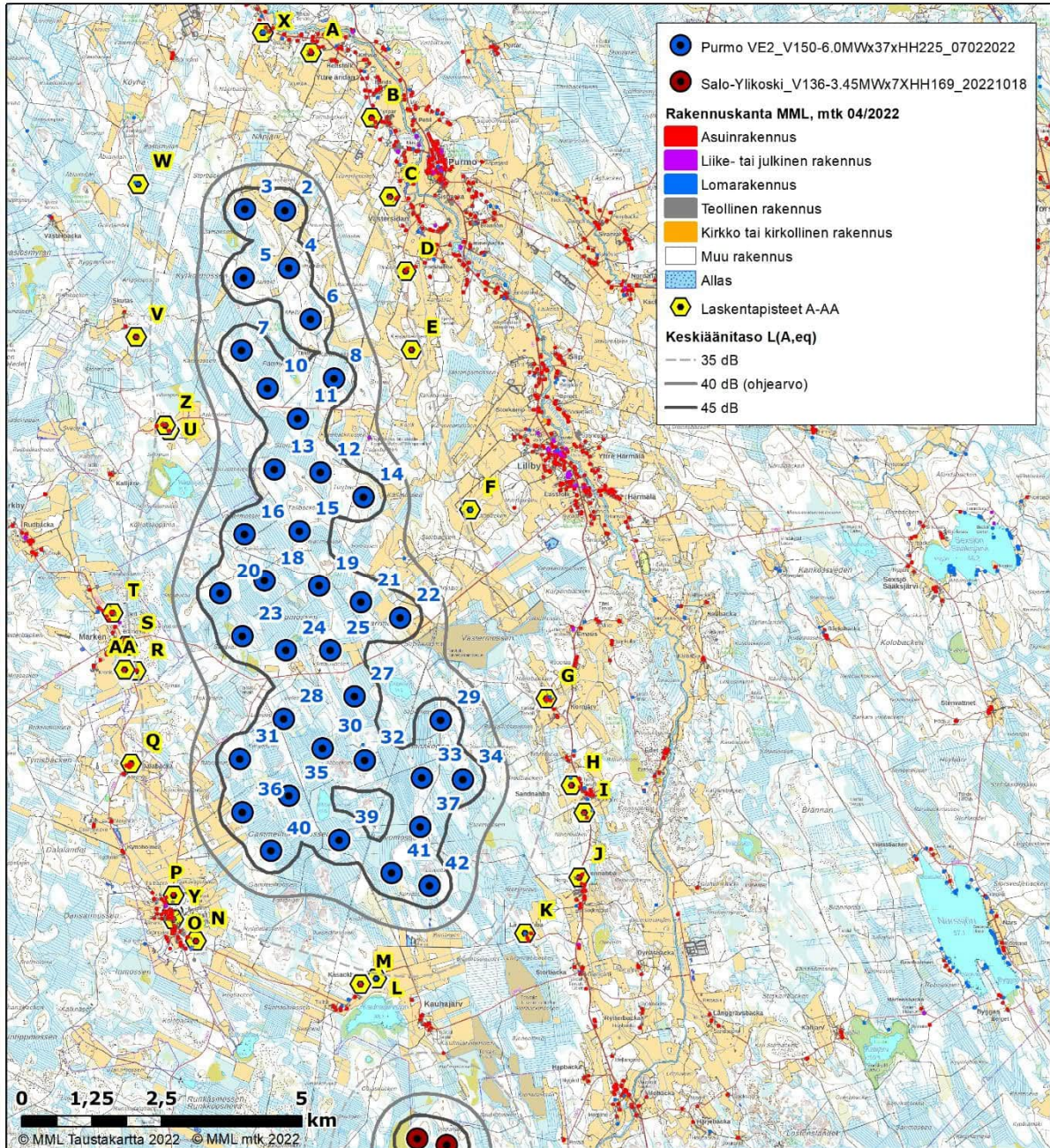
*Taulukko 10. Laskennalliset melutasot Purmon tuulivoimahankkeen ympäristössä voimalaitoksella V150 - 6,0 MW - VE1 Salo-Ylikosken hankkeen kanssa.*

Laskentapiste	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	4,0	30,8
Asuinrakennus B (Dallberga)	297952	7051163	25	4,0	32,0
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	4,0	33,9
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	4,0	35,1
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	4,0	38,4
Lomarakennus F (Källbacken)	299710	7044165	37,5	4,0	35,5
Asuinrakennus G (Kornjärv)	301071	7040772	55	4,0	34,4
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	4,0	34,0
Asuinrakennus I (Asp)	301749	7038736	54,4	4,0	33,1
Asuinrakennus J (Stennabba)	301661	7037581	55	4,0	32,5
Asuinrakennus K (Långnabba)	300689	7036583	55	4,0	34,0
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	4,0	35,6
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	4,0	35,2
Asuinrakennus N (Adler)	294812	7036441	45	4,0	33,5
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	4,0	33,7
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	4,0	34,5
Asuinrakennus Q (Dalabacka)	293652	7039610	40	4,0	34,8
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	4,0	35,8
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	4,0	35,3
Asuinrakennus T (Norrgård)	293326	7042304	31	4,0	34,3
Asuinrakennus U (Nåpi)	294326	7045578	35	4,0	36,1
Asuinrakennus V (Skutas)	293741	7047247	32,1	4,0	34,1
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	4,0	32,7
Lomarakennus X (Dalbacka)	296008	7052686	20,5	4,0	29,8
Asuinrakennus Y (Åvist)	294403	7036830	41,6	4,0	33,4
Asuinrakennus Z (Nabba)	294257	7045675	35	4,0	35,9
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	4,0	34,9

13.2.2023

Hankevaihtoehdossa 2 (VE 2) Purmon hankkeen lähimpien asuin- ja lomarakennusten pihapiirissä melutasot alittavat laskelmien mukaan 40 dB. Purmon tuulivoimapuiston aiheuttamat melutasot hankevaihtoehdossa 2 on esitetty kuvassa 3 ja mallinnuspisteiden A-AA melutasot taulukossa 11.

Mallinnuksessa on huomioitu myös lainvoimaisen kaavan omaavan Salo-Ylikosken tuulivoimapuiston tuulivoimalat.



Kuva 3. Melumallinnuksen ISO 9613-2 tulos Purmon VE2 Salo-Ylikosken hankkeen kanssa.

13.2.2023

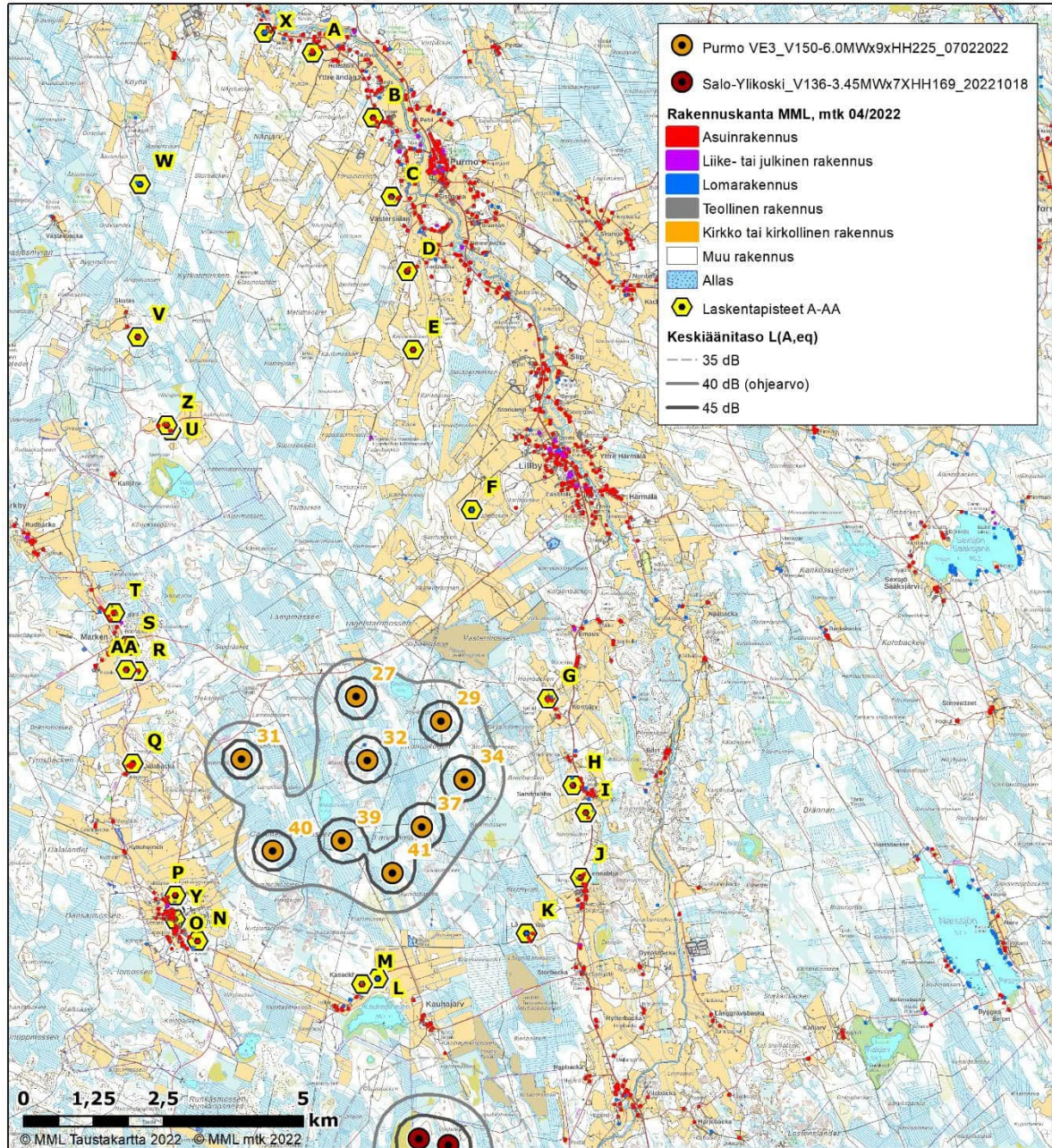
Taulukko 11. Laskennalliset melutasot Purmon tuulivoimahankkeen ympäristössä voimalaitoksella V150 - 6,0 MW - VE2 Salo-Ylikosken (V136-3.45MW HH169) hankkeen kanssa.

Laskentapiste	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	4,0	27,8
Asuinrakennus B (Dallberga)	297952	7051163	25	4,0	30,2
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	4,0	33,1
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	4,0	34,2
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	4,0	35,8
Lomarakennus F (Källbacken)	299710	7044165	37,5	4,0	34,4
Asuinrakennus G (Kornjärv)	301071	7040772	55	4,0	34,0
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	4,0	33,1
Asuinrakennus I (Asp)	301749	7038736	54,4	4,0	32,0
Asuinrakennus J (Stennabba)	301661	7037581	55	4,0	31,3
Asuinrakennus K (Långnabba)	300689	7036583	55	4,0	33,1
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	4,0	34,7
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	4,0	34,1
Asuinrakennus N (Adler)	294812	7036441	45	4,0	32,5
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	4,0	33,0
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	4,0	33,9
Asuinrakennus Q (Dalabacka)	293652	7039610	40	4,0	34,1
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	4,0	34,9
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	4,0	34,6
Asuinrakennus T (Norrgård)	293326	7042304	31	4,0	33,8
Asuinrakennus U (Nåpi)	294326	7045578	35	4,0	35,9
Asuinrakennus V (Skutas)	293741	7047247	32,1	4,0	33,8
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	4,0	31,8
Lomarakennus X (Dalbacka)	296008	7052686	20,5	4,0	26,8
Asuinrakennus Y (Åvist)	294403	7036830	41,6	4,0	32,6
Asuinrakennus Z (Nabba)	294257	7045675	35	4,0	35,7
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	4,0	34,1

13.2.2023

Hankevaihtoehdossa 3 (VE 3) Purmon hankkeen lähimpien asuin- ja lomarakennusten pihapiirissä melutasot alittavat laskelmien mukaan 40 dB. Purmon tuulivoimapuiston aiheuttamat melutasot hankevaihtoehdossa 3 on esitetty kuvassa 4 ja mallinnuspisteiden A-AA melutasot taulukossa 12.

Mallinnuksessa on huomioitu myös lainvoimaisen kaavan omaavan Salo-Ylikosken tuulivoimapuiston tuulivoimalat.



Kuva 4. Melumallinnuksen ISO 9613-2 tulos Purmon VE3 Salo-Ylikosken hankkeen kanssa.



13.2.2023

Taulukko 12. Laskennalliset melutasot Purmon tuulivoimahankkeen ympäristössä voimalaitoksella V150 - 6,0 MW - VE3 Salo-Ylikosken (V136-3.45MW HH169) hankkeen kanssa.

Laskentapiste	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	4,0	12,8
Asuinrakennus B (Dallberga)	297952	7051163	25	4,0	13,9
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	4,0	15,4
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	4,0	16,9
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	4,0	18,9
Lomarakennus F (Källbacken)	299710	7044165	37,5	4,0	24,5
Asuinrakennus G (Kornjärv)	301071	7040772	55	4,0	31,8
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	4,0	31,3
Asuinrakennus I (Asp)	301749	7038736	54,4	4,0	30,0
Asuinrakennus J (Stennabba)	301661	7037581	55	4,0	29,2
Asuinrakennus K (Långnabba)	300689	7036583	55	4,0	30,5
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	4,0	32,9
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	4,0	32,5
Asuinrakennus N (Adler)	294812	7036441	45	4,0	30,2
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	4,0	30,2
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	4,0	30,9
Asuinrakennus Q (Dalabacka)	293652	7039610	40	4,0	30,0
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	4,0	27,7
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	4,0	26,2
Asuinrakennus T (Norrgård)	293326	7042304	31	4,0	24,4
Asuinrakennus U (Nåpi)	294326	7045578	35	4,0	19,9
Asuinrakennus V (Skutas)	293741	7047247	32,1	4,0	17,2
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	4,0	14,4
Lomarakennus X (Dalbacka)	296008	7052686	20,5	4,0	12,5
Asuinrakennus Y (Åvist)	294403	7036830	41,6	4,0	29,9
Asuinrakennus Z (Nabba)	294257	7045675	35	4,0	19,7
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	4,0	27,0

13.2.2023

## 3.2 Matalataajuinen melu

### 3.2.1 Nykytilanne

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella.

Mallinnettaessa Purmon tuulivoimahankkeen lähialueen matalataajuisia melutasoja Salo-Ylikosken voimalaitostyyppillä V136-3.45MW HH169, matalataajuinen melu ei ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteissä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 10,2 dB alle toimenpiderajan taajuudella 50 Hz (Lomarakennus L ja asuinrakennus M).

*Taulukko 13. Matalataajuisen melun laskentatulokset nykytilanteessa Purmon hankkeen laskentapisteissä A-AA, mallinnettaessa Salo-Ylikosken voimalaitostyyppillä V136-3.45MW HH169.*

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L <sub>eq,1h</sub> – Asumisterveys ohje sisällä	Hz	L <sub>eq,1h</sub> – Asumisterveys ohje sisällä	Hz
Asuinrakennus A (Lillkvist)	-14,1	50	-25,6	50
Asuinrakennus B (Dallberga)	-13,5	50	-25,0	50
Asuinrakennus C (Tornbacka)	-12,7	50	-24,2	50
Asuinrakennus D (Kallträskvägen)	-12,0	63	-23,5	50
Metsästysmaja E (Kejsarbacken)	-11,0	63	-22,6	50
Lomarakennus F (Källbacken)	-8,9	63	-20,6	50
Asuinrakennus G (Kornjärvi)	-5,6	125	-17,8	50
Asuinrakennus H (Sandnabba)	-3,7	125	-16,4	50
Asuinrakennus I (Asp)	-3,1	125	-15,9	50
Asuinrakennus J (Stennabba)	-1,3	125	-14,4	50
Asuinrakennus K (Långnabba)	1,3	125	-12,3	50
Lomarakennus L (Åvistvägen)	3,7	125	-10,2	50
Asuinrakennus M (Stenbacka)	3,7	125	-10,2	50
Asuinrakennus N (Adler)	-1,2	125	-14,4	50
Asuinrakennus O (Åvistvägen)	-2,4	125	-15,3	50
Asuinrakennus P (Finnabbavägen)	-2,7	125	-15,6	50
Asuinrakennus Q (Dalabacka)	-6,0	125	-18,2	50

13.2.2023

Asuinrakennus R (Kronkvist)	-7,6	63	-19,4	50
Asuinrakennus S (Tallbacka)	-8,1	63	-19,8	50
Asuinrakennus T (Norrgård)	-8,6	63	-20,3	50
Asuinrakennus U (Nåpi)	-10,6	63	-22,2	50
Asuinrakennus V (Skutas)	-11,8	63	-23,3	50
Asuinrakennus W (Åbrännan)	-13,3	50	-24,8	50
Lomarakennus X (Dalbacka)	-14,3	50	-25,8	50
Asuinrakennus Y (Åvist)	-2,2	125	-15,2	50
Asuinrakennus Z (Nabba)	-10,7	63	-22,3	50
Asuinrakennus AA (Kronkvist)	-7,8	63	-19,5	50

### 3.2.2 Purmon tuulivoimahankkeen matalataajuinen melu (VE 1, VE 2 ja VE 3)

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella.

Mallinnettaessa Purmon tuulivoimahankkeen matalataajuisia melutasoja voimalaitostyyppillä V150 - 6,0 MW (107,7 dB) vaihtoehdossa 1 (VE 1) Salo-Ylikosken hankkeen kanssa, matalataajuinen melu ei ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteissä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 7,9 dB alle toimenpiderajan taajuudella 50 Hz (Lomarakennus L).

Taulukko 14. Matalataajuisen melun laskentatulokset VE1 Salo-Ylikosken hankkeen kanssa.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L <sub>eq,1h</sub> – Asumisterveys ohje sisällä	Hz	L <sub>eq,1h</sub> – Asumisterveys ohje sisällä	Hz
Asuinrakennus A (Lillkvist)	-0,7	100	-14,6	50
Asuinrakennus B (Dallberga)	0,4	100	-13,6	50
Asuinrakennus C (Tormbacka)	2,0	100	-12,2	50
Asuinrakennus D (Kallträskvägen)	3,0	125	-11,2	50
Metsästysmaja E (Kejsarbacken)	5,4	200	-9,4	50
Lomarakennus F (Källbacken)	3,9	125	-10,3	50
Asuinrakennus G (Kornjärvi)	3,3	125	-10,7	50
Asuinrakennus H (Sandnabba)	3,2	125	-10,7	50

13.2.2023

Asuinrakennus I (Asp)	2,7	125	-11,1	50
Asuinrakennus J (Stennabba)	2,9	125	-10,8	50
Asuinrakennus K (Långnabba)	4,5	125	-9,5	50
Lomarakennus L (Åvistvägen)	6,2	125	-7,9	50
Asuinrakennus M (Stenbacka)	6,1	125	-8,0	50
Asuinrakennus N (Adler)	3,4	125	-10,4	50
Asuinrakennus O (Åvistvägen)	3,3	125	-10,6	50
Asuinrakennus P (Finnabbavägen)	3,6	125	-10,3	50
Asuinrakennus Q (Dalabacka)	3,5	125	-10,6	50
Asuinrakennus R (Kronkvist)	4,1	125	-10,1	50
Asuinrakennus S (Tallbacka)	3,7	125	-10,4	50
Asuinrakennus T (Norrgård)	3,1	125	-11,0	50
Asuinrakennus U (Nåpi)	4,1	125	-10,2	50
Asuinrakennus V (Skutas)	2,5	100	-11,7	50
Asuinrakennus W (Åbrännan)	1,0	100	-13,1	50
Lomarakennus X (Dalbacka)	-1,3	100	-15,2	50
Asuinrakennus Y (Åvist)	3,1	125	-10,7	50
Asuinrakennus Z (Nabba)	3,9	125	-10,3	50
Asuinrakennus AA (Kronkvist)	3,6	125	-10,5	50

Mallinnettaessa Purmon tuulivoimahankkeen matalataajuisia melutasoja voimalaitostyyppillä V150 - 6,0 MW (107,7 dB) vaihtoehdossa 2 (VE 2), matalataajuinen melu ei ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteissä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 8,3 dB alle toimenpiderajan taajuudella 50 Hz (Lomarakennus L).

Taulukko 15. Matalataajuisen melun laskentatulokset VE2 Salo-Ylikosken hankkeen kanssa.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asumis-terveys ohje sisällä	Hz	L eq,1h – Asumis-terveys ohje sisällä	Hz
Asuinrakennus A (Lillkvist)	-2,5	100	-16,1	50
Asuinrakennus B (Dallberga)	-0,9	100	-14,8	50
Asuinrakennus C (Tormbacka)	1,2	100	-13,0	50

13.2.2023

Asuinrakennus D (Kallträskvägen)	2,3	125	-12,0	50
Metsästysmaja E (Kejsarbacken)	3,5	125	-10,8	50
Lomarakennus F (Källbacken)	3,1	125	-11,1	50
Asuinrakennus G (Kornjärvi)	2,8	125	-11,1	50
Asuinrakennus H (Sandnabba)	2,5	125	-11,3	50
Asuinrakennus I (Asp)	2,1	125	-11,6	50
Asuinrakennus J (Stennabba)	2,3	125	-11,3	50
Asuinrakennus K (Långnabba)	4,0	125	-9,9	50
Lomarakennus L (Åvistvägen)	5,8	125	-8,3	50
Asuinrakennus M (Stenbacka)	5,7	125	-8,4	50
Asuinrakennus N (Adler)	2,9	125	-10,9	50
Asuinrakennus O (Åvistvägen)	2,7	125	-11,1	50
Asuinrakennus P (Finnabbavägen)	3,1	125	-10,8	50
Asuinrakennus Q (Dalabacka)	2,9	125	-11,1	50
Asuinrakennus R (Kronkvist)	3,4	125	-10,7	50
Asuinrakennus S (Tallbacka)	3,1	125	-11,0	50
Asuinrakennus T (Norrgård)	2,6	125	-11,4	50
Asuinrakennus U (Nåpi)	3,8	125	-10,5	50
Asuinrakennus V (Skutas)	2,1	100	-12,1	50
Asuinrakennus W (Åbrännan)	0,2	100	-13,8	50
Lomarakennus X (Dalbacka)	-3,1	100	-16,6	50
Asuinrakennus Y (Åvist)	2,6	125	-11,2	50
Asuinrakennus Z (Nabba)	3,6	125	-10,7	50
Asuinrakennus AA (Kronkvist)	2,9	125	-11,1	50

13.2.2023

Mallinnettaessa Purmon tuulivoimahankkeen matalataajuisia melutasoja voimalaitostyyppillä V150 - 6,0 MW (107,7 dB) vaihtoehdossa 3 (VE 3), matalataajuinen melu ei ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteissä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 9,1 dB alle toimenpiderajan taajuudella 50 Hz (Lomarakennus L).

Taulukko 16. Matalataajuisen melun laskentatulokset VE3 Salo-Ylikosken hankkeen kanssa.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asumisterveys ohje sisällä	Hz	L eq,1h – Asumisterveys ohje sisällä	Hz
Asuinrakennus A (Lillkvist)	-12,1	63	-23,9	50
Asuinrakennus B (Dallberga)	-11,4	63	-23,2	50
Asuinrakennus C (Tormbacka)	-10,4	63	-22,3	50
Asuinrakennus D (Kallträskvägen)	-9,3	63	-21,3	50
Metsästysmaja E (Kejsarbacken)	-8,1	63	-20,2	50
Lomarakennus F (Källbacken)	-4,4	125	-17,3	50
Asuinrakennus G (Kornjärvi)	0,4	125	-13,5	50
Asuinrakennus H (Sandnabba)	0,7	125	-13,1	50
Asuinrakennus I (Asp)	0,3	125	-13,3	50
Asuinrakennus J (Stennabba)	0,9	125	-12,7	50
Asuinrakennus K (Långnabba)	2,8	125	-11,0	50
Lomarakennus L (Åvistvägen)	4,9	125	-9,1	50
Asuinrakennus M (Stenbacka)	4,9	125	-9,2	50
Asuinrakennus N (Adler)	1,2	125	-12,4	50
Asuinrakennus O (Åvistvägen)	0,7	125	-13,0	50
Asuinrakennus P (Finnabbavägen)	0,8	125	-12,9	50
Asuinrakennus Q (Dalabacka)	-0,8	125	-14,4	50
Asuinrakennus R (Kronkvist)	-2,4	125	-15,8	50
Asuinrakennus S (Tallbacka)	-3,3	125	-16,4	50
Asuinrakennus T (Norrgård)	-4,4	125	-17,2	50
Asuinrakennus U (Nåpi)	-7,5	63	-19,6	50
Asuinrakennus V (Skutas)	-9,1	63	-21,1	50

13.2.2023

---

Asuinrakennus W (Åbrännan)	-11,0	63	-22,9	50
Lomarakennus X (Dalbacka)	-12,4	63	-24,2	50
Asuinrakennus Y (Åvist)	0,6	125	-13,0	50
Asuinrakennus Z (Nabba)	-7,6	63	-19,7	50
Asuinrakennus AA (Kronkvist)	-2,8	125	-16,0	50

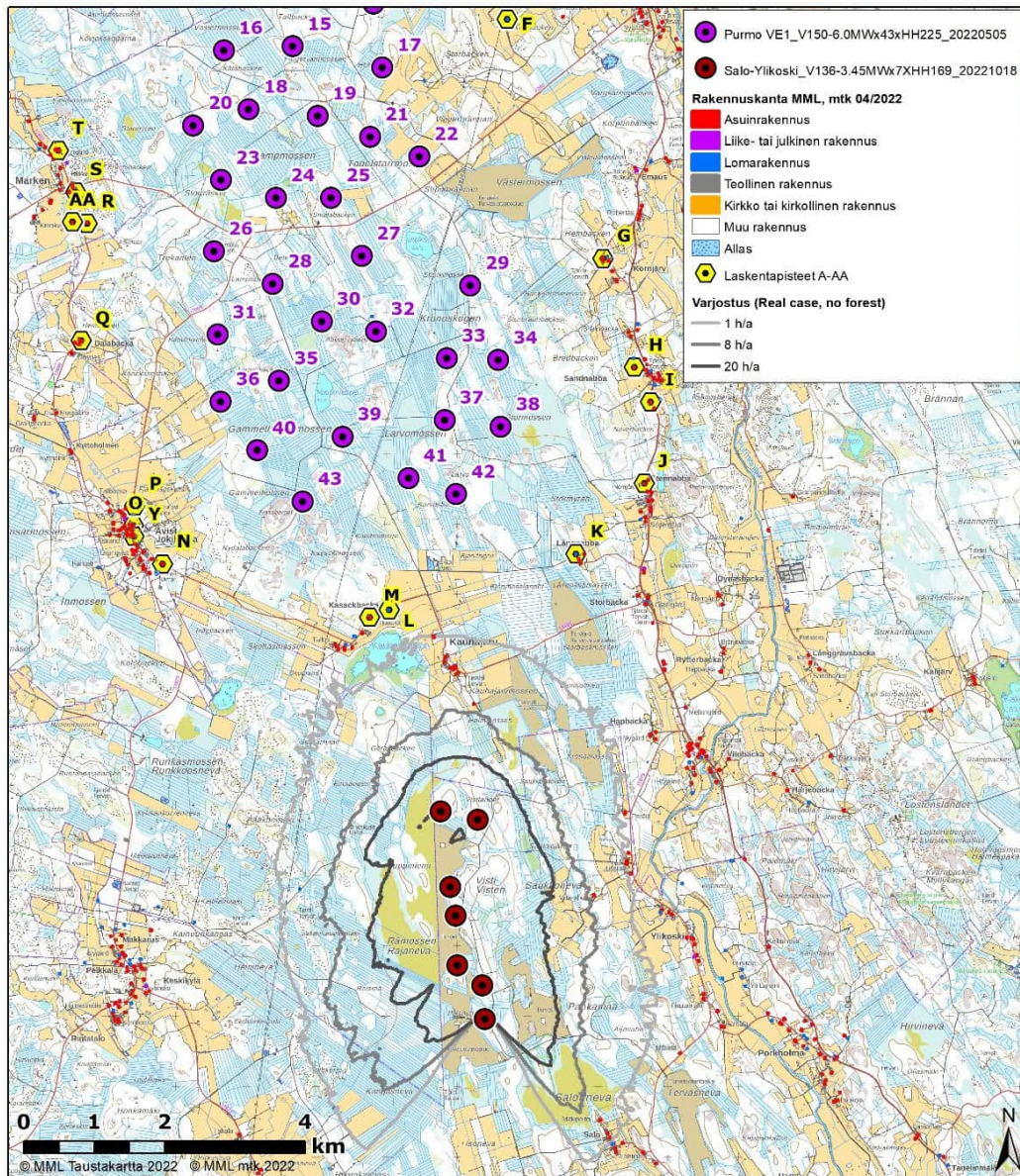
13.2.2023

### 3.3 Varjostus

#### 3.3.1 Nykytilanne

Purmon suunnitellun tuulivoimapuiston eteläpuolella sijaitsee Salo-Ylikosken tuulivoimapuisto-hanke, jonka osayleiskaava on lainvoimainen. Näin ollen Salo-Ylikosken tuulivoimapuiston toiminnasta aiheutuvan varjostuksen voidaan katsoa kuvaavan varjostuksen nykytilannetta. Salo-Ylikosken tuulivoimapuiston toiminnasta aiheutuva varjostus on esitetty alla olevassa kuvassa (Kuva 5) ja Purmon mallinnuspisteiden A-AA nykytilanteen varjostustunnit taulukossa 17.

Yli 8 tunnin vuotuisen välkevaikutuksen alueella ei Purmon hankkeen läheisyydessä sijaitse asuin- tai lomarakennuksia. Nykytilan varjostusmallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 9.



Kuva 5. Laskennalliset varjostusmallinnuksen tulokset nykytilanteessa. Mallinnus on tehty todellisen tilanteen mukaan ilman puuston suojavaikutusta.



13.2.2023

Taulukko 17. Nykytilanteen laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei huomioida.

	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	5,0 x 5,0	0:00
Asuinrakennus B (Dallberga)	297952	7051163	25	5,0 x 5,0	0:00
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	5,0 x 5,0	0:00
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	5,0 x 5,0	0:00
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	5,0 x 5,0	0:00
Lomarakennus F (Källbacken)	299710	7044165	37,5	5,0 x 5,0	0:00
Asuinrakennus G (Kornjärv)	301071	7040772	55	5,0 x 5,0	0:00
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	5,0 x 5,0	0:00
Asuinrakennus I (Asp)	301749	7038736	54,4	5,0 x 5,0	0:00
Asuinrakennus J (Stennabba)	301661	7037581	55	5,0 x 5,0	0:00
Asuinrakennus K (Långnabba)	300689	7036583	55	5,0 x 5,0	0:00
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	5,0 x 5,0	0:00
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	5,0 x 5,0	0:00
Asuinrakennus N (Adler)	294812	7036441	45	5,0 x 5,0	0:00
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	5,0 x 5,0	0:00
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	5,0 x 5,0	0:00
Asuinrakennus Q (Dalabacka)	293652	7039610	40	5,0 x 5,0	0:00
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	5,0 x 5,0	0:00
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	5,0 x 5,0	0:00
Asuinrakennus T (Norrgård)	293326	7042304	31	5,0 x 5,0	0:00
Asuinrakennus U (Nåpi)	294326	7045578	35	5,0 x 5,0	0:00
Asuinrakennus V (Skutas)	293741	7047247	32,1	5,0 x 5,0	0:00
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	5,0 x 5,0	0:00
Lomarakennus X (Dalbacka)	296008	7052686	20,5	5,0 x 5,0	0:00
Asuinrakennus Y (Åvist)	294403	7036830	41,6	5,0 x 5,0	0:00
Asuinrakennus Z (Nabba)	294257	7045675	35	5,0 x 5,0	0:00
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	5,0 x 5,0	0:00

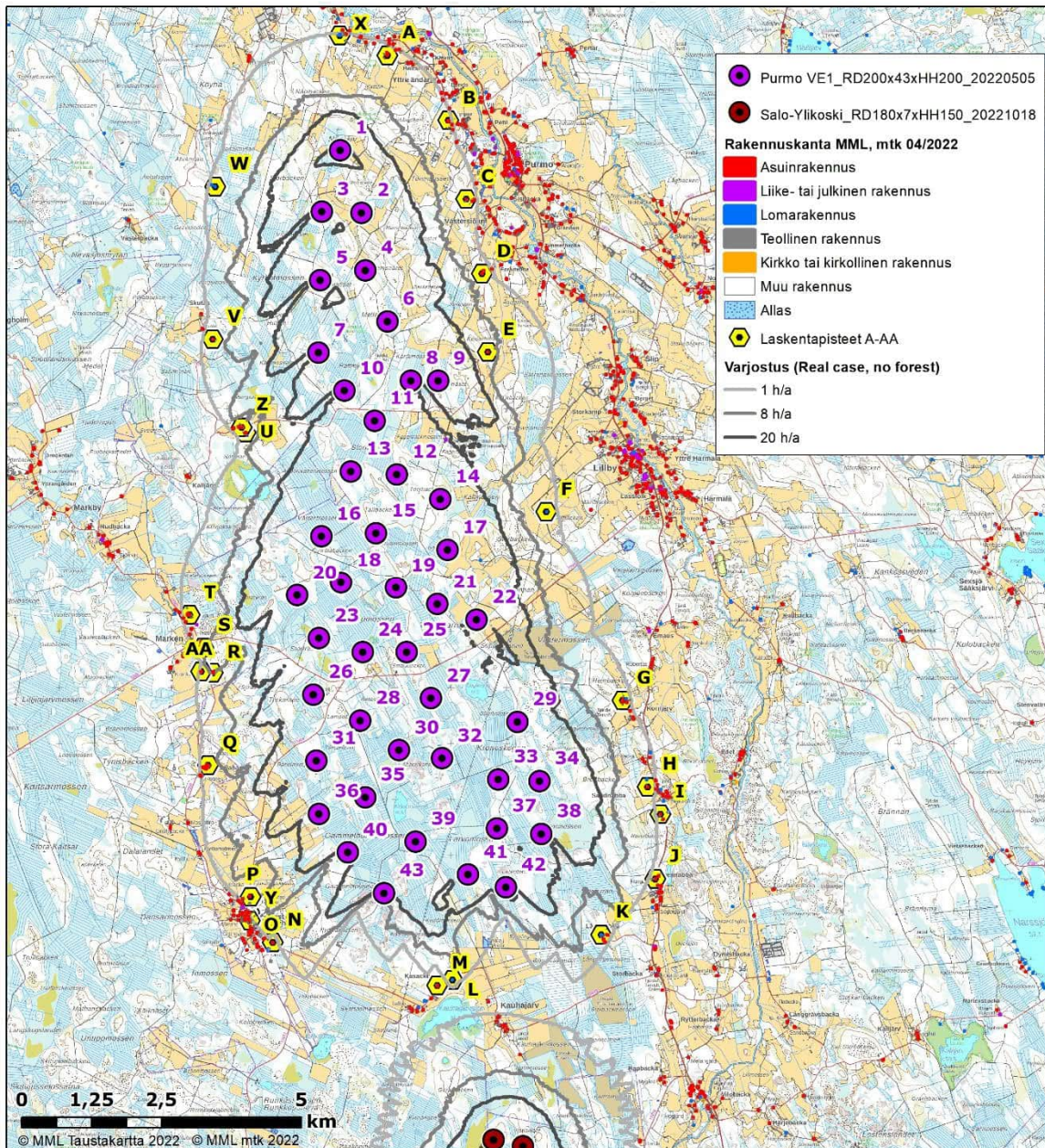
13.2.2023

### 3.3.2 Varjostusmallinnus

Ilman puuston suojaavaa vaikutusta yli 8 tunnin vuotuisen välkevaikutuksen alueelle sijoittuu Purmon tuulivoimahankkeen läheisyydessä yksi asuinrakennus (Asuinrakennus R, 8 h 35 min/vuosi). Aiheutuvat varjostustunnit on esitetty kuvassa 6 ja mallinnuspisteiden A-AA varjostustunnit taulukossa 18.

Mallinnuksessa on huomioitu myös Salo-Ylikosken tuulivoimapuistohanke.

Hankevaihtoehdon 1 varjostusmallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 10.



Kuva 6. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu. Purmon hankkeen VE1 Salo-Ylikosken hankkeen kanssa.

13.2.2023

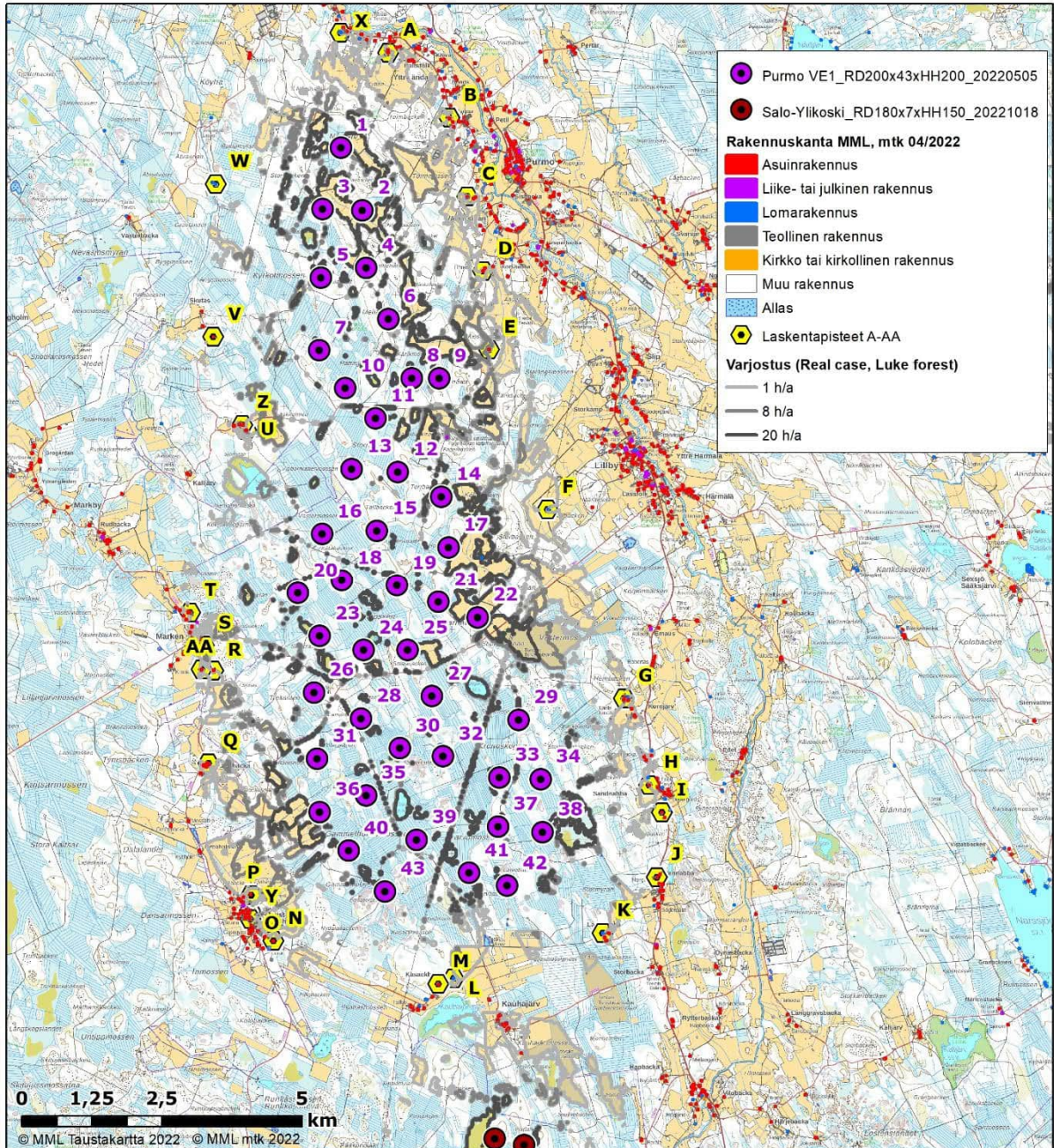
Taulukko 18. Varjostusmallinnuksen tulos VE1 Salo-Ylikosken hankkeen kanssa, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	5,0 x 5,0	2:17
Asuinrakennus B (Dallberga)	297952	7051163	25	5,0 x 5,0	1:34
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	5,0 x 5,0	1:42
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	5,0 x 5,0	4:01
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	5,0 x 5,0	11:36
Lomarakennus F (Källbacken)	299710	7044165	37,5	5,0 x 5,0	3:53
Asuinrakennus G (Kornjärv)	301071	7040772	55	5,0 x 5,0	3:27
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	5,0 x 5,0	3:25
Asuinrakennus I (Asp)	301749	7038736	54,4	5,0 x 5,0	0:00
Asuinrakennus J (Stennabba)	301661	7037581	55	5,0 x 5,0	0:00
Asuinrakennus K (Långnabba)	300689	7036583	55	5,0 x 5,0	2:49
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	5,0 x 5,0	3:34
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	5,0 x 5,0	0:00
Asuinrakennus N (Adler)	294812	7036441	45	5,0 x 5,0	0:00
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	5,0 x 5,0	4:30
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	5,0 x 5,0	3:43
Asuinrakennus Q (Dalabacka)	293652	7039610	40	5,0 x 5,0	1:58
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	5,0 x 5,0	8:35
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	5,0 x 5,0	6:39
Asuinrakennus T (Norrgård)	293326	7042304	31	5,0 x 5,0	2:05
Asuinrakennus U (Nåpi)	294326	7045578	35	5,0 x 5,0	5:56
Asuinrakennus V (Skutas)	293741	7047247	32,1	5,0 x 5,0	1:49
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	5,0 x 5,0	1:36
Lomarakennus X (Dalbacka)	296008	7052686	20,5	5,0 x 5,0	2:49
Asuinrakennus Y (Åvist)	294403	7036830	41,6	5,0 x 5,0	0:00
Asuinrakennus Z (Nabba)	294257	7045675	35	5,0 x 5,0	6:28
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	5,0 x 5,0	1:28

13.2.2023

Mallinnus "Real Case, No Forest" ei ota huomioon puustosta aiheutuvia katvevaikutuksia, joten vaikutukset jäävät todellisuudessa edellä esitettyä vähäisemmiksi. Kuvassa 7 on esitetty varjostusvaikutus tilanteessa, jossa puuston aiheuttama katvevaikutus on huomioitu. Taulukossa 19 on esitetty mallinnuspisteiden A-AA vuotuiset varjostustunnit, kun puuston katvevaikutus huomioidaan. Mallinnuksessa on huomioitu myös Salo-Ylikosken tuulivoimapuistohanke.

Huomioitaessa puuston suojaava vaikutus, ei hankevaihtoehdosta 1 aiheudu yli 8 h/a varjostusvaikutuksia Purmon hankkeen läheisyydessä.



Kuva 7. Varjostusmallinnuksen tulos, kun puuston suojaava vaikutus on huomioitu. Purmon hankkeen VE1 Salo-Ylikosken hankkeen kanssa.

13.2.2023

Taulukko 19. Varjostusmallinnuksen tulos VE1 Salo-Ylikosken hankkeen kanssa, kun puuston suojaava vaikutus on huomioitu "real case, Luke forest".

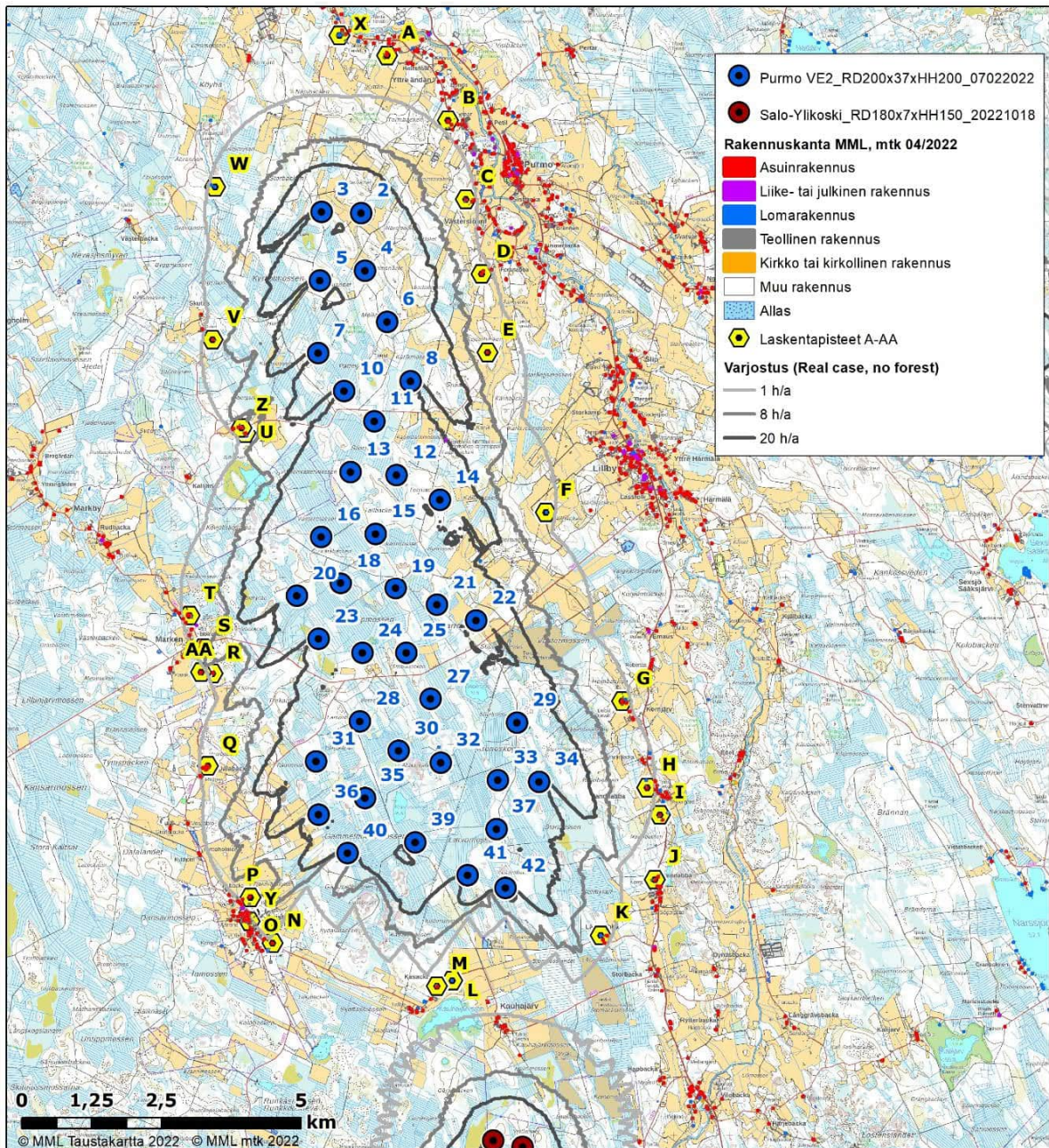
	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	5,0 x 5,0	2:17
Asuinrakennus B (Dallberga)	297952	7051163	25	5,0 x 5,0	1:34
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	5,0 x 5,0	1:42
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	5,0 x 5,0	4:01
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	5,0 x 5,0	8:33
Lomarakennus F (Källbacken)	299710	7044165	37,5	5,0 x 5,0	3:53
Asuinrakennus G (Kornjärv)	301071	7040772	55	5,0 x 5,0	3:27
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	5,0 x 5,0	3:25
Asuinrakennus I (Asp)	301749	7038736	54,4	5,0 x 5,0	0:00
Asuinrakennus J (Stennabba)	301661	7037581	55	5,0 x 5,0	0:00
Asuinrakennus K (Långnabba)	300689	7036583	55	5,0 x 5,0	0:00
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	5,0 x 5,0	0:00
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	5,0 x 5,0	0:00
Asuinrakennus N (Adler)	294812	7036441	45	5,0 x 5,0	0:00
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	5,0 x 5,0	4:30
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	5,0 x 5,0	0:00
Asuinrakennus Q (Dalabacka)	293652	7039610	40	5,0 x 5,0	1:58
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	5,0 x 5,0	1:52
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	5,0 x 5,0	6:39
Asuinrakennus T (Norrgård)	293326	7042304	31	5,0 x 5,0	0:00
Asuinrakennus U (Nåpi)	294326	7045578	35	5,0 x 5,0	5:56
Asuinrakennus V (Skutas)	293741	7047247	32,1	5,0 x 5,0	1:49
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	5,0 x 5,0	1:36
Lomarakennus X (Dalbacka)	296008	7052686	20,5	5,0 x 5,0	2:49
Asuinrakennus Y (Åvist)	294403	7036830	41,6	5,0 x 5,0	0:00
Asuinrakennus Z (Nabba)	294257	7045675	35	5,0 x 5,0	2:45
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	5,0 x 5,0	1:28

13.2.2023

Ilman puuston suojaavaa vaikutusta Purmon tuulivoimahankkeen VE 2 läheisyydessä sijaitseviin asuin- tai lomarakennuksiin ei aiheudu yli 8 tunnin vuotuista varjostusvaikutusta. Kuvassa 8 on esitetty varjostusvaikutus ja mallinnuspisteiden A-AA varjostustunnit taulukossa 20.

Mallinnuksessa on huomioitu myös Salo-Ylikosken tuulivoimapaistohanke.

Hankevaihtoehdon 2 varjostusmallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 12.



Kuva 8. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu. Purmon hankkeen VE2 Salo-Ylikosken hankkeen kanssa.

13.2.2023

Taulukko 20. Varjostusmallinnuksen tulos. Purmon hankkeen VE2 Salo-Ylikosken hankkeen kanssa, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

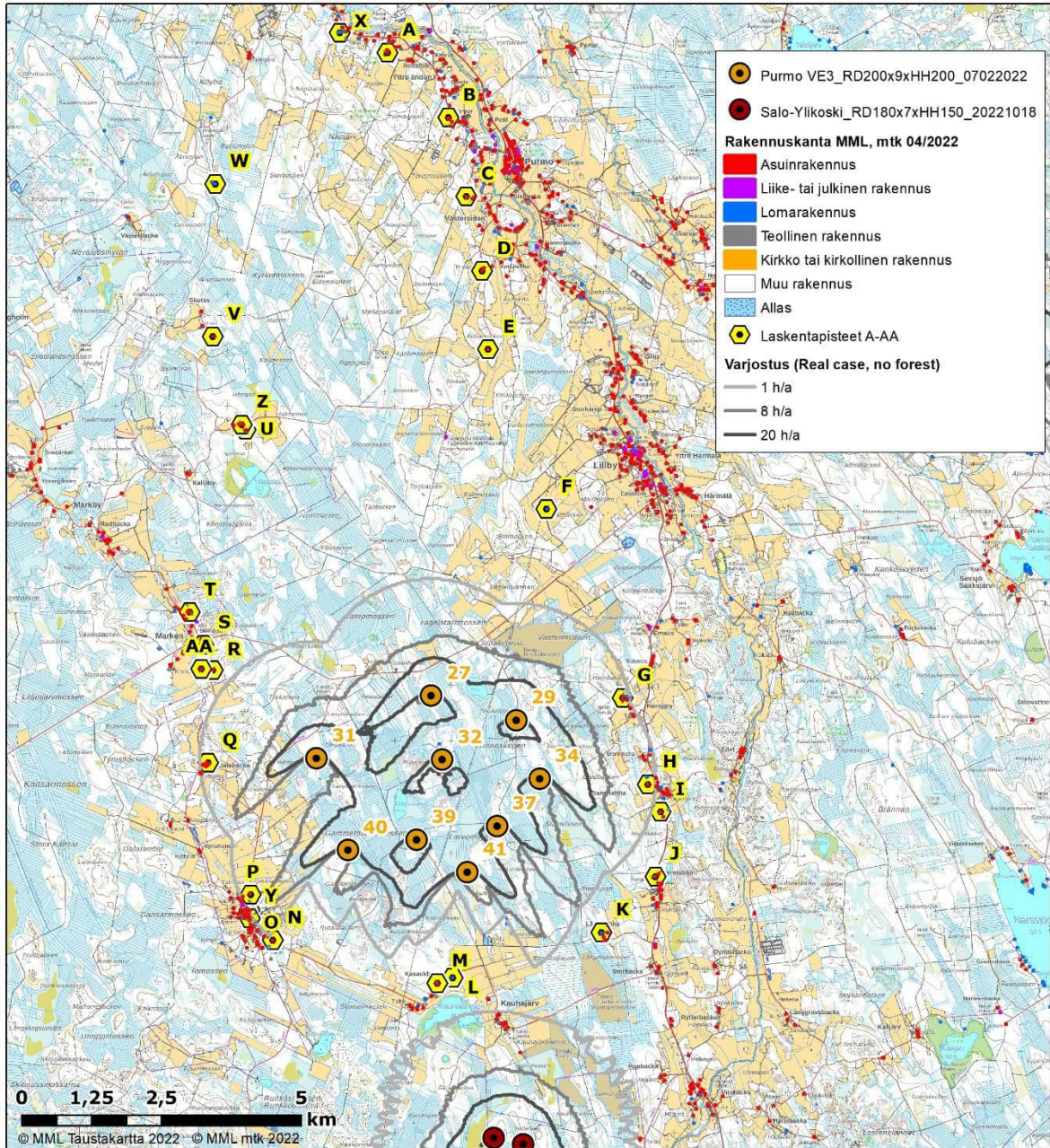
	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	5,0 x 5,0	0:00
Asuinrakennus B (Dallberga)	297952	7051163	25	5,0 x 5,0	0:00
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	5,0 x 5,0	1:42
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	5,0 x 5,0	1:58
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	5,0 x 5,0	5:17
Lomarakennus F (Källbacken)	299710	7044165	37,5	5,0 x 5,0	2:01
Asuinrakennus G (Kornjärv)	301071	7040772	55	5,0 x 5,0	3:27
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	5,0 x 5,0	1:51
Asuinrakennus I (Asp)	301749	7038736	54,4	5,0 x 5,0	0:00
Asuinrakennus J (Stennabba)	301661	7037581	55	5,0 x 5,0	0:00
Asuinrakennus K (Långnabba)	300689	7036583	55	5,0 x 5,0	2:49
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	5,0 x 5,0	0:00
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	5,0 x 5,0	0:00
Asuinrakennus N (Adler)	294812	7036441	45	5,0 x 5,0	0:00
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	5,0 x 5,0	4:30
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	5,0 x 5,0	3:43
Asuinrakennus Q (Dalabacka)	293652	7039610	40	5,0 x 5,0	1:58
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	5,0 x 5,0	6:45
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	5,0 x 5,0	6:39
Asuinrakennus T (Norrgård)	293326	7042304	31	5,0 x 5,0	2:05
Asuinrakennus U (Näpi)	294326	7045578	35	5,0 x 5,0	5:56
Asuinrakennus V (Skutas)	293741	7047247	32,1	5,0 x 5,0	1:49
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	5,0 x 5,0	1:36
Lomarakennus X (Dalbacka)	296008	7052686	20,5	5,0 x 5,0	0:00
Asuinrakennus Y (Åvist)	294403	7036830	41,6	5,0 x 5,0	0:00
Asuinrakennus Z (Nabba)	294257	7045675	35	5,0 x 5,0	6:28
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	5,0 x 5,0	0:00

13.2.2023

Ilman puuston suojaavaa vaikutusta Purmon tuulivoimahankkeen VE 3 läheisyydessä sijaitseviin asuin- tai lomarakennuksiin ei aiheudu yli 8 tunnin vuotuista varjostusvaikutusta. Kuvassa 9 on esitetty varjostusvaikutus ja mallinnuspisteiden A-AA varjostustunnit taulukossa 21.

Mallinnuksessa on huomioitu myös Salo-Ylikosken tuulivoimapaistohanke.

Hankevaihtoehdon 3 varjostusmallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 13.



Kuva 9. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu. Purmon hankkeen VE3 Salo-Ylikosken hankkeen kanssa.



13.2.2023

Taulukko 21. Varjostusmallinnuksen tulos VE3, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

	ETRS89-TM35 I tä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Lillkvist)	296866	7052328	25,9	5,0 x 5,0	0:00
Asuinrakennus B (Dallberga)	297952	7051163	25	5,0 x 5,0	0:00
Asuinrakennus C (Tormbacka)	298274	7049757	28,2	5,0 x 5,0	0:00
Asuinrakennus D (Kallträskvägen)	298556	7048421	35,6	5,0 x 5,0	0:00
Metsästysmaja E (Kejsarbacken)	298663	7047017	33,9	5,0 x 5,0	0:00
Lomarakennus F (Källbacken)	299710	7044165	37,5	5,0 x 5,0	0:00
Asuinrakennus G (Kornjärv)	301071	7040772	55	5,0 x 5,0	3:25
Asuinrakennus H (Sandnabba)	301519	7039228	51,9	5,0 x 5,0	1:51
Asuinrakennus I (Asp)	301749	7038736	54,4	5,0 x 5,0	0:00
Asuinrakennus J (Stennabba)	301661	7037581	55	5,0 x 5,0	0:00
Asuinrakennus K (Långnabba)	300689	7036583	55	5,0 x 5,0	0:00
Lomarakennus L (Åvistvägen)	298031	7035773	52,4	5,0 x 5,0	0:00
Asuinrakennus M (Stenbacka)	297753	7035671	53,9	5,0 x 5,0	0:00
Asuinrakennus N (Adler)	294812	7036441	45	5,0 x 5,0	0:00
Asuinrakennus O (Åvistvägen)	294394	7036982	40,2	5,0 x 5,0	4:30
Asuinrakennus P (Finnabbavägen)	294415	7037260	40	5,0 x 5,0	3:43
Asuinrakennus Q (Dalabacka)	293652	7039610	40	5,0 x 5,0	1:58
Asuinrakennus R (Kronkvist)	293736	7041267	32,5	5,0 x 5,0	0:00
Asuinrakennus S (Tallbacka)	293575	7041715	32,1	5,0 x 5,0	0:00
Asuinrakennus T (Norrgård)	293326	7042304	31	5,0 x 5,0	0:00
Asuinrakennus U (Näpi)	294326	7045578	35	5,0 x 5,0	0:00
Asuinrakennus V (Skutas)	293741	7047247	32,1	5,0 x 5,0	0:00
Asuinrakennus W (Åbrännan)	293782	7049981	22,5	5,0 x 5,0	0:00
Lomarakennus X (Dalbacka)	296008	7052686	20,5	5,0 x 5,0	0:00
Asuinrakennus Y (Åvist)	294403	7036830	41,6	5,0 x 5,0	0:00
Asuinrakennus Z (Nabba)	294257	7045675	35	5,0 x 5,0	0:00
Asuinrakennus AA (Kronkvist)	293533	7041290	31,6	5,0 x 5,0	0:00

FCG Finnish Consulting Group Oy

Henna-Riikka Rintamäki, ins. AMK  
Laatija

Johanna Harju, ins. AMK  
Tarkastaja

13.2.2023

---

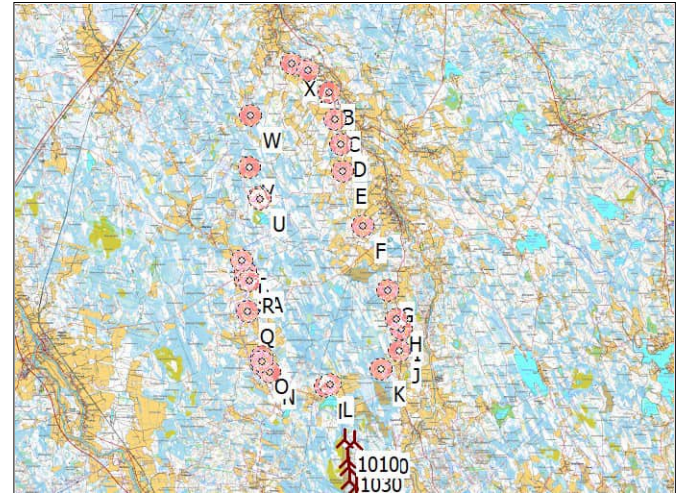
Liite 1. Purmon tuulivoimahanke nykytilanne. Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014

## DECIBEL - Main Result

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

All coordinates are in  
Finish TM ETRS-TM35FIN-ETRS89



## WTGs

East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
				Valid	Manufact.	Type-generator				Creator	Name		
1010	298 762	7 032 913	58,6 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1020	299 290	7 032 796	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1030	298 900	7 031 842	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1040	298 977	7 031 430	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1050	299 000	7 030 729	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1060	299 358	7 030 441	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1070	299 389	7 029 959	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4

## Calculation Results

### Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height [m]	Demands Noise [dB(A)]	Sound level		2 dB penalty applied for one or more WTGs
							From WTGs [dB(A)]	Distance to noise demand [m]	
A	Asuinrakennus A (Lillkvist)	296 866	7 052 328	26,8	4,0	40,0	9,1	18 740	No
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	4,0	40,0	9,9	17 493	No
C	Asuinrakennus C (Tormbacka)	298 274	7 049 757	28,2	4,0	40,0	10,8	16 074	No
D	Asuinrakennus D (Kalltrdskvdgen)	298 556	7 048 421	35,5	4,0	40,0	11,7	14 730	No
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	4,0	40,0	12,7	13 324	No
F	Lomarakennus F (Kdillbacken)	299 710	7 044 165	37,5	4,0	40,0	15,1	10 497	No
G	Asuinrakennus G (Kornjdrv)	301 071	7 040 772	55,0	4,0	40,0	18,3	7 347	No
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	4,0	40,0	20,0	6 007	No
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	4,0	40,0	20,5	5 639	No
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	4,0	40,0	22,1	4 559	No
K	Asuinrakennus K (Lengnabba)	300 689	7 036 583	55,0	4,0	40,0	24,7	3 242	No
L	Lomarakennus L (Evistvdgen)	298 031	7 035 773	52,3	4,0	40,0	27,5	2 201	No
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	4,0	40,0	27,6	2 192	No
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	4,0	40,0	22,2	4 564	No
O	Asuinrakennus O (Evistvdgen)	294 394	7 036 982	41,2	4,0	40,0	21,1	5 237	No
P	Asuinrakennus P (Finnabbavdgen)	294 415	7 037 260	40,0	4,0	40,0	20,9	5 415	No
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	4,0	40,0	17,9	7 690	No
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	4,0	40,0	16,5	9 013	No
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	4,0	40,0	16,1	9 480	No
T	Asuinrakennus T (Norrgerd)	293 326	7 042 304	30,9	4,0	40,0	15,5	10 114	No
U	Asuinrakennus U (Nepi)	294 326	7 045 578	35,0	4,0	40,0	13,3	12 673	No
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	4,0	40,0	11,9	14 442	No
W	Asuinrakennus W (Ebrdnan)	293 782	7 049 981	22,5	4,0	40,0	10,2	17 030	No
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	4,0	40,0	8,8	19 201	No
Y	Asuinrakennus Y (Evist)	294 403	7 036 830	41,9	4,0	40,0	21,3	5 128	No
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	4,0	40,0	13,2	12 788	No
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	4,0	40,0	16,4	9 140	No

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

23.1.2023 16.21/3.5.584

## DECIBEL - Main Result

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Distances (m)

	WTG						
NSA	1010	1020	1030	1040	1050	1060	1070
A	19500	19674	20579	20996	21696	22020	22502
B	18261	18409	19337	19752	20453	20762	21245
C	16845	16985	17919	18334	19035	19339	19822
D	15503	15636	16576	16990	17691	17991	18474
E	14099	14229	15171	15584	16285	16584	17067
F	11288	11373	12345	12751	13450	13723	14204
G	8188	8169	9187	9570	10251	10468	10939
H	6888	6805	7834	8199	8861	9046	9507
I	6542	6427	7457	7811	8463	8630	9085
J	5493	5338	6366	6709	7348	7499	7951
K	4144	4036	5065	5428	6091	6282	6748
L	2951	3231	4024	4443	5134	5493	5968
M	2936	3259	3996	4412	5095	5469	5939
N	5294	5772	6151	6513	7080	7525	7932
O	5967	6439	6833	7196	7763	8208	8615
P	6145	6607	7031	7400	7977	8419	8831
Q	8421	8841	9371	9757	10363	10795	11223
R	9745	10125	10743	11142	11775	12194	12637
S	10213	10589	11213	11613	12248	12666	13110
T	10847	11219	11850	12250	12886	13303	13748
U	13414	13707	14472	14887	15561	15945	16413
V	15182	15474	16239	16655	17328	17713	18180
W	17773	18039	18840	19257	19939	20312	20784
X	19956	20151	21036	21454	22151	22487	22968
Y	5858	6334	6713	7074	7636	8082	8486
Z	13528	13822	14586	15001	15674	16059	16526
AA	9871	10257	10862	11259	11887	12309	12750

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
23.1.2023 16.21/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Noise calculation model:

ISO 9613-2 Finland

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): (14)

Area type with hard ground: Vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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 V136-3.45 HH169 3450 136.0 !O!

Noise: Level 0- Calculated- Mode 0 - 11.02.2016

Source

Source/Date Creator Edited

HH: Vestas; 10 m: calculated by EMD 13.7.2016 USER 23.1.2023 16.21

Document no.: DMS 0053-3713 V02

Blades with serrated trailing edge.

Hub height wind speed noise data from Vestas. Wind speed at hub height is converted to 10 m height using the IEC 61400-11 wind profile (5 cm roughness). Noise levels are interpolated at integer wind speeds.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data								
					63	125	250	500	1000	2000	4000	8000	
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	169,0	8,0	107,4	No	93,1	99,8	97,4	100,6	102,1	99,3	92,8	75,3	

Noise sensitive area: A Asuinrakennus A (Lillkvist)

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

Pure tone penalty: 0 dB

Noise sensitive area: B Asuinrakennus B (Dallberga)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

23.1.2023 16.21/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Noise sensitive area: C Asuinrakennus C (Tormbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: D Asuinrakennus D (Kalltrdskvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: E Metsästysmaja E (Kejsarbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: F Lomarakennus F (Kdillbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: G Asuinrakennus G (Kornjdrv)

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

Pure tone penalty: 0 dB

Noise sensitive area: H Asuinrakennus H (Sandnabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: I Asuinrakennus I (Asp)

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

Pure tone penalty: 0 dB

Noise sensitive area: J Asuinrakennus J (Stennabba)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

23.1.2023 16.21/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: K Asuinrakennus K (Lengnabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: L Lomarakenus L (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: M Asuinrakennus M (Stenbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: N Asuinrakennus N (Adler)

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

Pure tone penalty: 0 dB

Noise sensitive area: O Asuinrakennus O (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: P Asuinrakennus P (Finnabbavdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: Q Asuinrakennus Q (Dalabacka)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

23.1.2023 16.21/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Noise sensitive area: R Asuinrakennus R (Kronkvist)

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

Pure tone penalty: 0 dB

Noise sensitive area: S Asuinrakennus S (Tallbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: T Asuinrakennus T (Norrgerd)

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

Pure tone penalty: 0 dB

Noise sensitive area: U Asuinrakennus U (Nepi)

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

Pure tone penalty: 0 dB

Noise sensitive area: V Asuinrakennus V (Skutas)

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

Pure tone penalty: 0 dB

Noise sensitive area: W Asuinrakennus W (Ebrdnnan)

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

Pure tone penalty: 0 dB

Noise sensitive area: X Lomarakennus X (Dalbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: Y Asuinrakennus Y (Evist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

23.1.2023 16.21/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: Z Asuinrakennus Z (Nabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: AA Asuinrakennus AA (Kronkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

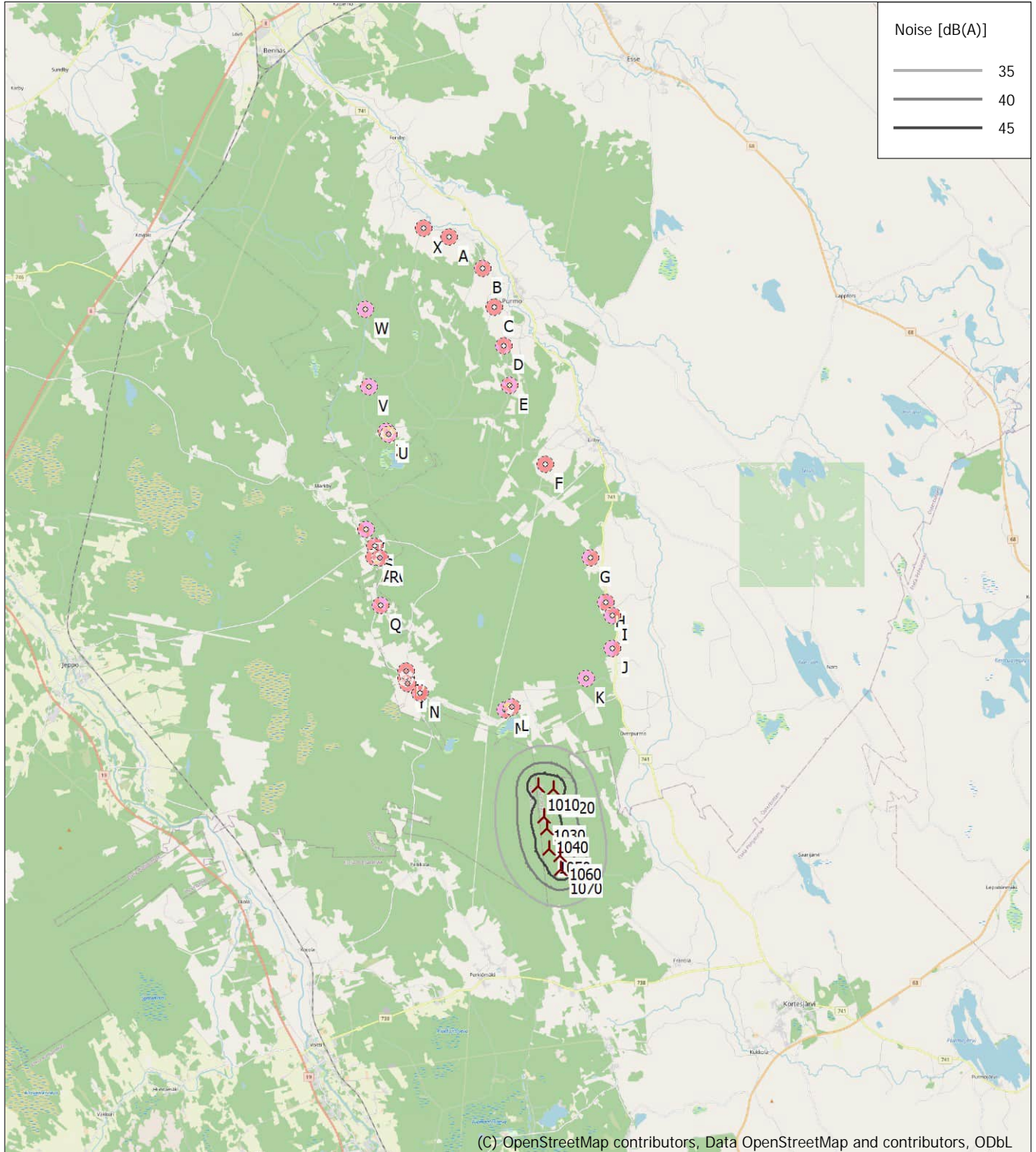
Noise demand: 40,0 dB(A)

No distance demand

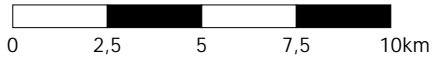
Pure tone penalty: 0 dB

## DECIBEL - Map 8,0 m/s

Calculation: Purmon hanke YV (Salo-Ylikoski)\_nykytilanne



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL



Map: EMD OpenStreetMap, Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 297 858 North: 7 039 822

New WTG

Noise sensitive area

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

13.2.2023

---

Liite 2. Purmon tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE1) V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.38/3.5.584

## DECIBEL - Main Result

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
37	13976	12704	11282	9936	8531	5748	3208	2798	2938	2980	2665	2823	3008	4497	4673	4571	5287	5794	6158	6689	8394	10124
38	14203	12877	11443	10084	8678	5775	2791	2079	2160	2198	2100	3057	3294	5182	5406	5320	6086	6544	6894	7406	8922	10625
39	14084	12924	11541	10239	8861	6362	4481	4264	4407	4344	3714	2561	2604	3128	3230	3112	3956	4721	5136	5724	7933	9699
40	14286	13226	11888	10637	9304	7067	5616	5490	5635	5526	4766	2954	2869	2098	2060	1911	2944	4019	4476	5102	7739	9500
41	14734	13504	12094	10761	9362	6654	4163	3576	3608	3356	2615	1905	2062	3697	3967	3909	5043	5820	6228	6807	8859	10615
42	15041	13765	12342	10994	9588	6771	3938	3106	3057	2681	1904	1912	2147	4286	4610	4570	5758	6498	6897	7464	9381	11124
43	14996	13879	12513	11228	9864	7428	5484	5084	5142	4863	3955	1980	1908	2178	2432	2387	3890	4991	5445	6069	8612	10378
1010	19500	18261	16845	15503	14099	11288	8188	6888	6542	5493	4144	2951	2936	5294	5967	6145	8421	9745	10213	10847	13414	15182
1020	19674	18409	16985	15636	14229	11373	8169	6805	6427	5338	4036	3231	3259	5772	6439	6607	8841	10125	10589	11219	13707	15474
1030	20579	19337	17919	16576	15171	12345	9187	7834	7457	6366	5065	4024	3996	6151	6833	7031	9371	10743	11213	11850	14472	16239
1040	20996	19752	18334	16990	15584	12751	9570	8199	7811	6709	5428	4443	4412	6513	7196	7400	9757	11142	11613	12250	14887	16655
1050	21696	20453	19035	17691	16285	13450	10251	8861	8463	7348	6091	5134	5095	7080	7763	7977	10363	11775	12248	12886	15561	17328
1060	22020	20762	19339	17991	16584	13723	10468	9046	8630	7499	6282	5493	5469	7525	8208	8419	10795	12194	12666	13303	15945	17713
1070	22502	21245	19822	18474	17067	14204	10939	9507	9085	7951	6748	5968	5939	7932	8615	8831	11223	12637	13110	13748	16413	18180

WTG	W	X	Y	Z	AA
1	2326	2053	13891	5258	9663
2	2661	3197	12834	4394	8705
3	1957	3168	12762	4113	8516
4	3072	4222	11834	3576	7770
5	2515	4390	11542	2983	7330
6	3907	5181	11016	3220	7107
7	3494	5686	10250	1912	6089
8	4926	6302	10096	3136	6425
9	5284	6421	10243	3607	6718
10	4316	6351	9648	1949	5653
11	5062	6916	9235	2378	5467
12	6087	7917	8421	2901	4979
13	5641	7799	8254	2106	4482
14	6885	8485	8288	3773	5277
15	6829	8921	7308	3055	3998
16	6534	8962	7010	2412	3246
17	7707	9397	7531	4279	4917
18	7434	9790	6275	3300	2968
19	7872	9934	6512	3982	3791
20	7460	10048	5891	3169	2194
21	8469	10332	6586	4725	4394
22	9056	10743	6745	5437	5012
23	8300	10800	5205	4030	2189
24	8748	11053	5210	4579	2907
25	9016	11109	5563	4998	3688
26	9268	11814	4201	4964	2045
27	9943	11980	5132	5921	4135
28	9909	12273	4090	5670	2975
29	11002	12693	5961	7222	5721
30	10615	12841	4053	6436	3806
31	10439	12992	3101	6124	2602
32	11012	13070	4503	6931	4577
33	11762	13619	5114	7804	5653
34	12119	13816	5750	8277	6354
35	11259	13646	3024	6988	3694
36	11384	13941	2276	7064	3301
37	12547	14472	4715	8513	5983
38	12973	14740	5439	9041	6737
39	12264	14497	3284	8049	4893
40	12155	14626	2135	7850	4162
41	13121	15196	3987	8977	5994
42	13580	15536	4618	9499	6676
43	13005	15374	2449	8725	5136
1010	17773	19956	5858	13528	9871
1020	18039	20151	6334	13822	10257
1030	18840	21036	6713	14586	10862
1040	19257	21454	7074	15001	11259
1050	19939	22151	7636	15674	11887
1060	20312	22487	8082	16059	12309
1070	20784	22968	8486	16526	12750

Project:  
Purmon tuulivoimahanke

Licensed user:  
FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

Noise calculation model:

ISO 9613-2 Finland

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): (14)

Area type with hard ground: Vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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 V150-6.0 HH225 6000 150.0 !O!

Noise: Level 0 - Measured - Mode PO6000 - 10-2020

Source Source/Date Creator Edited  
Manufacturer 13.10.2020 USER 13.10.2022 14.09  
Blades with serrated trailing edge.  
Document nr. 0098-0749 V01.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data								
					63	125	250	500	1000	2000	4000	8000	
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	225,0	8,0	107,7	No	86,1	94,8	100,4	102,8	102,2	98,4	91,6	81,5	

WTG: VESTAS V136-3.45 HH169 3450 136.0 !O!

Noise: Level 0- Calculated- Mode 0 - 11.02.2016

Source Source/Date Creator Edited  
HH: Vestas; 10 m: calculated by EMD 13.7.2016 USER 23.1.2023 16.21  
Document no.: DMS 0053-3713 V02  
Blades with serrated trailing edge.

Hub height wind speed noise data from Vestas. Wind speed at hub height is converted to 10 m height using the IEC 61400-11 wind profile (5 cm roughness). Noise levels are interpolated at integer wind speeds.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	169,0	8,0	107,4	No	93,1	99,8	97,4	100,6	102,1	99,3	92,8	75,3

Noise sensitive area: A Asuinrakennus A (Lillkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B Asuinrakennus B (Dallberga)

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

Pure tone penalty: 0 dB

Noise sensitive area: C Asuinrakennus C (Tormbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: D Asuinrakennus D (Kalltrdskvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: E Metsästysmaja E (Kejsarbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: F Lomarakennus F (Kdillbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: G Asuinrakennus G (Kornjdrv)

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

Pure tone penalty: 0 dB

Noise sensitive area: H Asuinrakennus H (Sandnabba)

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

Pure tone penalty: 0 dB



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

Noise sensitive area: I Asuinrakennus I (Asp)

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

Pure tone penalty: 0 dB

Noise sensitive area: J Asuinrakennus J (Stennabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: K Asuinrakennus K (Lengnabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: L Lomarakennus L (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: M Asuinrakennus M (Stenbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: N Asuinrakennus N (Adler)

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

Pure tone penalty: 0 dB

Noise sensitive area: O Asuinrakennus O (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: P Asuinrakennus P (Finnabbavdgen)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: Q Asuinrakennus Q (Dalabacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: R Asuinrakennus R (Kronkvist)

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

Pure tone penalty: 0 dB

Noise sensitive area: S Asuinrakennus S (Tallbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: T Asuinrakennus T (Norrgerd)

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

Pure tone penalty: 0 dB

Noise sensitive area: U Asuinrakennus U (Nepi)

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

Pure tone penalty: 0 dB

Noise sensitive area: V Asuinrakennus V (Skutas)

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

Pure tone penalty: 0 dB

Noise sensitive area: W Asuinrakennus W (Ebrdnan)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_

Noise sensitive area: X Lomarakennus X (Dalbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: Y Asuinrakennus Y (Evist)

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

Pure tone penalty: 0 dB

Noise sensitive area: Z Asuinrakennus Z (Nabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: AA Asuinrakennus AA (Kronkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

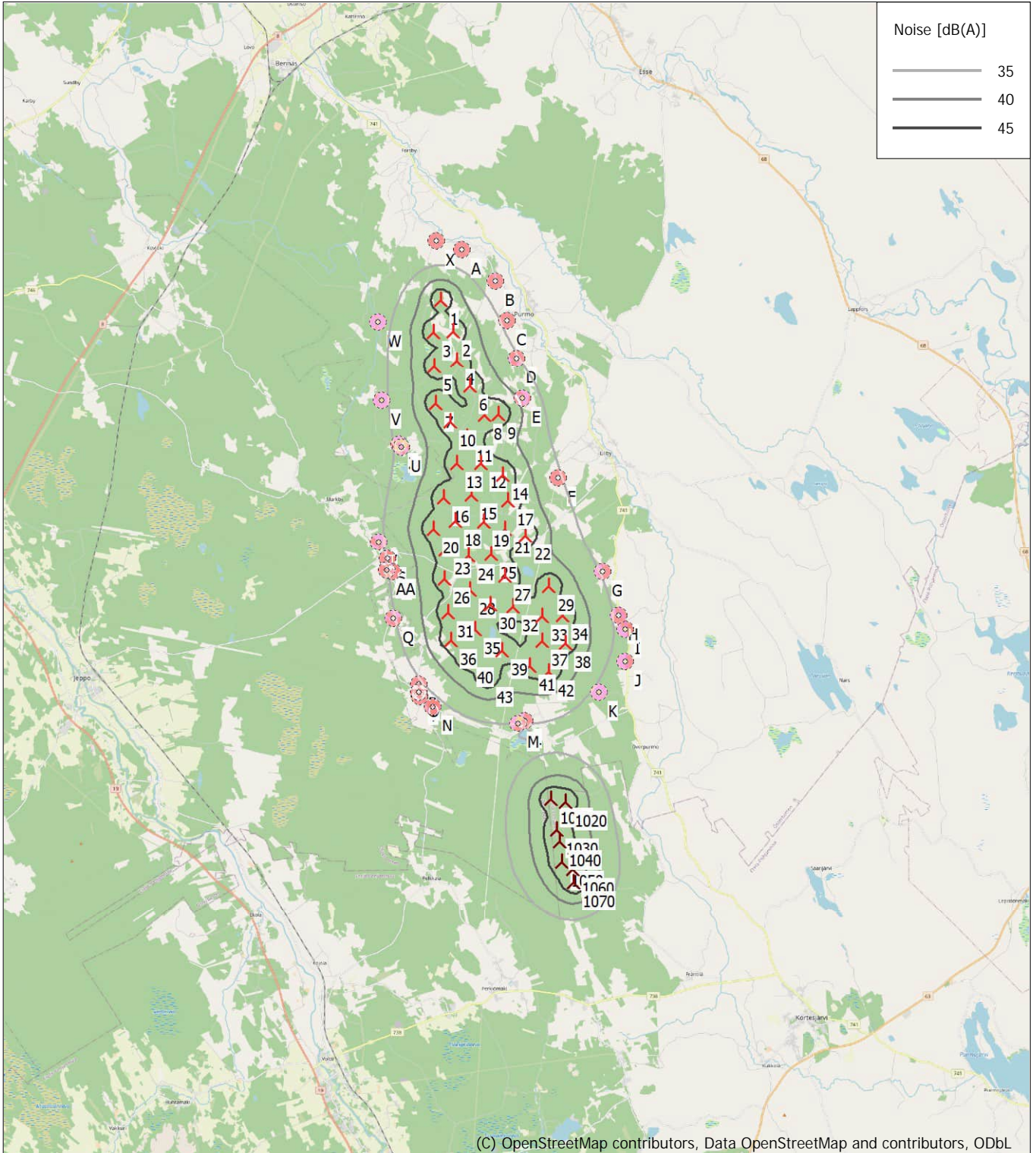
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

## DECIBEL - Map 8,0 m/s

Calculation: Purmo VE1\_V150-6.0MWx43xHH225\_20220505 + YV (Salo-Ylikoski)\_



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 2,5 5 7,5 10km

Map: EMD OpenStreetMap, Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 297 431 North: 7 040 296

New WTG

Noise sensitive area

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

13.2.2023

---

Liite 3. Purmon tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE2) V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.37/3.5.584

## DECIBEL - Main Result

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
42	15041	13765	12342	10994	9588	6771	3938	3106	3057	2681	1904	1912	2147	4286	4610	4570	5758	6498	6897	7464	9381	11124
1010	19500	18261	16845	15503	14099	11288	8188	6888	6542	5493	4144	2951	2936	5294	5967	6145	8421	9745	10213	10847	13414	15182
1020	19674	18409	16985	15636	14229	11373	8169	6805	6427	5338	4036	3231	3259	5772	6439	6607	8841	10125	10589	11219	13707	15474
1030	20579	19337	17919	16576	15171	12345	9187	7834	7457	6366	5065	4024	3996	6151	6833	7031	9371	10743	11213	11850	14472	16239
1040	20996	19752	18334	16990	15584	12751	9570	8199	7811	6709	5428	4443	4412	6513	7196	7400	9757	11142	11613	12250	14887	16655
1050	21696	20453	19035	17691	16285	13450	10251	8861	8463	7348	6091	5134	5095	7080	7763	7977	10363	11775	12248	12886	15561	17328
1060	22020	20762	19339	17991	16584	13723	10468	9046	8630	7499	6282	5493	5469	7525	8208	8419	10795	12194	12666	13303	15945	17713
1070	22502	21245	19822	18474	17067	14204	10939	9507	9085	7951	6748	5968	5939	7932	8615	8831	11223	12637	13110	13748	16413	18180

WTG	W	X	Y	Z	AA
2	2661	3197	12834	4394	8705
3	1957	3168	12762	4113	8516
4	3072	4222	11834	3576	7770
5	2515	4390	11542	2983	7330
6	3907	5181	11016	3220	7107
7	3494	5686	10250	1912	6089
8	4926	6302	10096	3136	6425
10	4316	6351	9648	1949	5653
11	5062	6916	9235	2378	5467
12	6087	7917	8421	2901	4979
13	5641	7799	8254	2106	4482
14	6885	8485	8288	3773	5277
15	6829	8921	7308	3055	3998
16	6534	8962	7010	2412	3246
18	7434	9790	6275	3300	2968
19	7872	9934	6512	3982	3791
20	7460	10048	5891	3169	2194
21	8469	10332	6586	4725	4394
22	9056	10743	6745	5437	5012
23	8300	10800	5205	4030	2189
24	8748	11053	5210	4579	2907
25	9016	11109	5563	4998	3688
27	9943	11980	5132	5921	4135
28	9909	12273	4090	5670	2975
29	11002	12693	5961	7222	5721
30	10615	12841	4053	6436	3806
31	10439	12992	3101	6124	2602
32	11067	13134	4446	6978	4582
33	11762	13619	5114	7804	5653
34	12119	13816	5750	8277	6354
35	11259	13646	3024	6988	3694
36	11384	13941	2276	7064	3301
37	12547	14472	4715	8513	5983
39	12264	14497	3284	8049	4893
40	12155	14626	2135	7850	4162
41	13121	15196	3987	8977	5994
42	13580	15536	4618	9499	6676
1010	17773	19956	5858	13528	9871
1020	18039	20151	6334	13822	10257
1030	18840	21036	6713	14586	10862
1040	19257	21454	7074	15001	11259
1050	19939	22151	7636	15674	11887
1060	20312	22487	8082	16059	12309
1070	20784	22968	8486	16526	12750



Project:  
Purmon tuulivoimahanke

Licensed user:  
FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.37/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

Noise calculation model:

ISO 9613-2 Finland

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): (14)

Area type with hard ground: Vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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 V150-6.0 HH225 6000 150.0 !O!

Noise: Level 0 - Measured - Mode PO6000 - 10-2020

Source	Source/Date	Creator	Edited
Manufacturer	13.10.2020	USER	13.10.2022 14.09

Blades with serrated trailing edge.  
Document nr. 0098-0749 V01.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	225,0	8,0	107,7	No	86,1	94,8	100,4	102,8	102,2	98,4	91,6	81,5

WTG: VESTAS V136-3.45 HH169 3450 136.0 !O!

Noise: Level 0- Calculated- Mode 0 - 11.02.2016

Source	Source/Date	Creator	Edited
HH: Vestas; 10 m: calculated by EMD	13.7.2016	USER	23.1.2023 16.21

Document no.: DMS 0053-3713 V02  
Blades with serrated trailing edge.

Hub height wind speed noise data from Vestas. Wind speed at hub height is converted to 10 m height using the IEC 61400-11 wind profile (5 cm roughness). Noise levels are interpolated at integer wind speeds.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	169,0	8,0	107,4	No	93,1	99,8	97,4	100,6	102,1	99,3	92,8	75,3

Noise sensitive area: A Asuinrakennus A (Lillkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.37/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B Asuinrakennus B (Dallberga)

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

Pure tone penalty: 0 dB

Noise sensitive area: C Asuinrakennus C (Tormbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: D Asuinrakennus D (Kalltrdskvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: E Metsästysmaja E (Kejsarbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: F Lomarakennus F (Kdillbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: G Asuinrakennus G (Kornjdrv)

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

Pure tone penalty: 0 dB

Noise sensitive area: H Asuinrakennus H (Sandnabba)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.37/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

Noise sensitive area: I Asuinrakennus I (Asp)

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

Pure tone penalty: 0 dB

Noise sensitive area: J Asuinrakennus J (Stennabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: K Asuinrakennus K (Lengnabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: L Lomarakennus L (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: M Asuinrakennus M (Stenbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: N Asuinrakennus N (Adler)

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

Pure tone penalty: 0 dB

Noise sensitive area: O Asuinrakennus O (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: P Asuinrakennus P (Finnabbavdgen)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.37/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: Q Asuinrakennus Q (Dalabacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: R Asuinrakennus R (Kronkvist)

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

Pure tone penalty: 0 dB

Noise sensitive area: S Asuinrakennus S (Tallbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: T Asuinrakennus T (Norrgerd)

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

Pure tone penalty: 0 dB

Noise sensitive area: U Asuinrakennus U (Nepi)

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

Pure tone penalty: 0 dB

Noise sensitive area: V Asuinrakennus V (Skutas)

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

Pure tone penalty: 0 dB

Noise sensitive area: W Asuinrakennus W (Ebrdnnan)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.37/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)

Noise sensitive area: X Lomarakennus X (Dalbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: Y Asuinrakennus Y (Evist)

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

Pure tone penalty: 0 dB

Noise sensitive area: Z Asuinrakennus Z (Nabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: AA Asuinrakennus AA (Kronkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

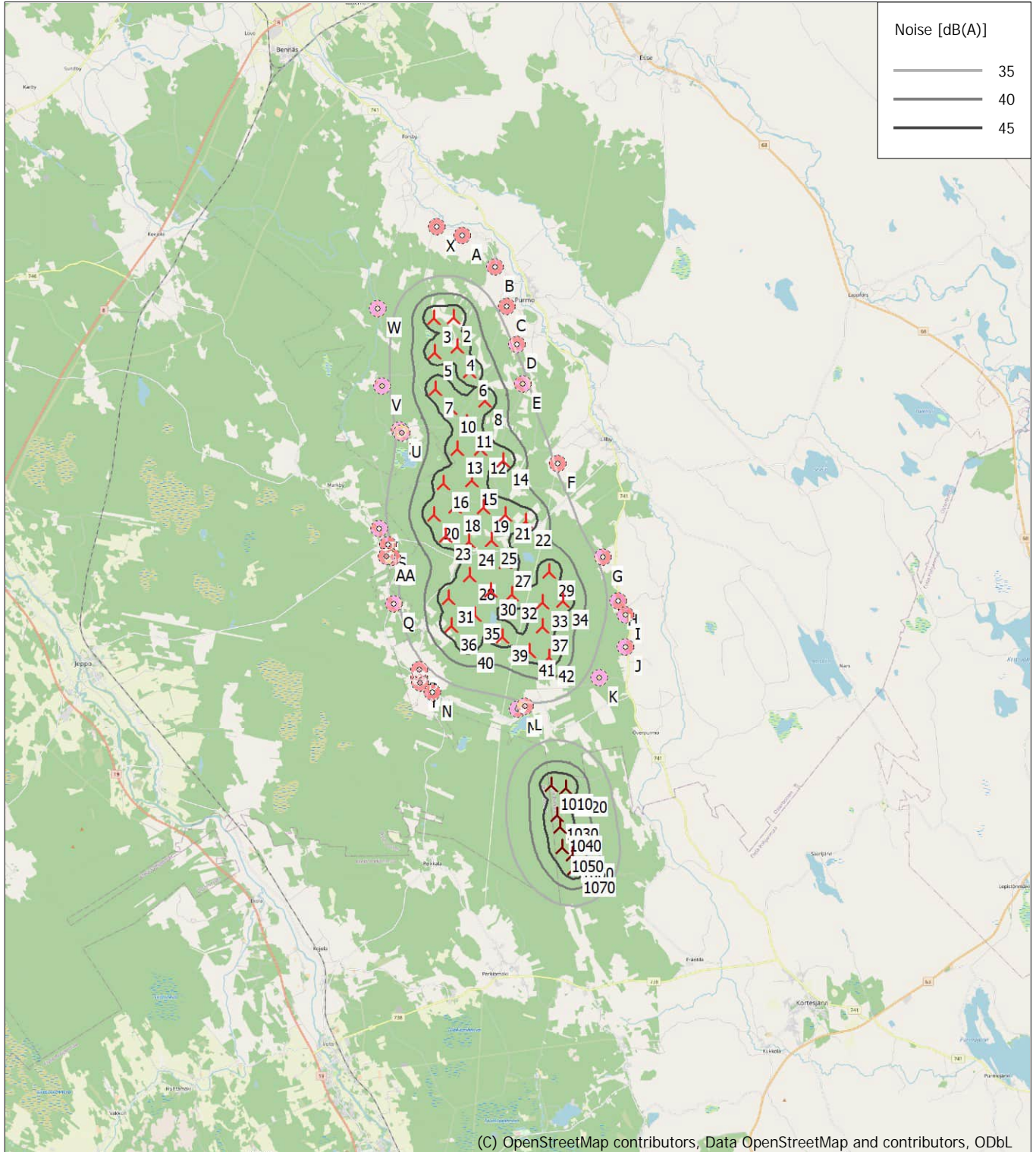
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

## DECIBEL - Map 8,0 m/s

Calculation: Purmo VE2\_V150-6.0MWx37xHH225\_20220207 + YV (Salo-Ylikoski)



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap, Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 297 413 North: 7 039 822

New WTG

Noise sensitive area

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

---

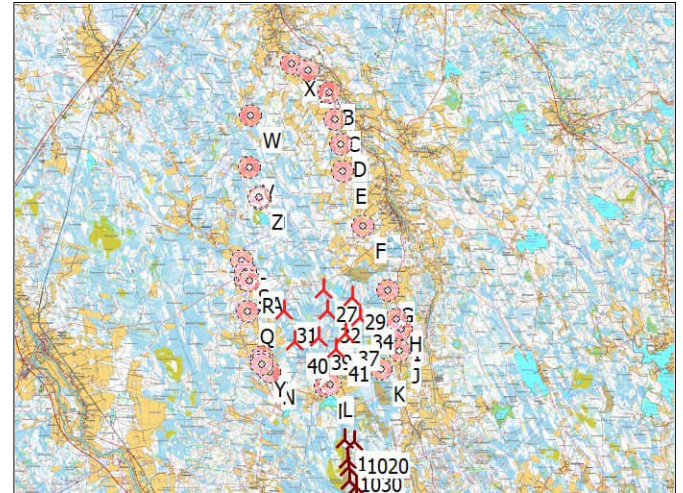
Liite 4. Purmon tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE3) V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.

## DECIBEL - Main Result

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

All coordinates are in  
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:400 000

New WTG

Noise sensitive area

### WTGs

East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
				Valid	Manufact.	Type-generator				Creator	Name		
27	297 642	7 040 813	45,0 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
29	299 163	7 040 378	48,1 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
31	295 591	7 039 696	41,5 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
32	297 843	7 039 671	47,5 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
34	299 581	7 039 334	53,6 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
37	298 820	7 038 484	53,1 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
39	297 381	7 038 242	47,5 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
40	296 154	7 038 055	45,0 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
41	298 289	7 037 664	50,4 VESTAS V150-6.0 HH225 600...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0 - Measured - Mode PO6000 - 10-2020	8,0	107,7
1010	298 762	7 032 913	58,6 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1020	299 290	7 032 796	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1030	298 900	7 031 842	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1040	298 977	7 031 430	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1050	299 000	7 030 729	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1060	299 358	7 030 441	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4
1070	299 389	7 029 959	60,0 VESTAS V136-3.45 HH169 34...	Yes	VESTAS	V136-3.45 HH169-3 450	3 450	136,0	169,0	USER	Level 0- Calculated- Mode 0 - 11.02.2016	8,0	107,4

### Calculation Results

#### Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height [m]	Demands Noise [dB(A)]	Sound level		2 dB penalty applied for one or more WTGs
							From WTGs [dB(A)]	Distance to noise demand [m]	
A	Asuinrakennus A (Lillkvist)	296 866	7 052 328	26,8	4,0	40,0	12,8	10 867	No
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	4,0	40,0	13,9	9 679	No
C	Asuinrakennus C (Tormbacka)	298 274	7 049 757	28,2	4,0	40,0	15,4	8 289	No
D	Asuinrakennus D (Kalltrdskvdgen)	298 556	7 048 421	35,5	4,0	40,0	16,9	6 984	No
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	4,0	40,0	18,9	5 610	No
F	Lomarakennus F (Kdillbacken)	299 710	7 044 165	37,5	4,0	40,0	24,5	3 125	No
G	Asuinrakennus G (Kornjdrv)	301 071	7 040 772	55,0	4,0	40,0	31,8	1 206	No
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	4,0	40,0	31,3	1 234	No
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	4,0	40,0	30,0	1 540	No
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	4,0	40,0	29,2	1 987	No
K	Asuinrakennus K (Lengnabba)	300 689	7 036 583	55,0	4,0	40,0	30,5	1 819	No
L	Lomarakennus L (Evistvdgen)	298 031	7 035 773	52,3	4,0	40,0	32,9	1 186	No
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	4,0	40,0	32,5	1 335	No
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	4,0	40,0	30,2	1 430	No
O	Asuinrakennus O (Evistvdgen)	294 394	7 036 982	41,2	4,0	40,0	30,2	1 396	No
P	Asuinrakennus P (Finnabbvdgen)	294 415	7 037 260	40,0	4,0	40,0	30,9	1 241	No
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	4,0	40,0	30,0	1 294	No
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	4,0	40,0	27,7	1 790	No
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	4,0	40,0	26,2	2 210	No
T	Asuinrakennus T (Norrgerd)	293 326	7 042 304	30,9	4,0	40,0	24,4	2 812	No

To be continued on next page...



## DECIBEL - Main Result

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Distance to noise demand	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
U	Asuinrakennus U (Nepi)	294 326	7 045 578	35,0	4,0	40,0	19,9	5 133	No
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	4,0	40,0	17,2	6 851	No
W	Asuinrakennus W (Ebrdnnan)	293 782	7 049 981	22,5	4,0	40,0	14,4	9 277	No
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	4,0	40,0	12,5	11 312	No
Y	Asuinrakennus Y (Evist)	294 403	7 036 830	41,9	4,0	40,0	29,9	1 469	No
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	4,0	40,0	19,7	5 252	No
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	4,0	40,0	27,0	1 962	No

### Distances (m)

NSA	WTG															
	27	29	31	32	34	37	39	40	41	1010	1020	1030	1040	1050	1060	1070
A	11536	12164	12692	12690	13269	13976	14090	14286	14727	19500	19674	20579	20996	21696	22020	22502
B	10350	10849	11703	11488	11936	12704	12928	13226	13498	18261	18409	19337	19752	20453	20762	21245
C	8962	9417	10409	10092	10501	11282	11545	11888	12089	16845	16985	17919	18334	19035	19339	19822
D	7659	8063	9212	8776	9141	9936	10242	10637	10757	15503	15636	16576	16990	17691	17991	18474
E	6285	6655	7937	7389	7735	8531	8865	9304	9357	14099	14229	15171	15584	16285	16584	17067
F	3937	3825	6076	4865	4831	5748	6362	7067	6652	11288	11373	12345	12751	13450	13723	14204
G	3428	1947	5583	3409	2070	3208	4472	5616	4170	8188	8169	9187	9570	10251	10468	10939
H	4187	2620	5944	3701	1940	2798	4252	5490	3588	6888	6805	7834	8199	8861	9046	9507
I	4601	3062	6230	4015	2248	2938	4394	5635	3621	6542	6427	7457	7811	8463	8630	9085
J	5156	3749	6425	4351	2719	2980	4329	5526	3372	5493	5338	6366	6709	7348	7499	7951
K	5212	4089	5971	4198	2965	2665	3700	4766	2631	4144	4036	5065	5428	6091	6282	6748
L	5054	4741	4618	3901	3883	2823	2552	2954	1907	2951	3231	4024	4443	5134	5493	5968
M	5142	4912	4567	3999	4093	3008	2597	2869	2063	2936	3259	3996	4412	5095	5469	5939
N	5206	5866	3345	4427	5576	4497	3136	2098	3684	5294	5772	6151	6513	7080	7525	7932
O	5021	5853	2965	4371	5694	4673	3240	2060	3953	5967	6439	6833	7196	7763	8208	8615
P	4798	5679	2704	4189	5565	4571	3123	1911	3893	6145	6607	7031	7400	7977	8419	8831
Q	4166	5563	1940	4190	5934	5287	3970	2944	5027	8421	8841	9371	9757	10363	10795	11223
R	3930	5498	2430	4405	6154	5794	4735	4019	5804	9745	10125	10743	11142	11775	12194	12637
S	4164	5744	2852	4730	6459	6158	5150	4476	6213	10213	10589	11213	11613	12248	12666	13110
T	4564	6144	3453	5226	6922	6689	5737	5102	6792	10847	11219	11850	12250	12886	13303	13748
U	5802	7099	6014	6872	8158	8394	7943	7739	8848	13414	13707	14472	14887	15561	15945	16413
V	7521	8748	7772	8612	9831	10124	9709	9500	10603	15182	15474	16239	16655	17328	17713	18180
W	9943	11004	10439	11077	12119	12547	12273	12155	13111	17773	18039	18840	19257	19939	20312	20784
X	11980	12701	12992	13139	13816	14472	14503	14626	15189	19956	20151	21036	21454	22151	22487	22968
Y	5132	5935	3101	4460	5750	4715	3294	2135	3973	5858	6334	6713	7074	7636	8082	8486
Z	5921	7217	6124	6991	8277	8513	8059	7850	8965	13528	13822	14586	15001	15674	16059	16526
AA	4135	5702	2602	4602	6354	5983	4907	4162	5978	9871	10257	10862	11259	11887	12309	12750

Project:  
Purmon tuulivoimahanke

Licensed user:  
FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Noise calculation model:

ISO 9613-2 Finland

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): (14)

Area type with hard ground: Vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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 V150-6.0 HH225 6000 150.0 !O!

Noise: Level 0 - Measured - Mode PO6000 - 10-2020

Source	Source/Date	Creator	Edited
Manufacturer	13.10.2020	USER	13.10.2022 14.09

Blades with serrated trailing edge.  
Document nr. 0098-0749 V01.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	225,0	8,0	107,7	No	86,1	94,8	100,4	102,8	102,2	98,4	91,6	81,5

WTG: VESTAS V136-3.45 HH169 3450 136.0 !O!

Noise: Level 0- Calculated- Mode 0 - 11.02.2016

Source	Source/Date	Creator	Edited
HH: Vestas; 10 m: calculated by EMD	13.7.2016	USER	23.1.2023 16.21

Document no.: DMS 0053-3713 V02  
Blades with serrated trailing edge.

Hub height wind speed noise data from Vestas. Wind speed at hub height is converted to 10 m height using the IEC 61400-11 wind profile (5 cm roughness). Noise levels are interpolated at integer wind speeds.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	169,0	8,0	107,4	No	93,1	99,8	97,4	100,6	102,1	99,3	92,8	75,3

Noise sensitive area: A Asuinrakennus A (Lillkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B Asuinrakennus B (Dallberga)

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

Pure tone penalty: 0 dB

Noise sensitive area: C Asuinrakennus C (Tormbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: D Asuinrakennus D (Kalltrdskvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: E Metsästysmaja E (Kejsarbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: F Lomarakennus F (Kdillbacken)

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

Pure tone penalty: 0 dB

Noise sensitive area: G Asuinrakennus G (Kornjdrv)

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

Pure tone penalty: 0 dB

Noise sensitive area: H Asuinrakennus H (Sandnabba)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Noise sensitive area: I Asuinrakennus I (Asp)

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

Pure tone penalty: 0 dB

Noise sensitive area: J Asuinrakennus J (Stennabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: K Asuinrakennus K (Lengnabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: L Lomarakennus L (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: M Asuinrakennus M (Stenbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: N Asuinrakennus N (Adler)

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

Pure tone penalty: 0 dB

Noise sensitive area: O Asuinrakennus O (Evistvdgen)

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

Pure tone penalty: 0 dB

Noise sensitive area: P Asuinrakennus P (Finnabbavdgen)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: Q Asuinrakennus Q (Dalabacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: R Asuinrakennus R (Kronkvist)

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

Pure tone penalty: 0 dB

Noise sensitive area: S Asuinrakennus S (Tallbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: T Asuinrakennus T (Norrgerd)

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

Pure tone penalty: 0 dB

Noise sensitive area: U Asuinrakennus U (Nepi)

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

Pure tone penalty: 0 dB

Noise sensitive area: V Asuinrakennus V (Skutas)

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

Pure tone penalty: 0 dB

Noise sensitive area: W Asuinrakennus W (Ebrdnan)

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

Pure tone penalty: 0 dB

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 14.38/3.5.584

## DECIBEL - Assumptions for noise calculation

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)

Noise sensitive area: X Lomarakennus X (Dalbacka)

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

Pure tone penalty: 0 dB

Noise sensitive area: Y Asuinrakennus Y (Evist)

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

Pure tone penalty: 0 dB

Noise sensitive area: Z Asuinrakennus Z (Nabba)

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

Pure tone penalty: 0 dB

Noise sensitive area: AA Asuinrakennus AA (Kronkvist)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

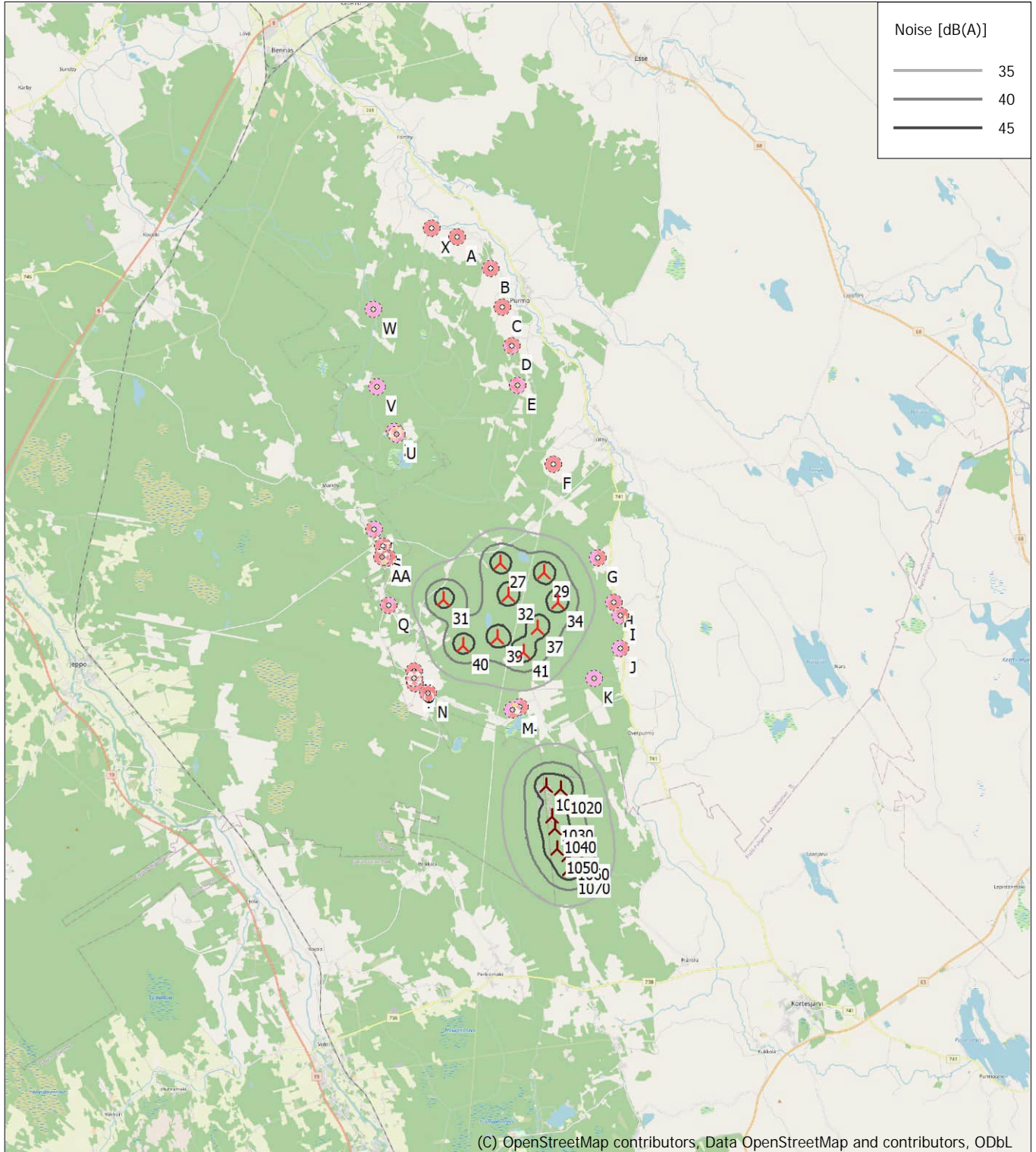
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

## DECIBEL - Map 8,0 m/s

Calculation: Purmo VE3\_V150-6.0MWx9xHH225\_20220207 + YV (Salo-Ylikoski)



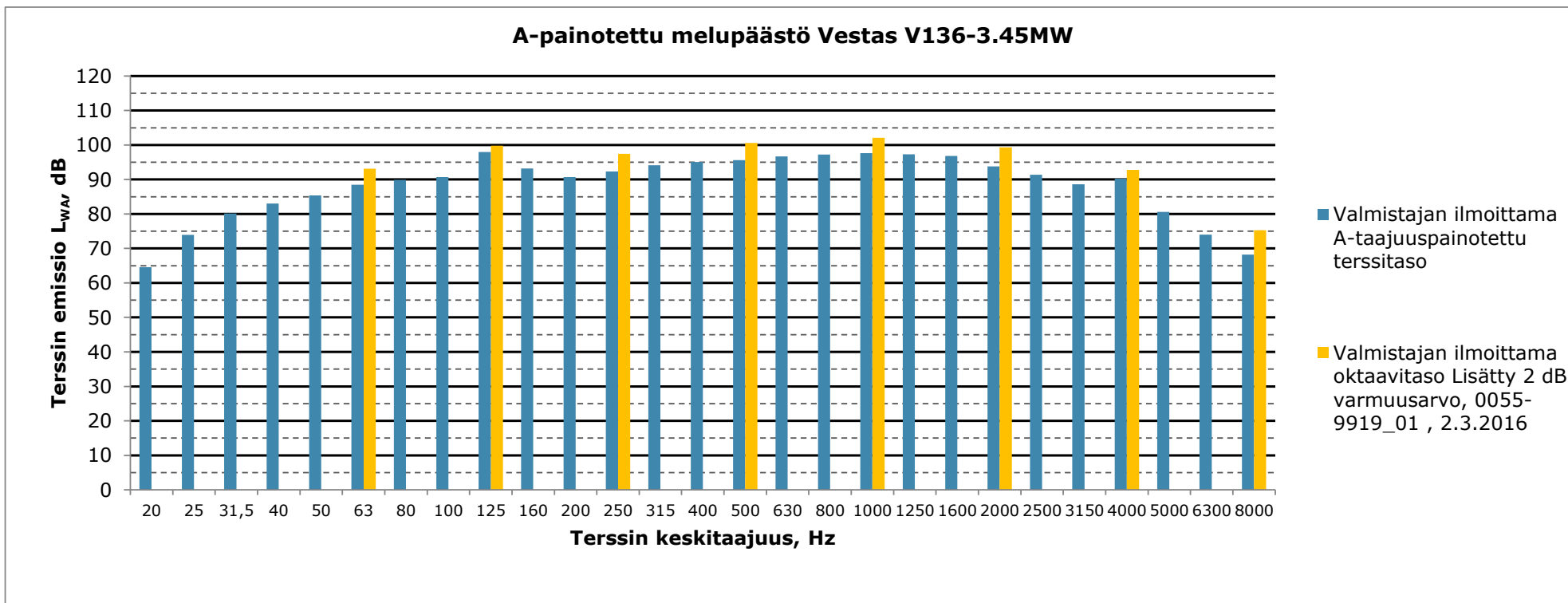
Map: EMD OpenStreetMap, Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 297 586 North: 7 039 822  
 🚧 New WTG      🏠 Noise sensitive area  
 Noise calculation model: ISO 9613-2 Finland. Wind speed: 8,0 m/s  
 Height above sea level from active line object

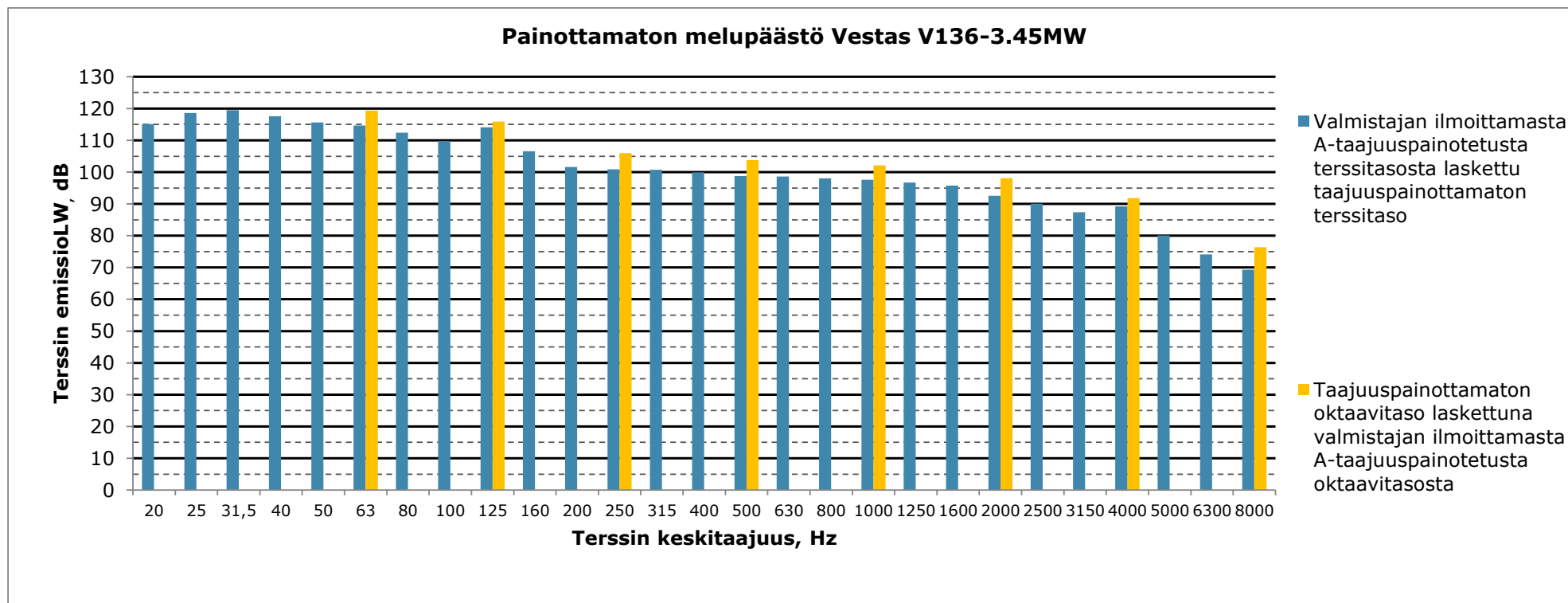
13.2.2023

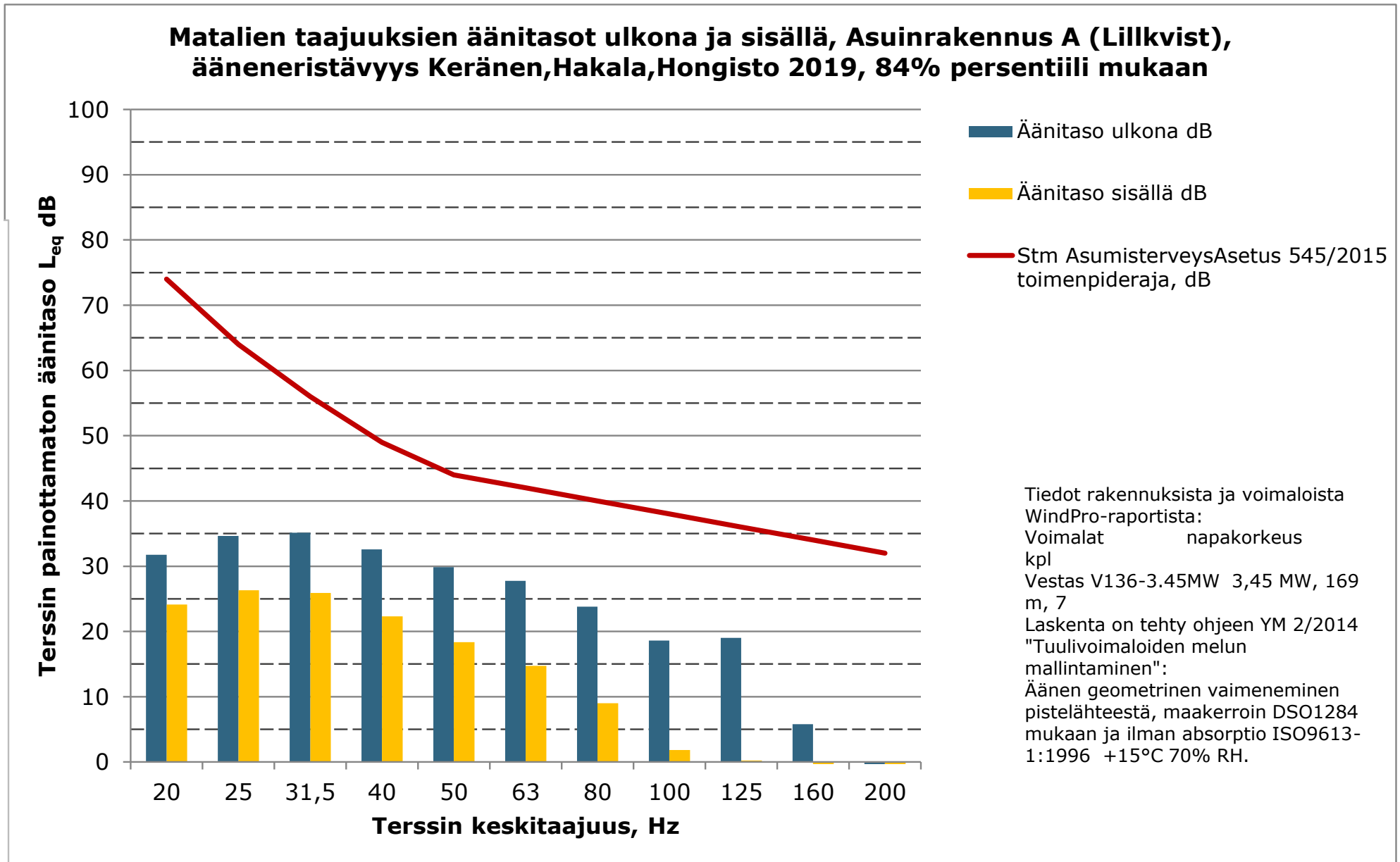
---

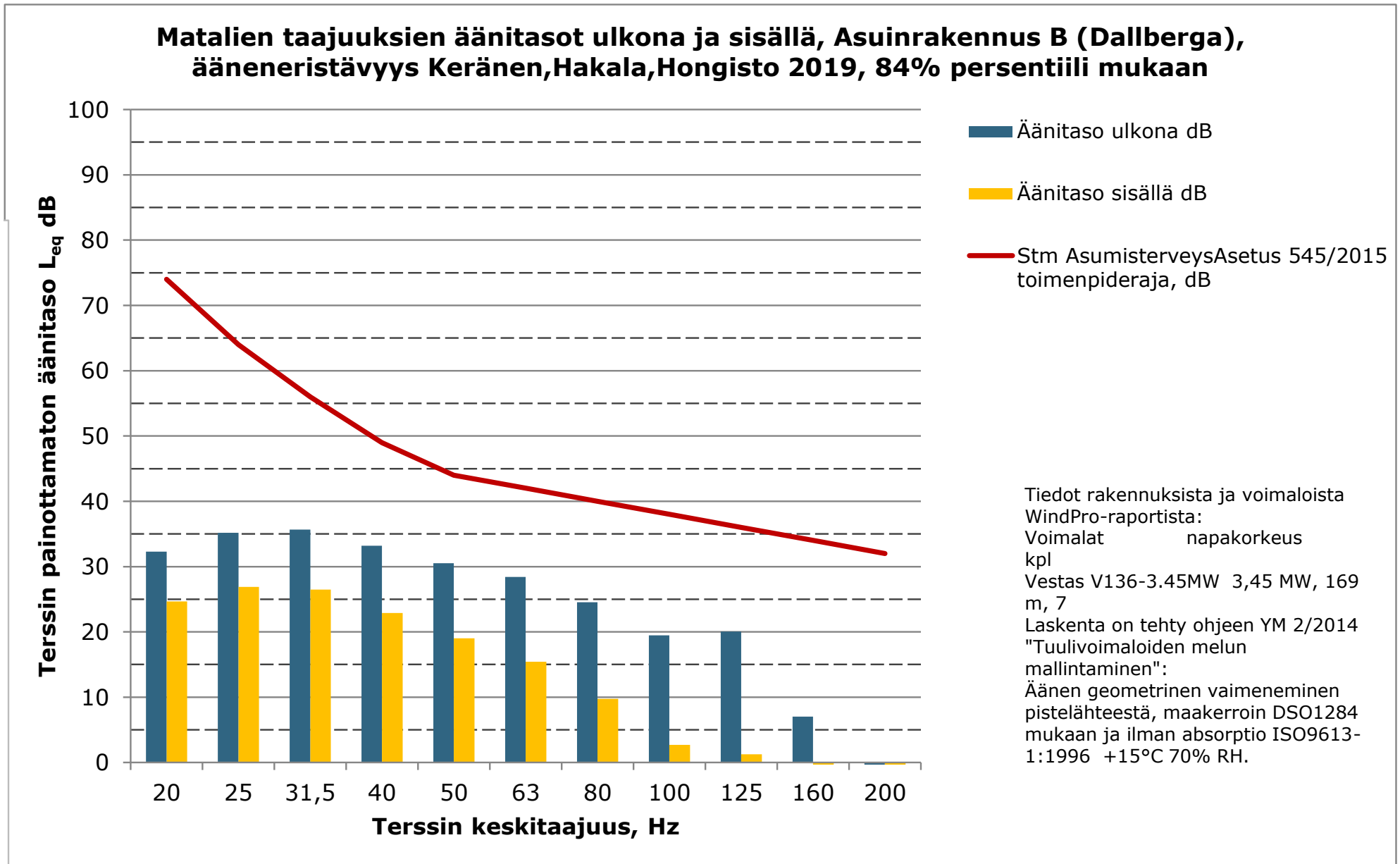
Liite 5. Purmon tuulivoimahanke nykytilanne. Matalataajuisen melun rakennuskohtaiset arvot.

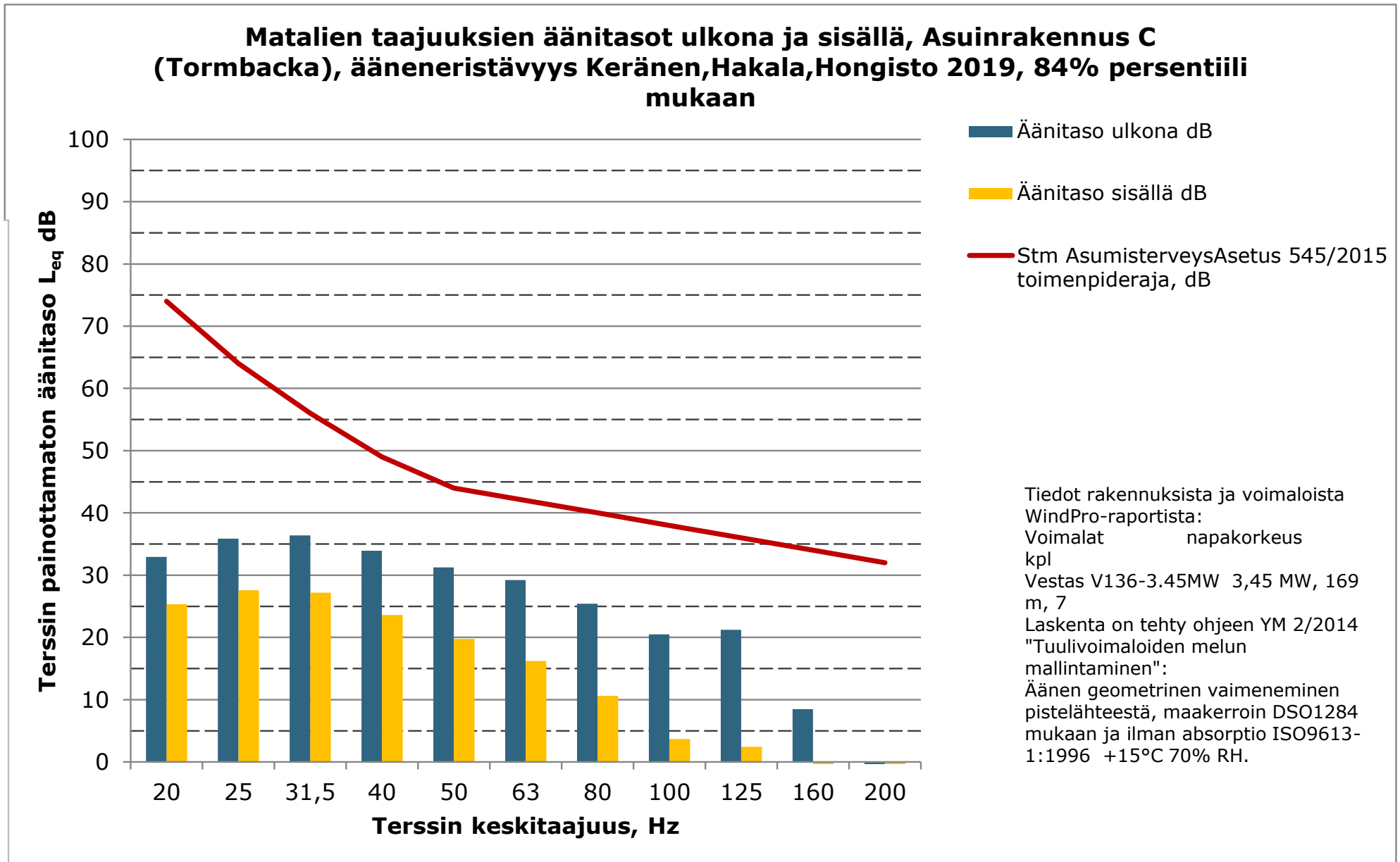




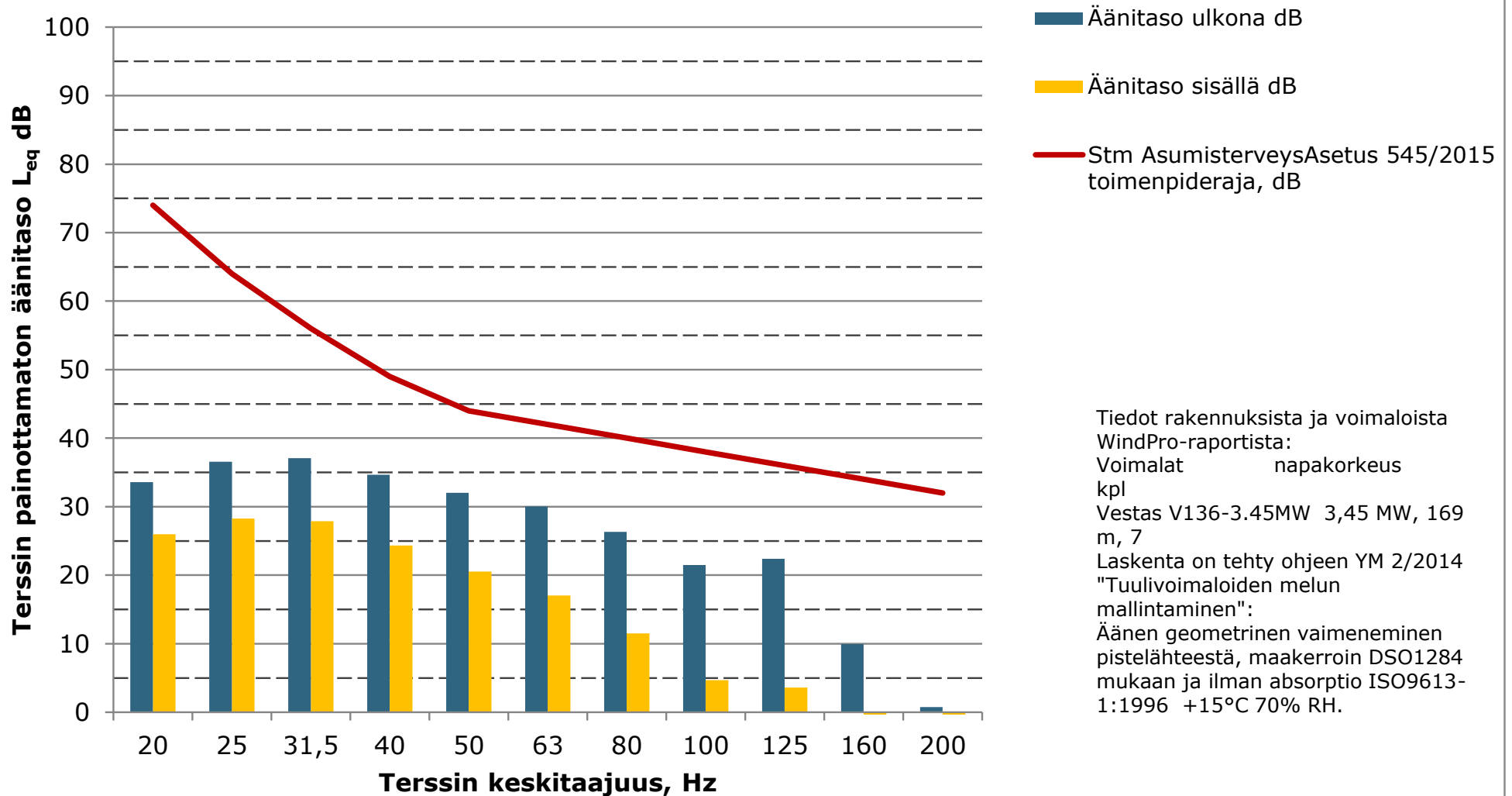




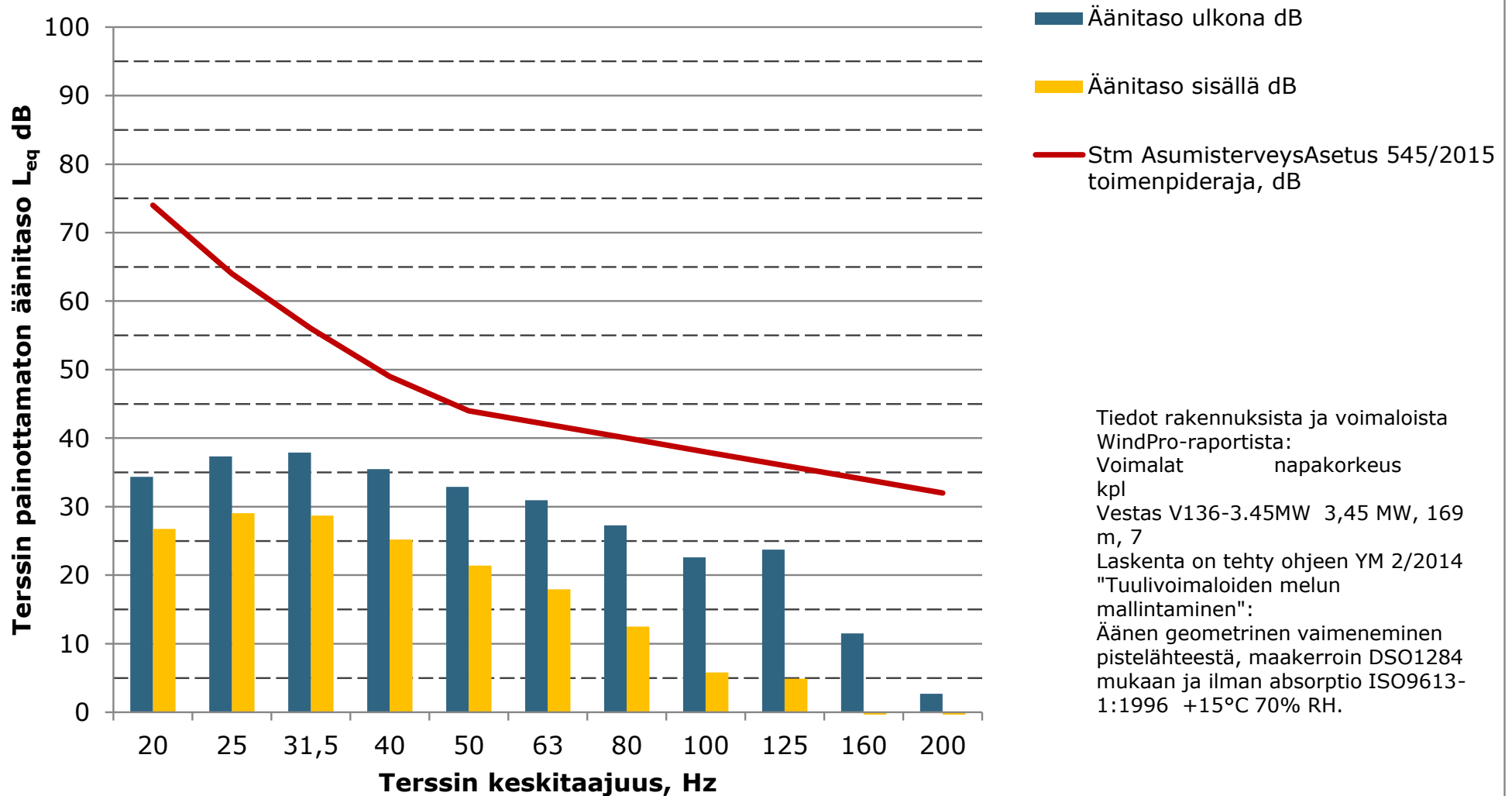




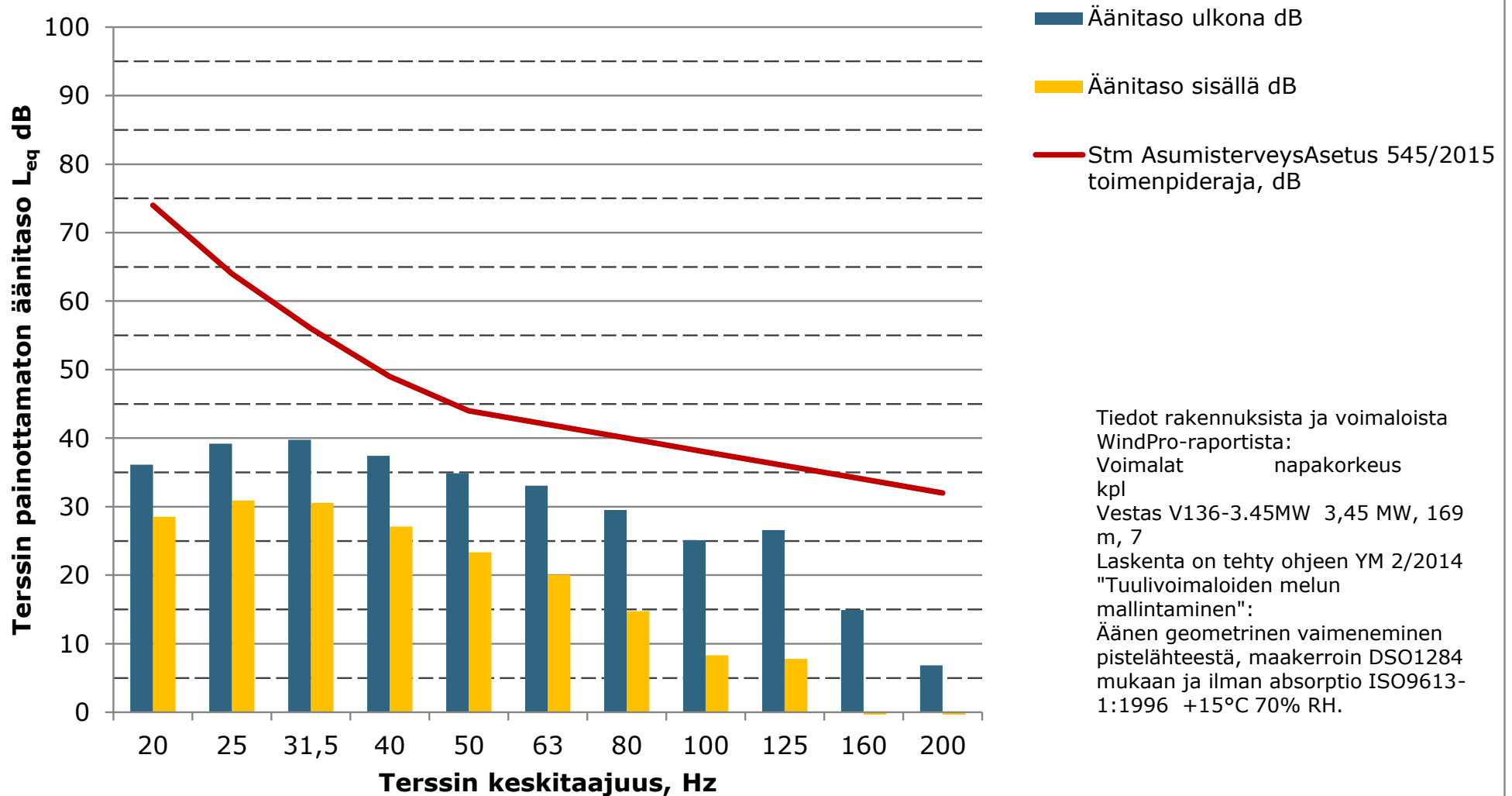
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D  
(Kalltrdskvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**



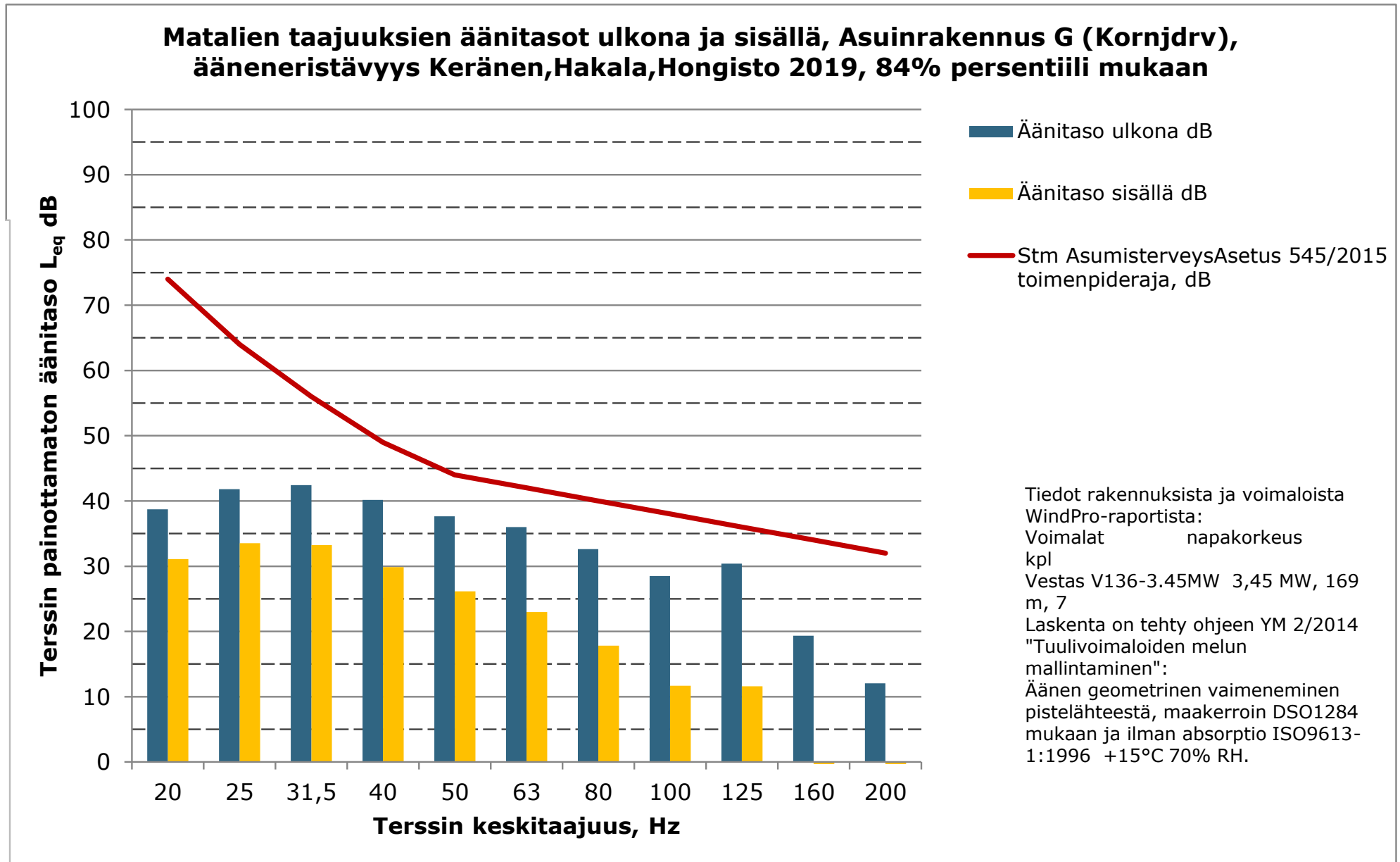
**Matalien taajuuksien äänitasot ulkona ja sisällä, Metsästysmaja E  
(Kejsarbacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**



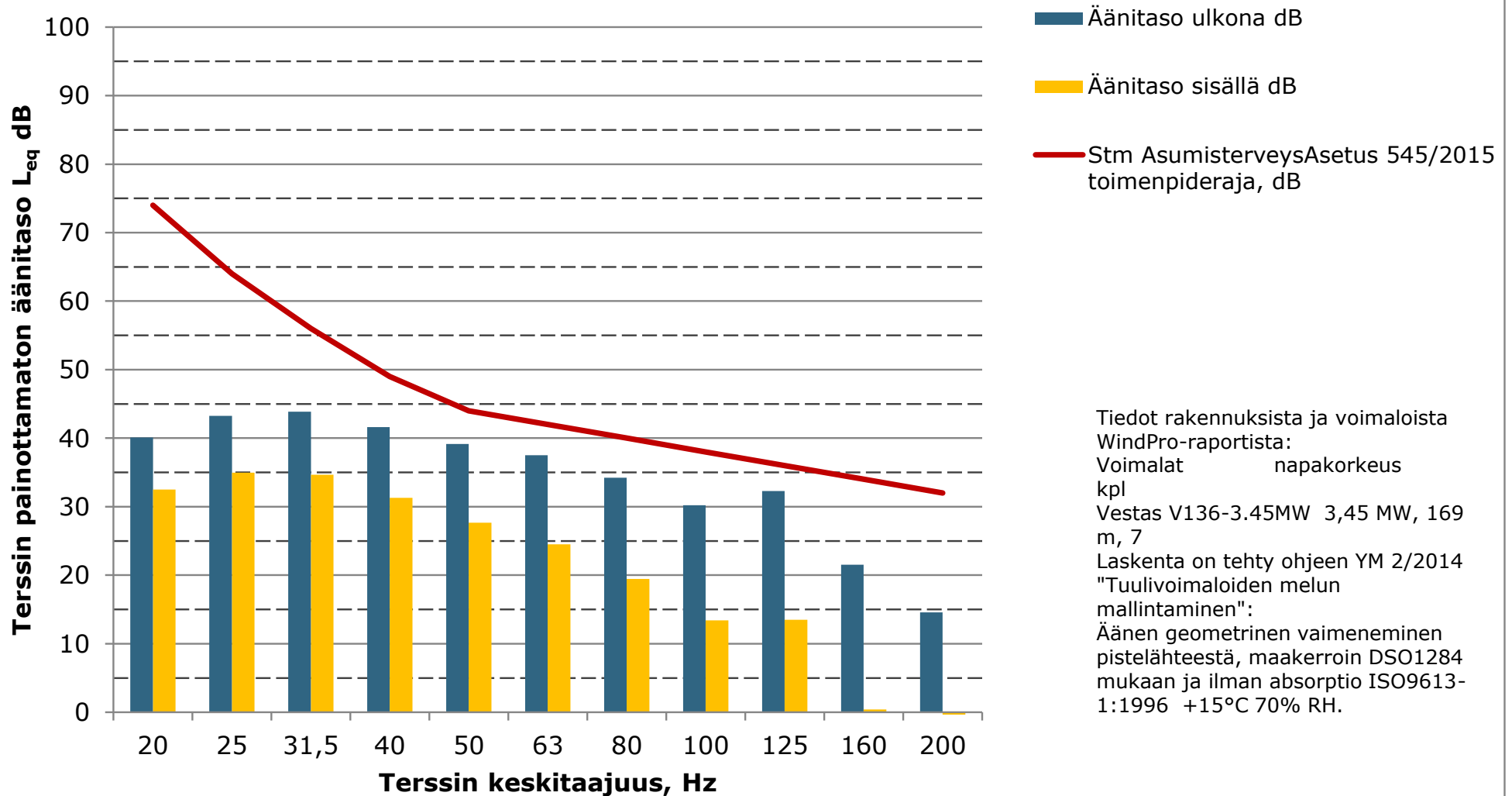
### Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus F (Kdillbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan

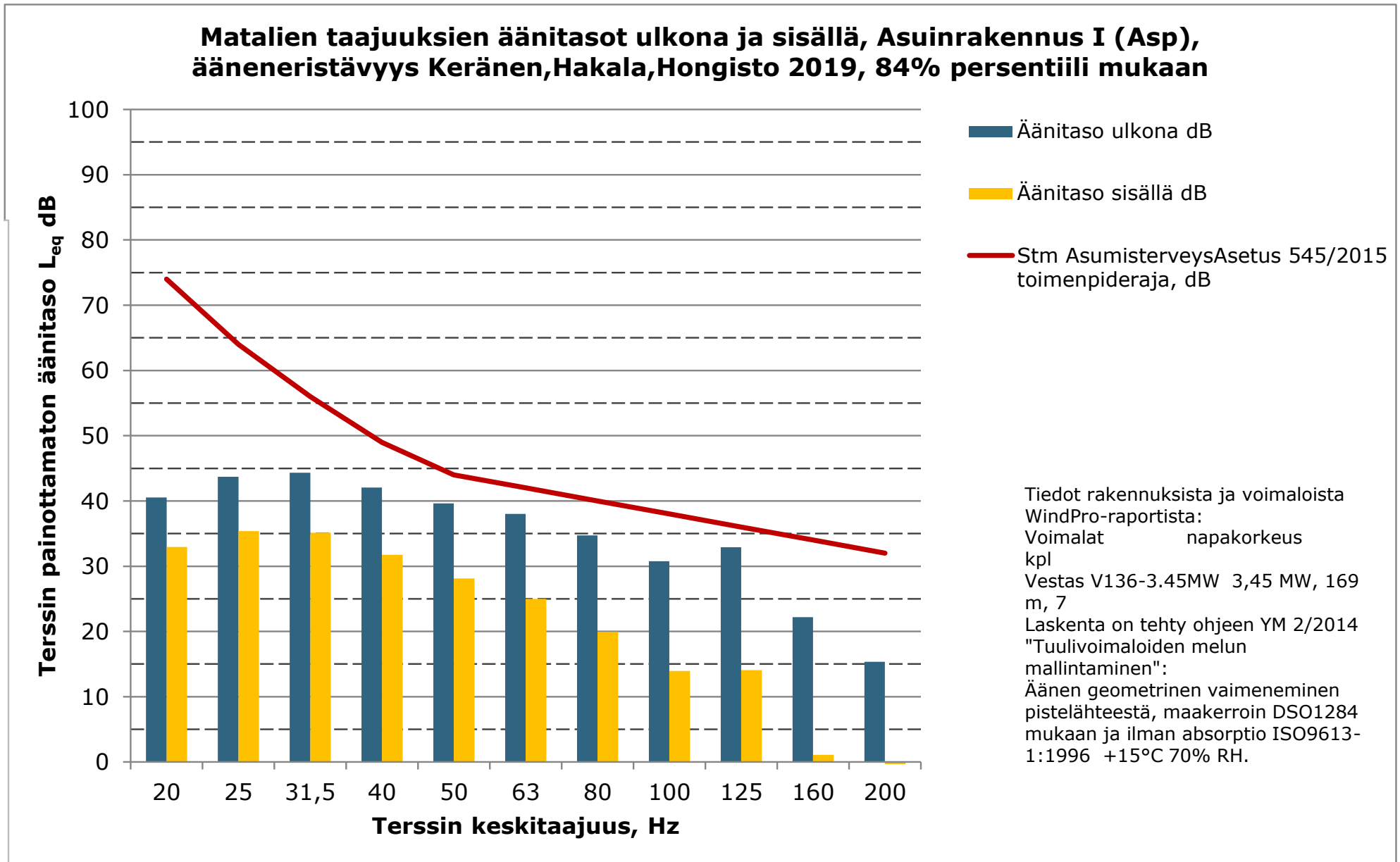


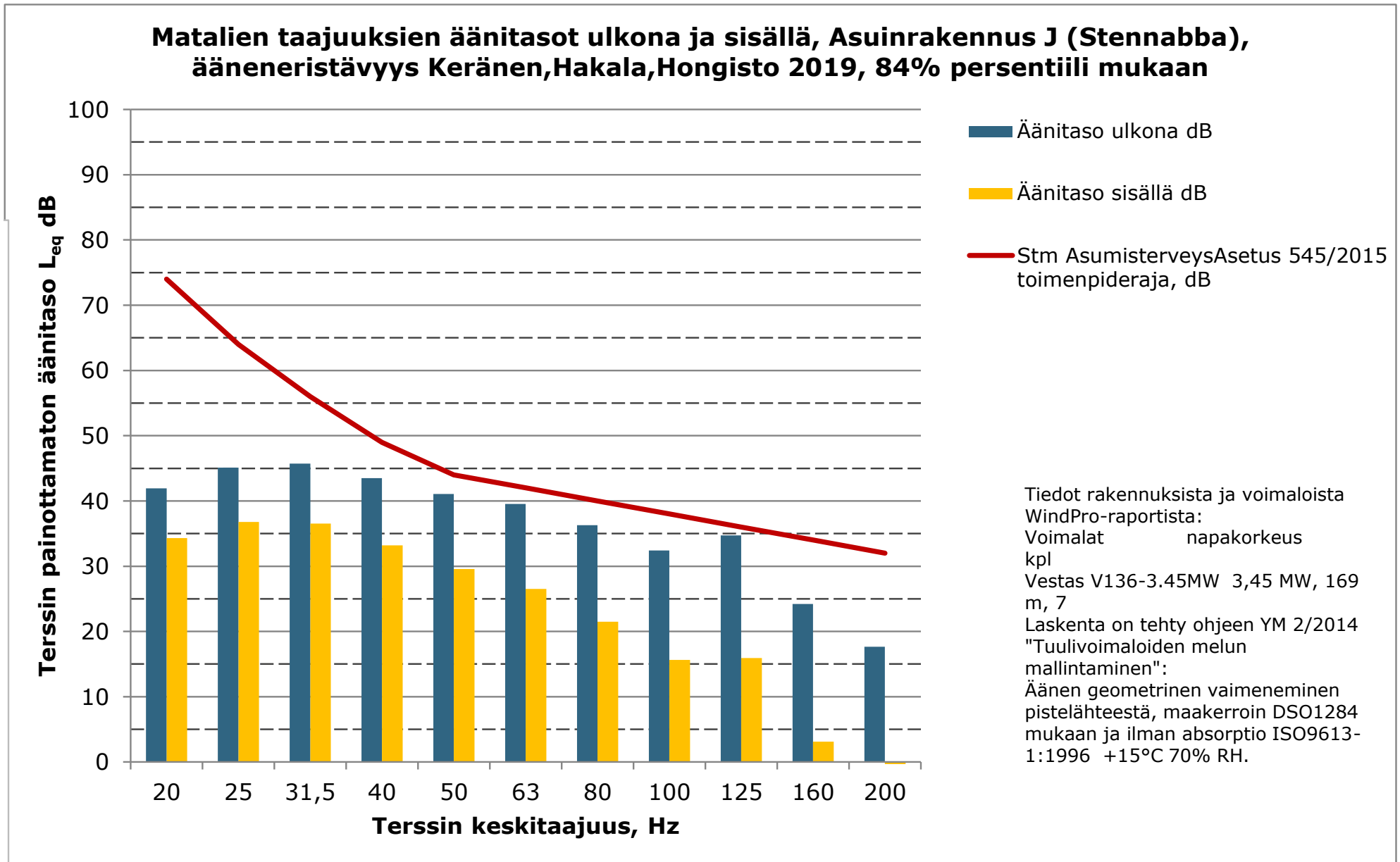




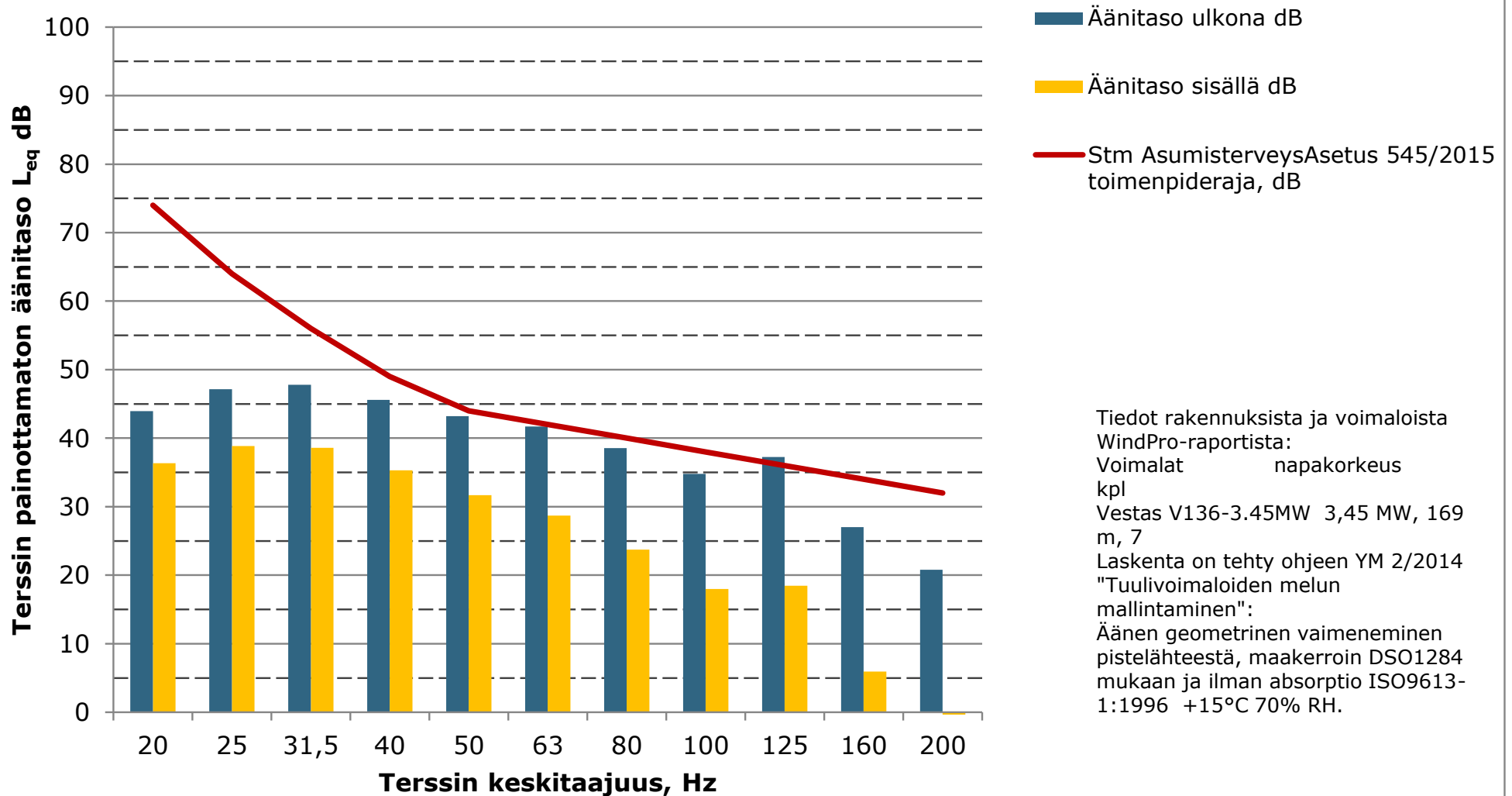
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Sandnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



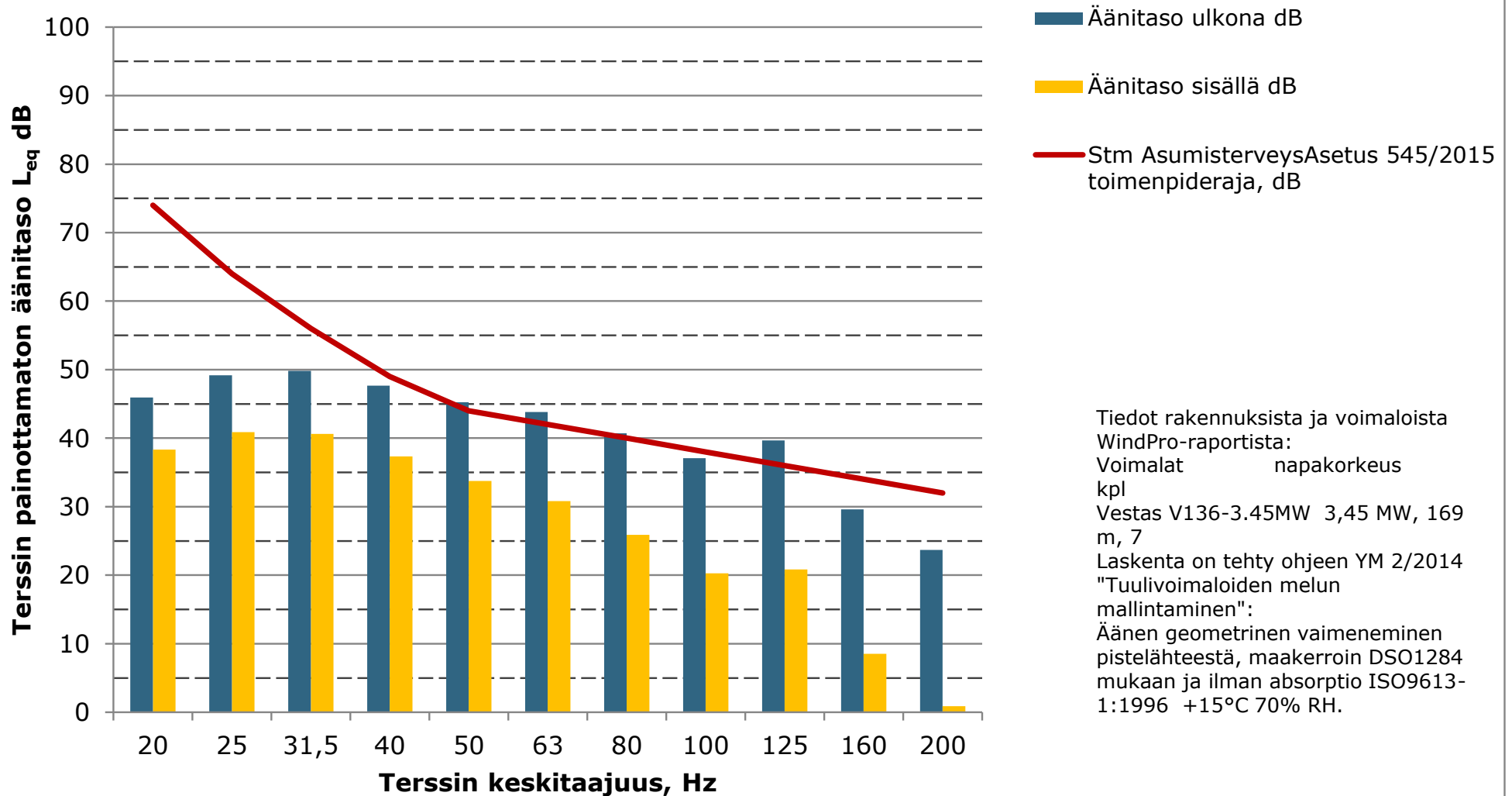




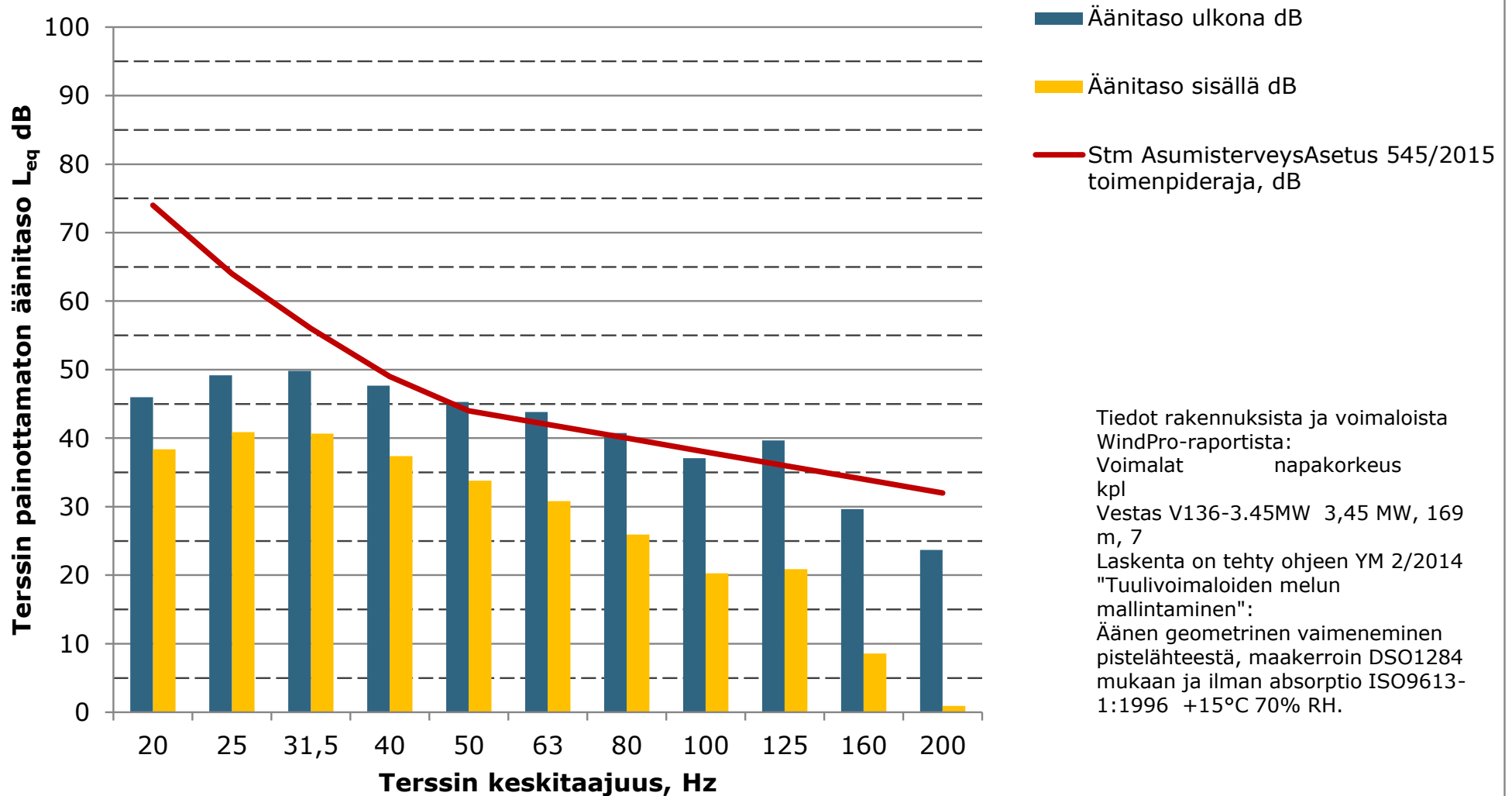
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Lengnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan

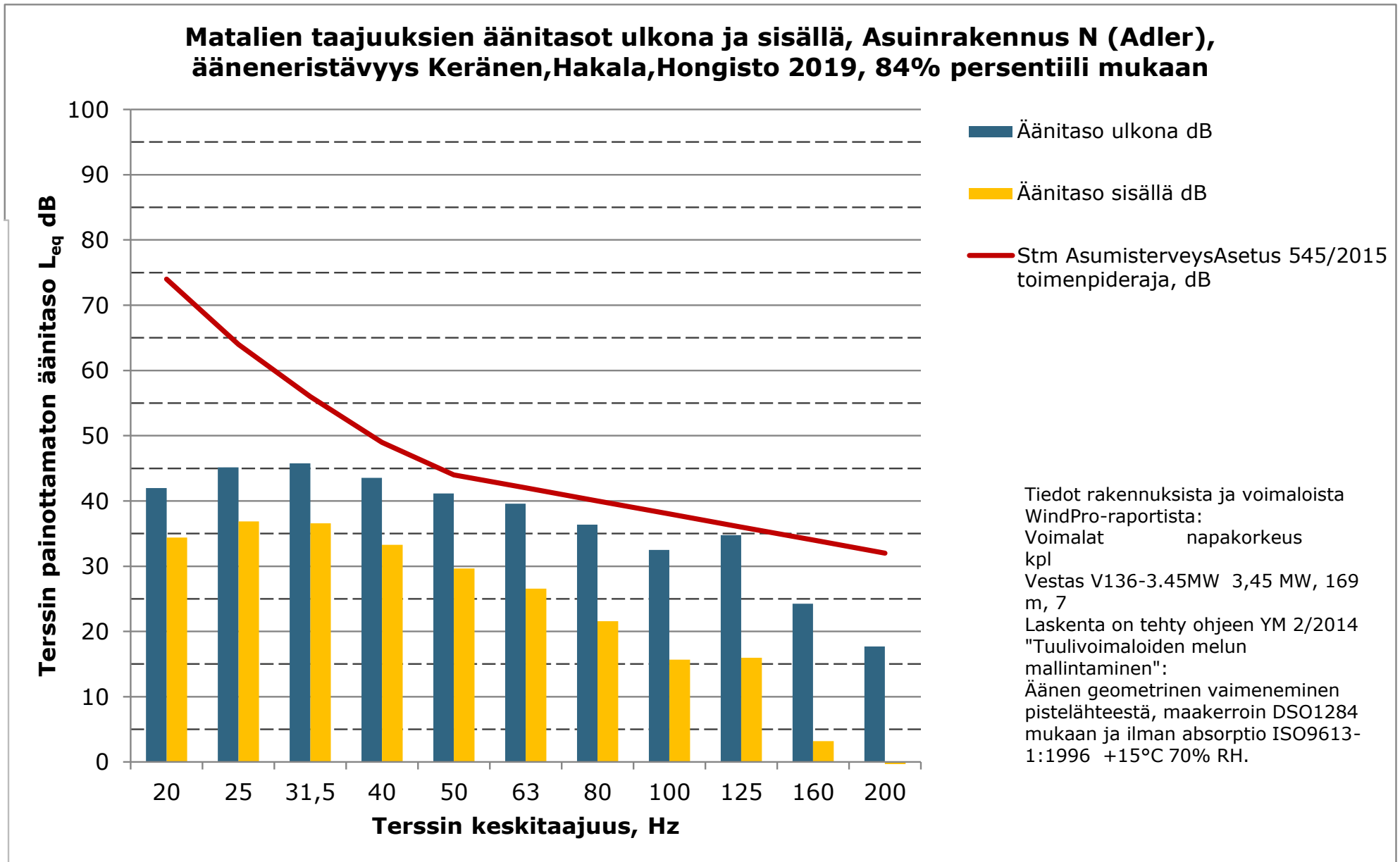


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus L  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**



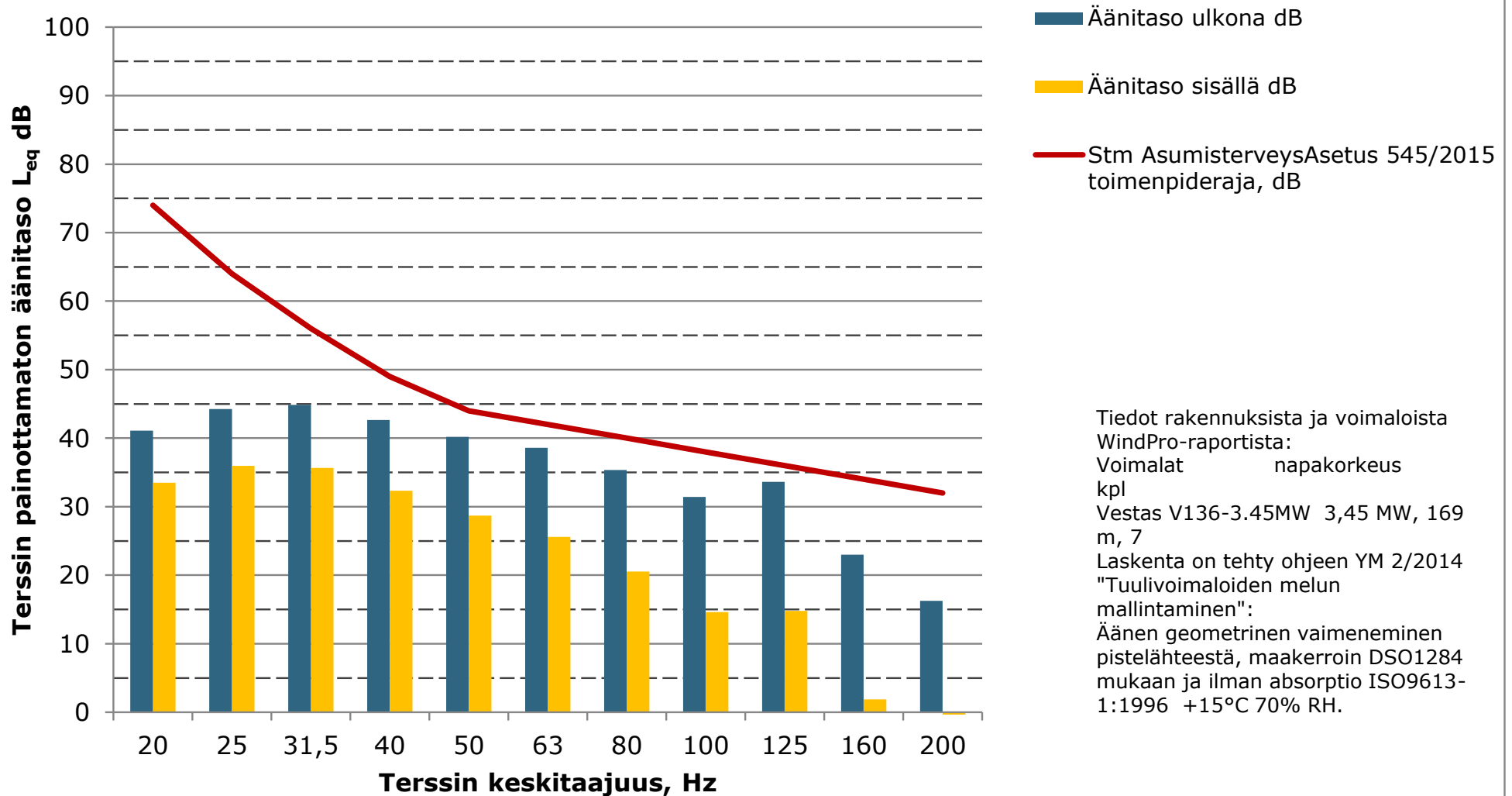
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M  
(Stenbacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili  
mukaan**



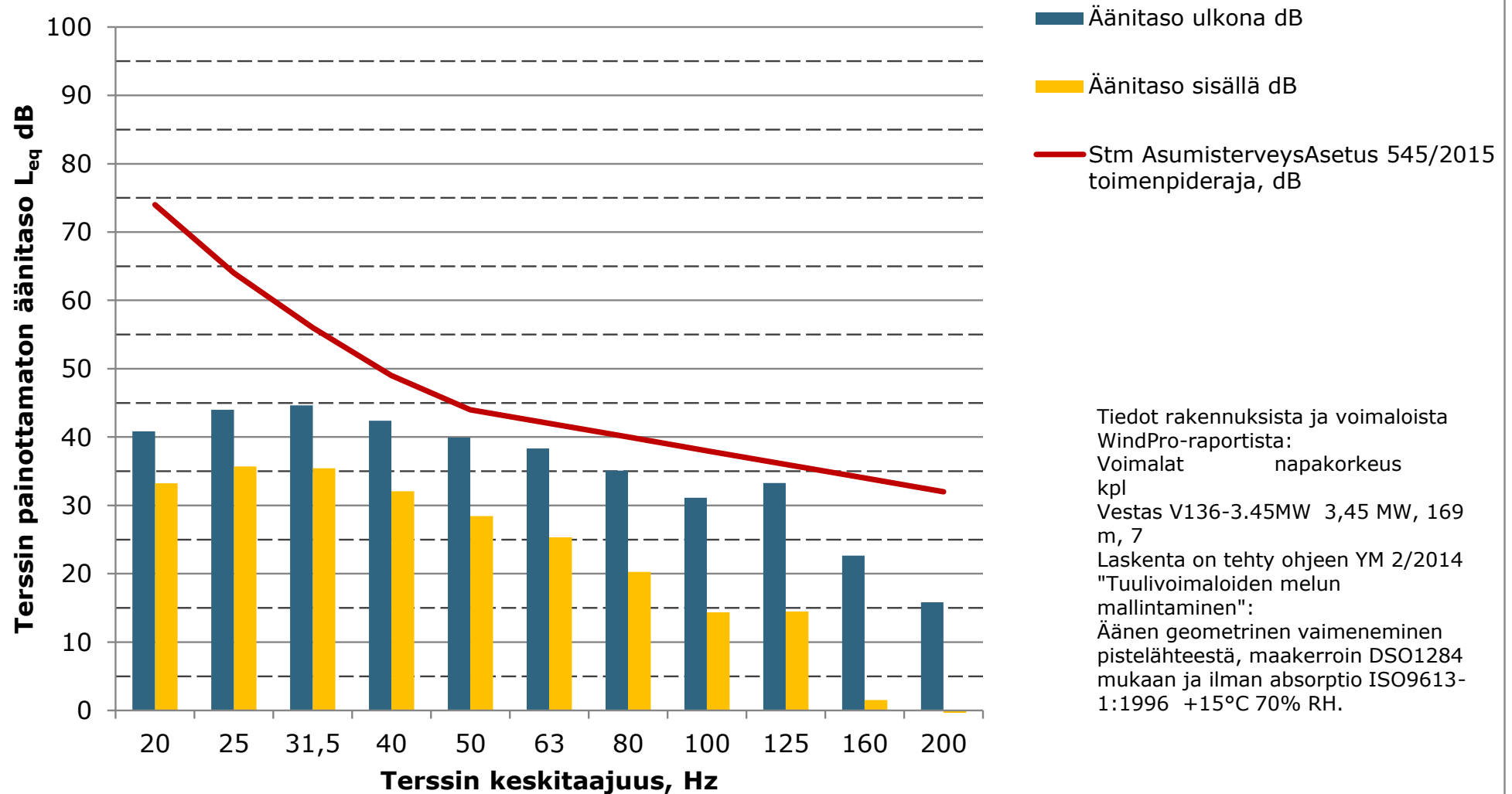




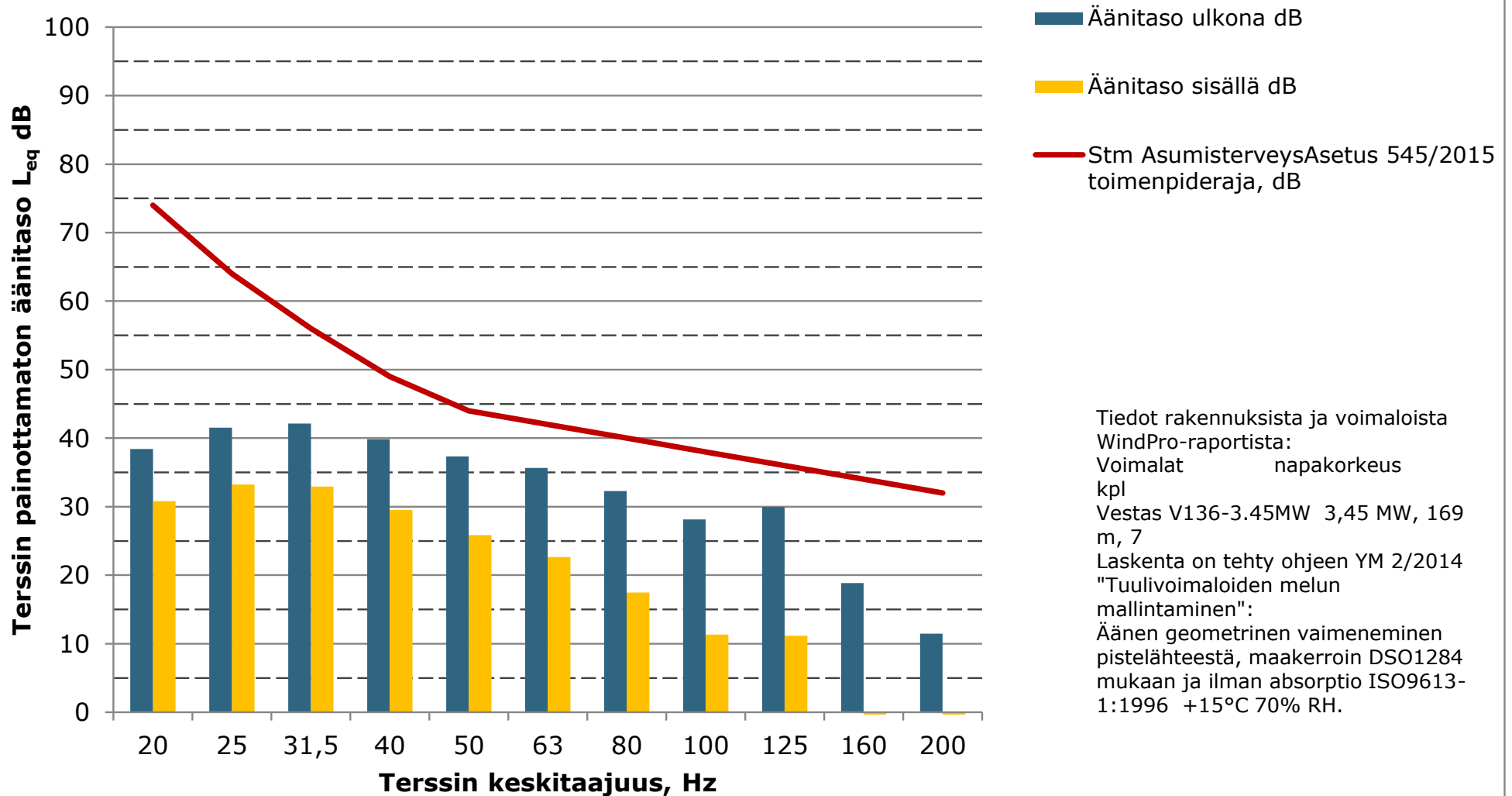
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

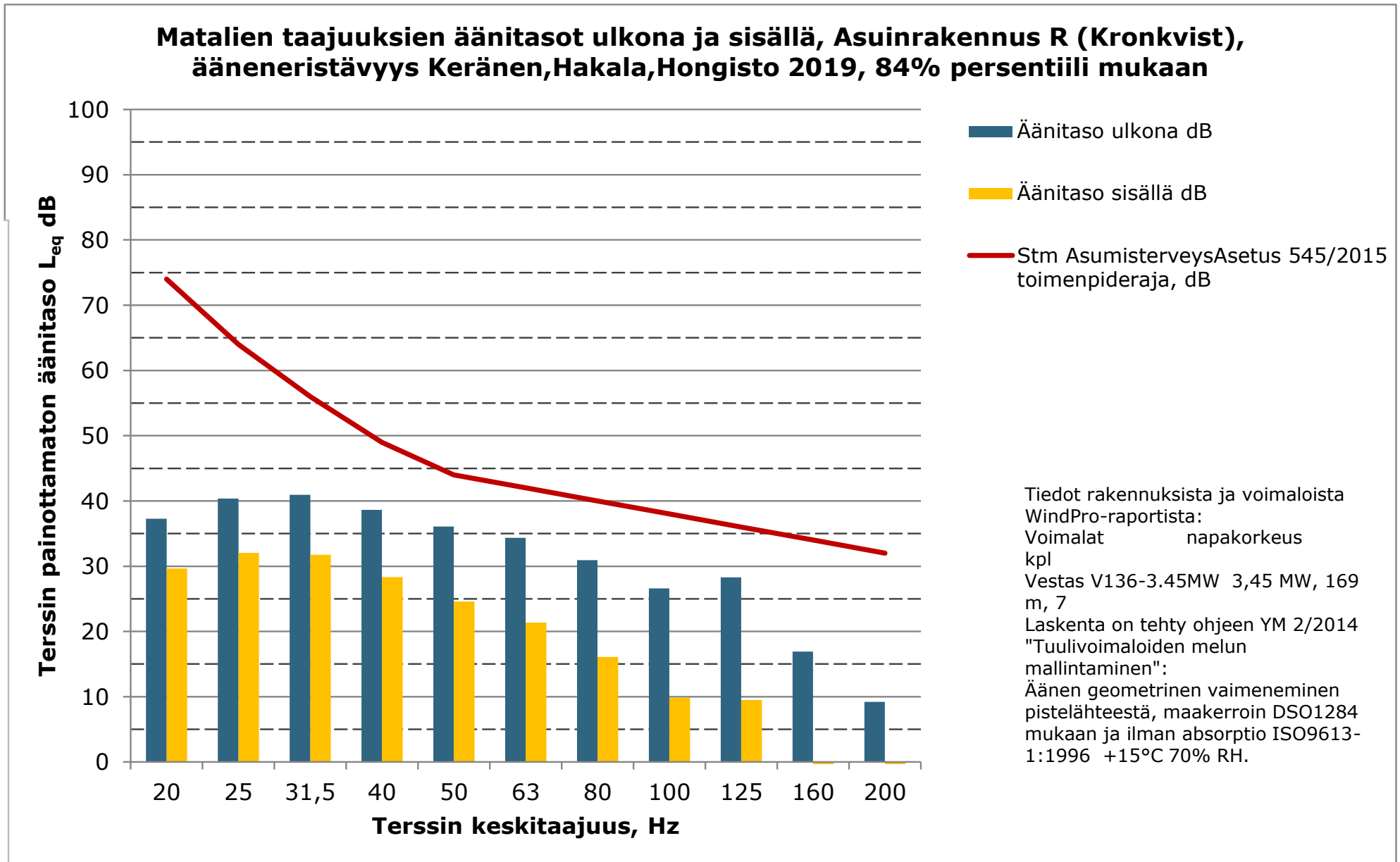


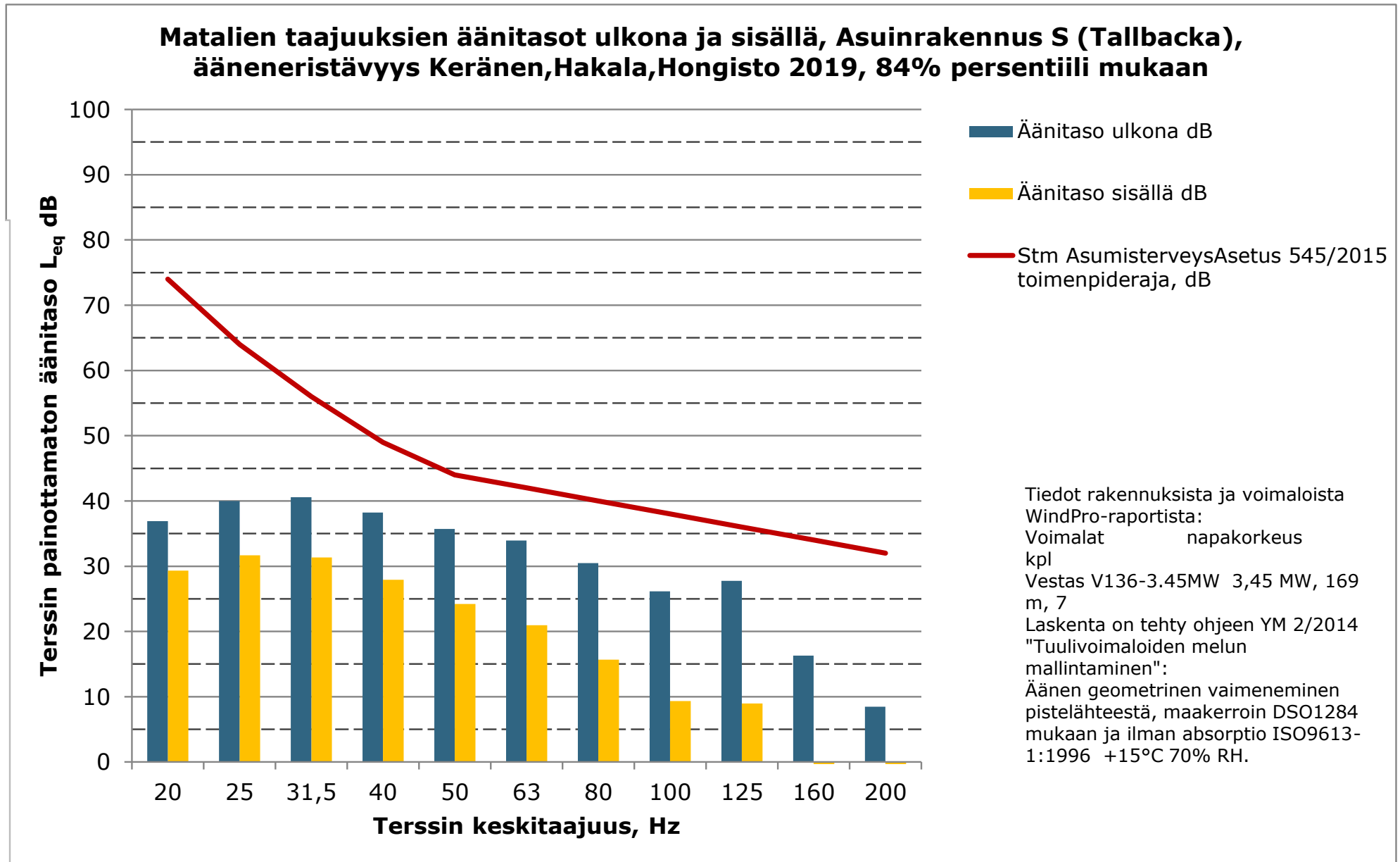
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Finnabbavdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

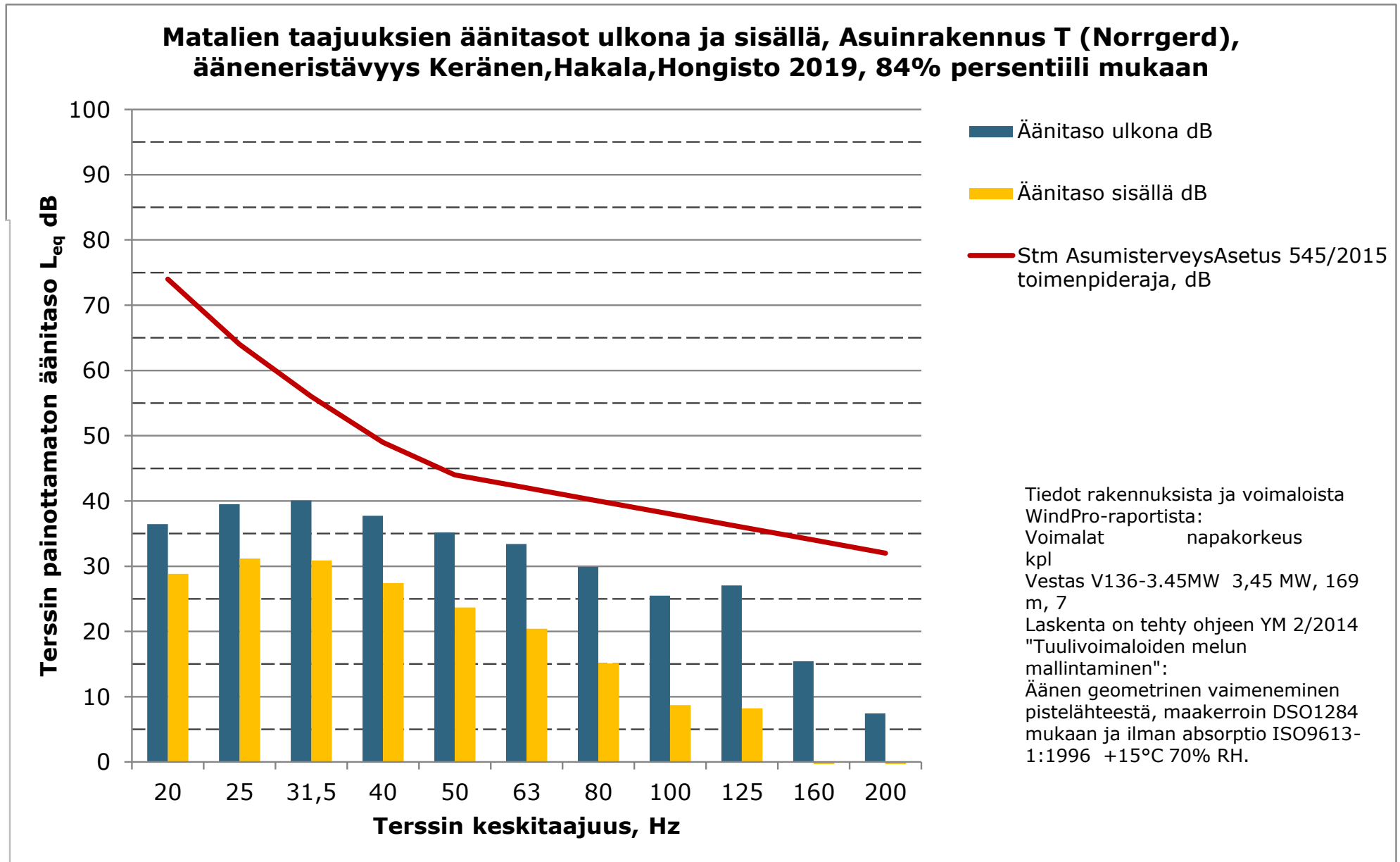


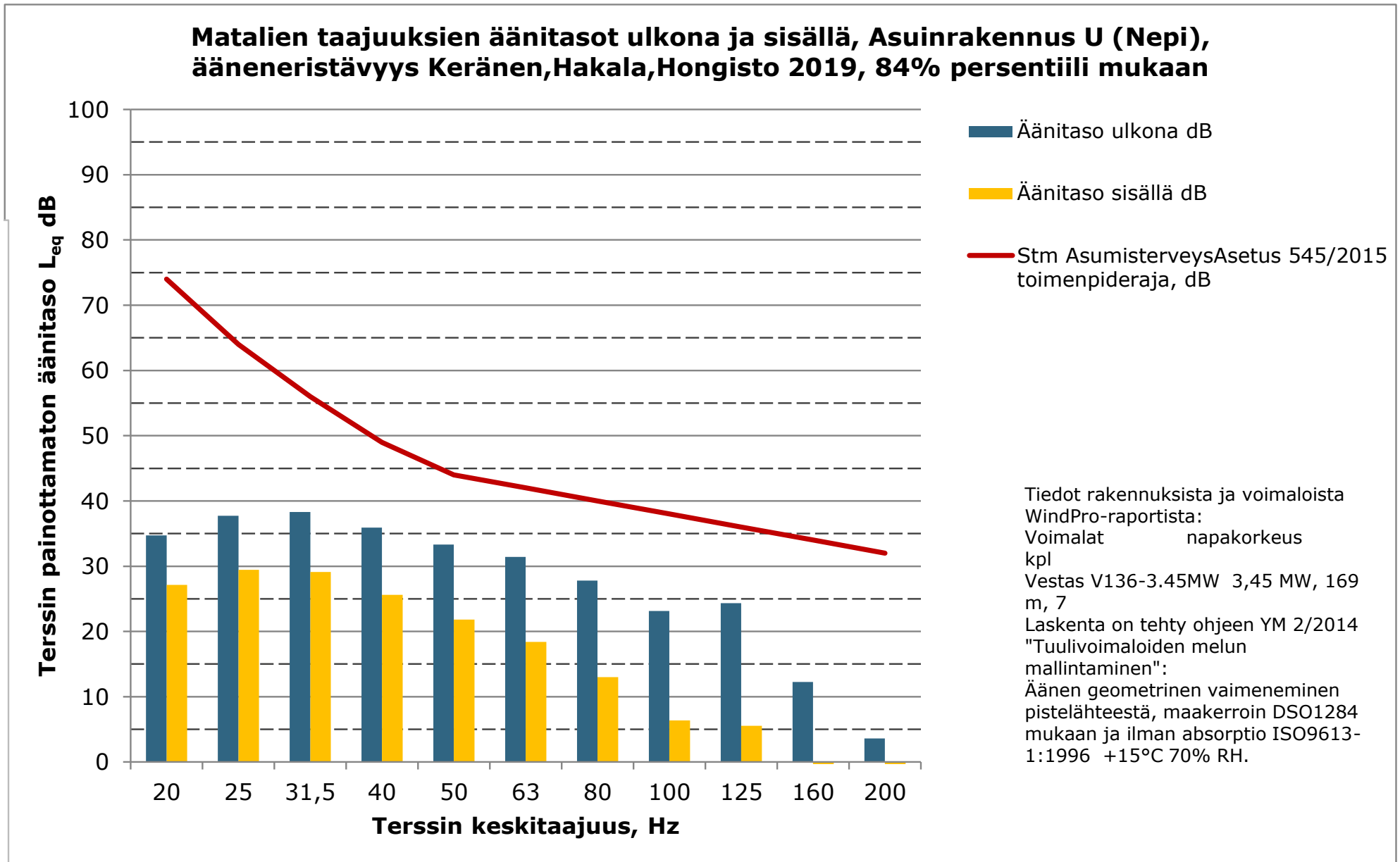
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q (Dalabacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili mukaan

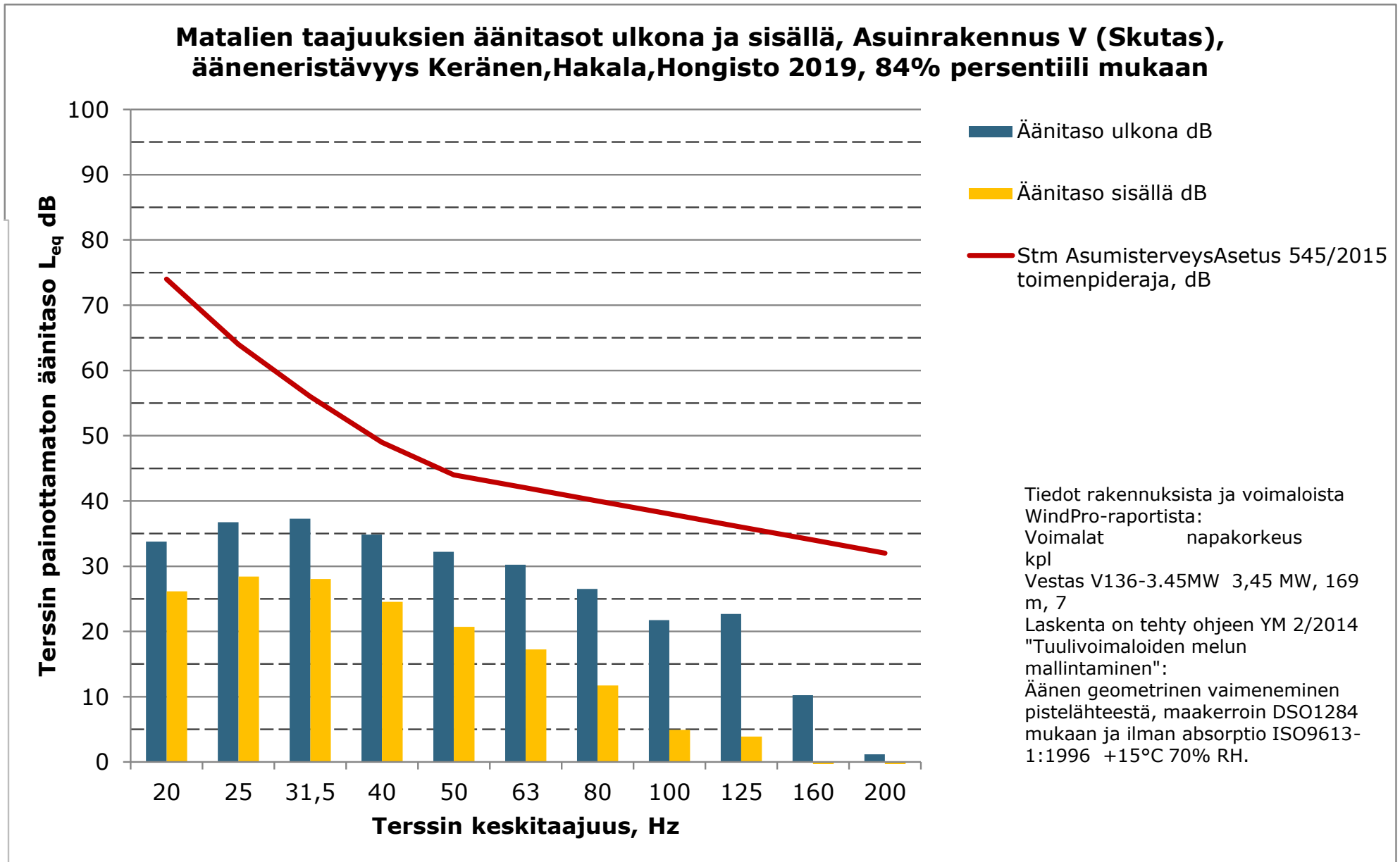




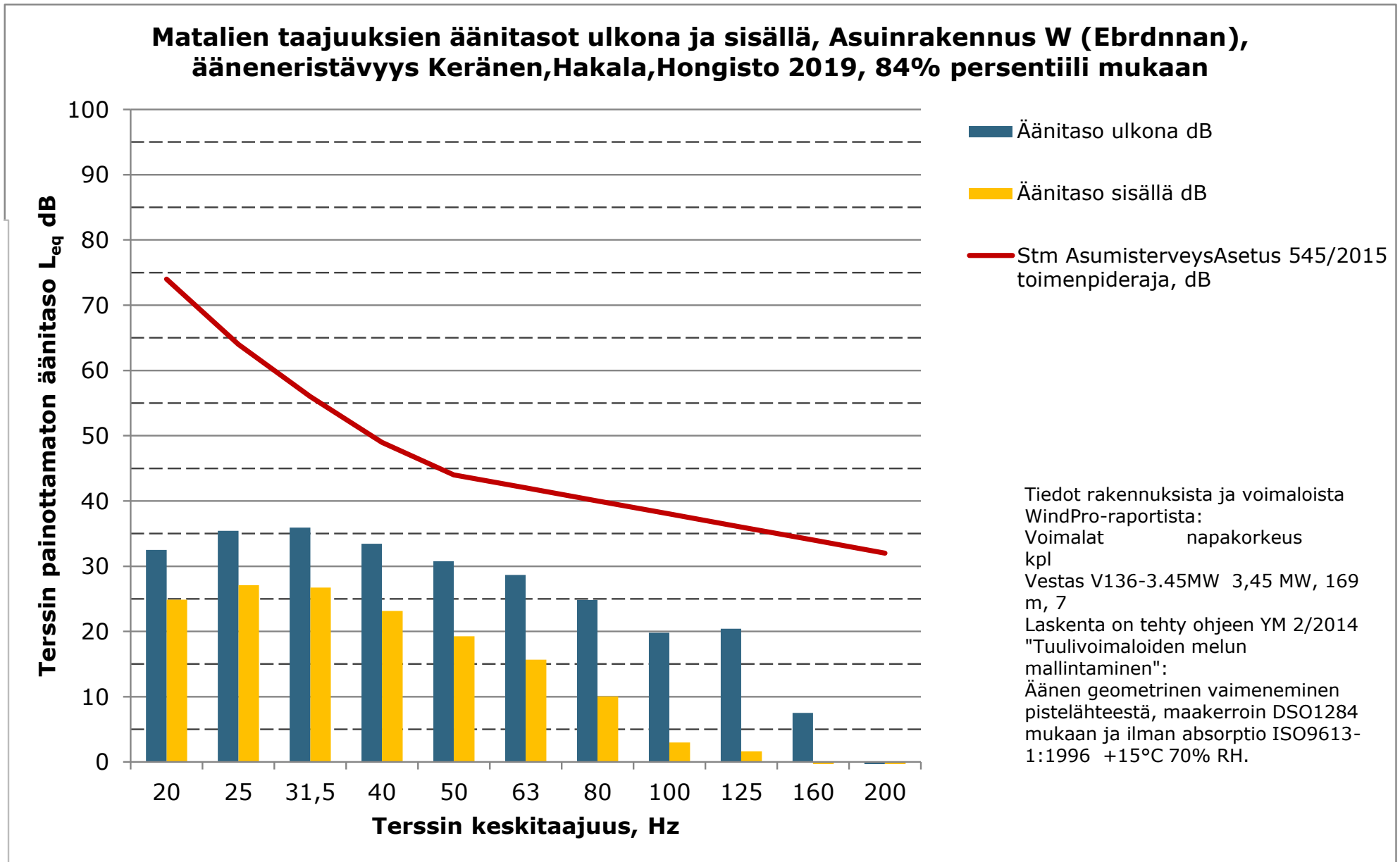


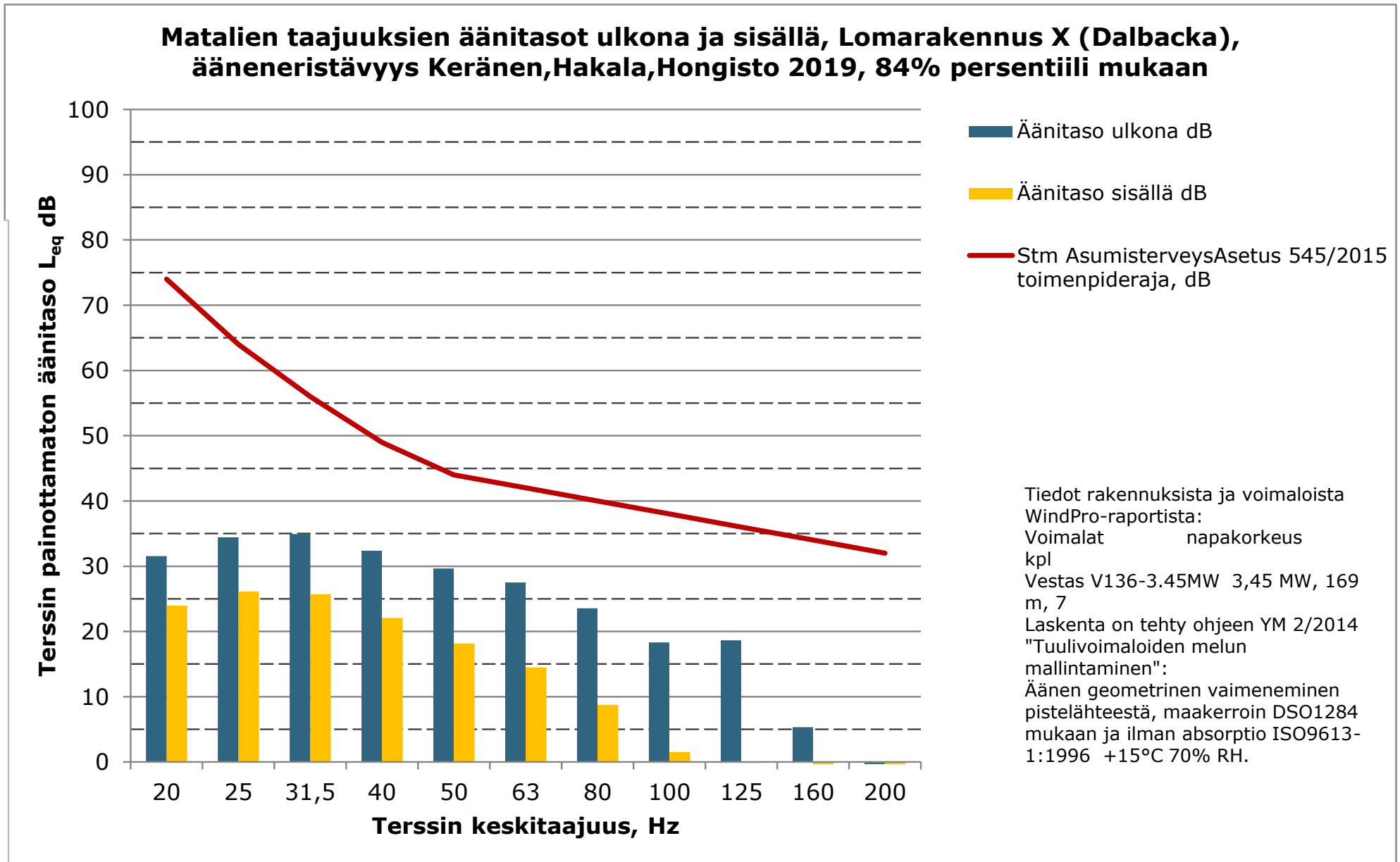


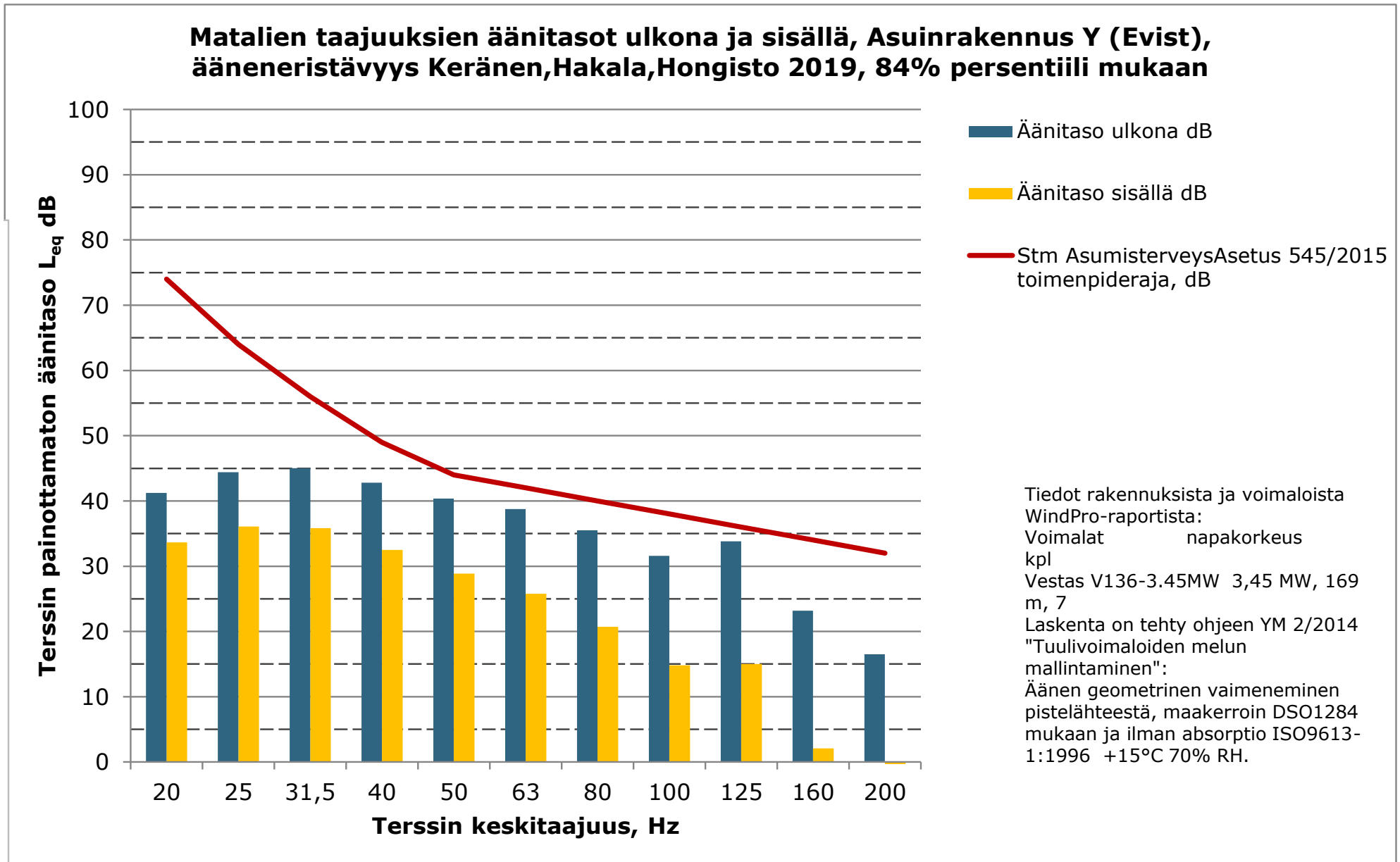


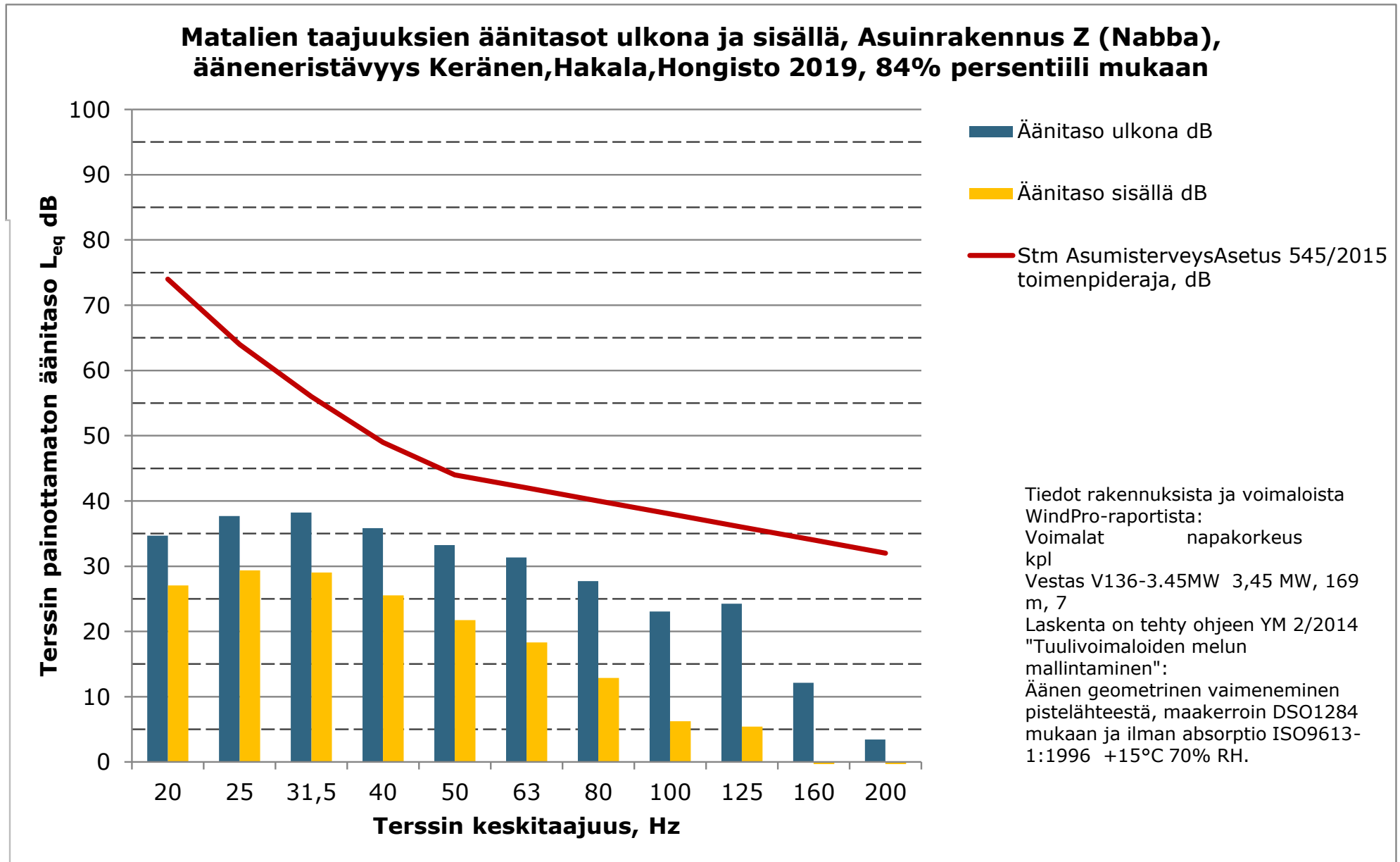




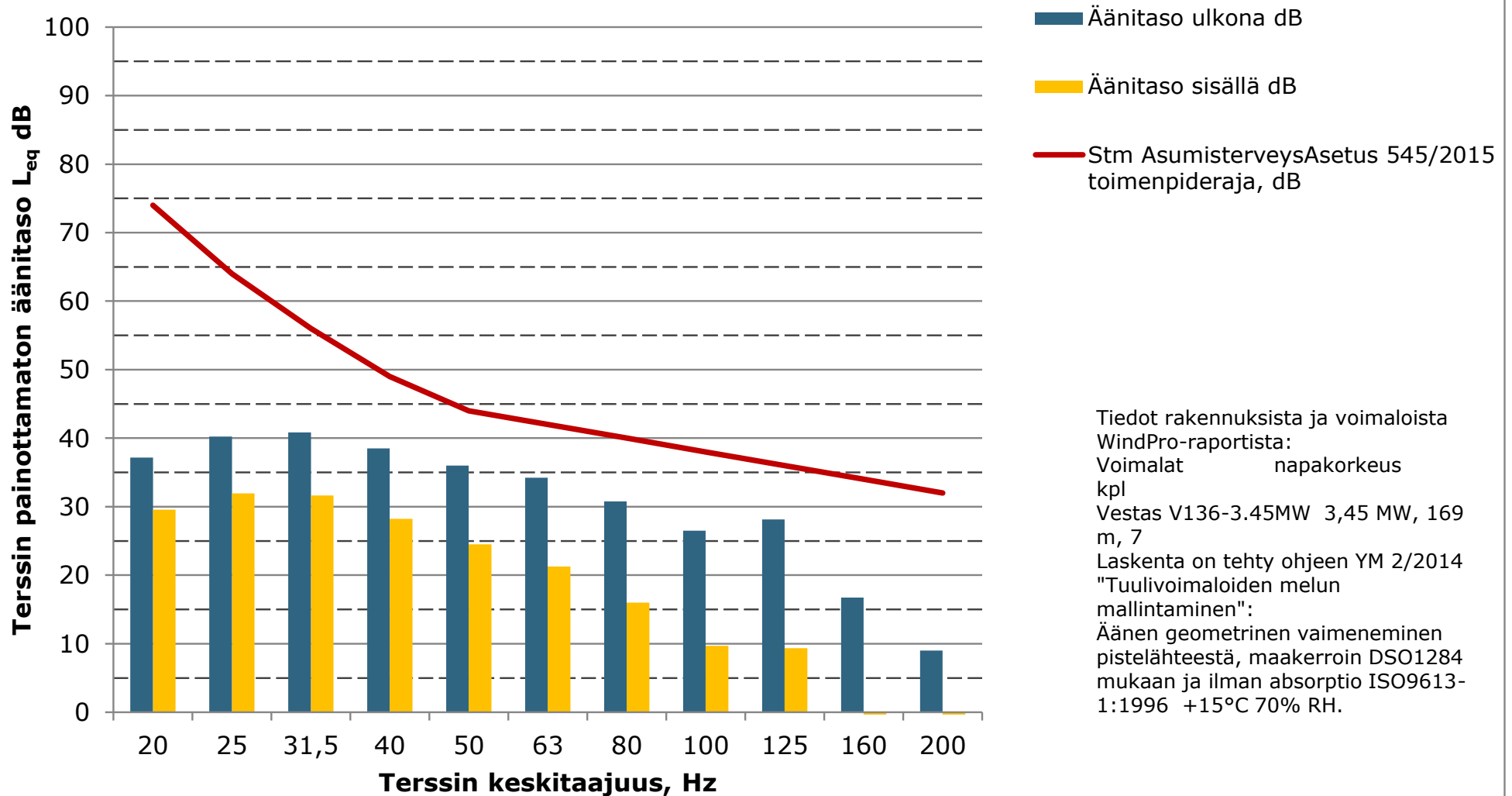








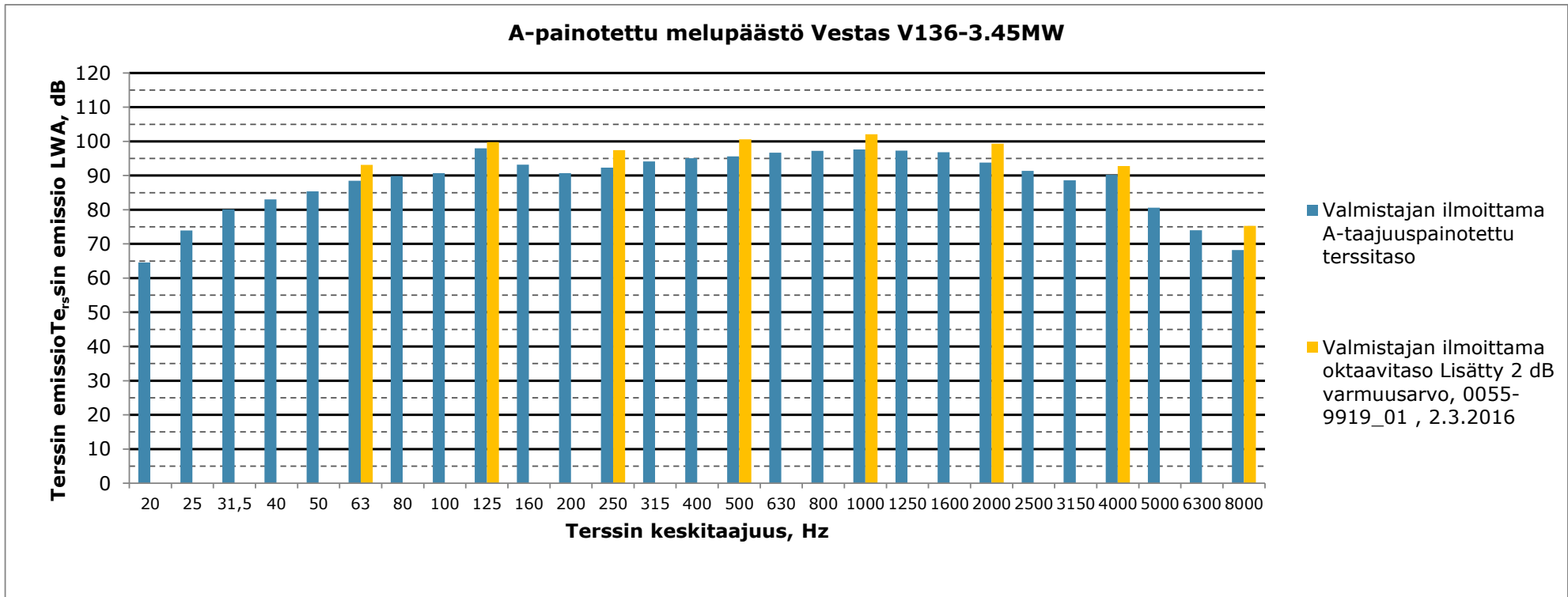
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus AA (Kronkvist), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persenttiili mukaan

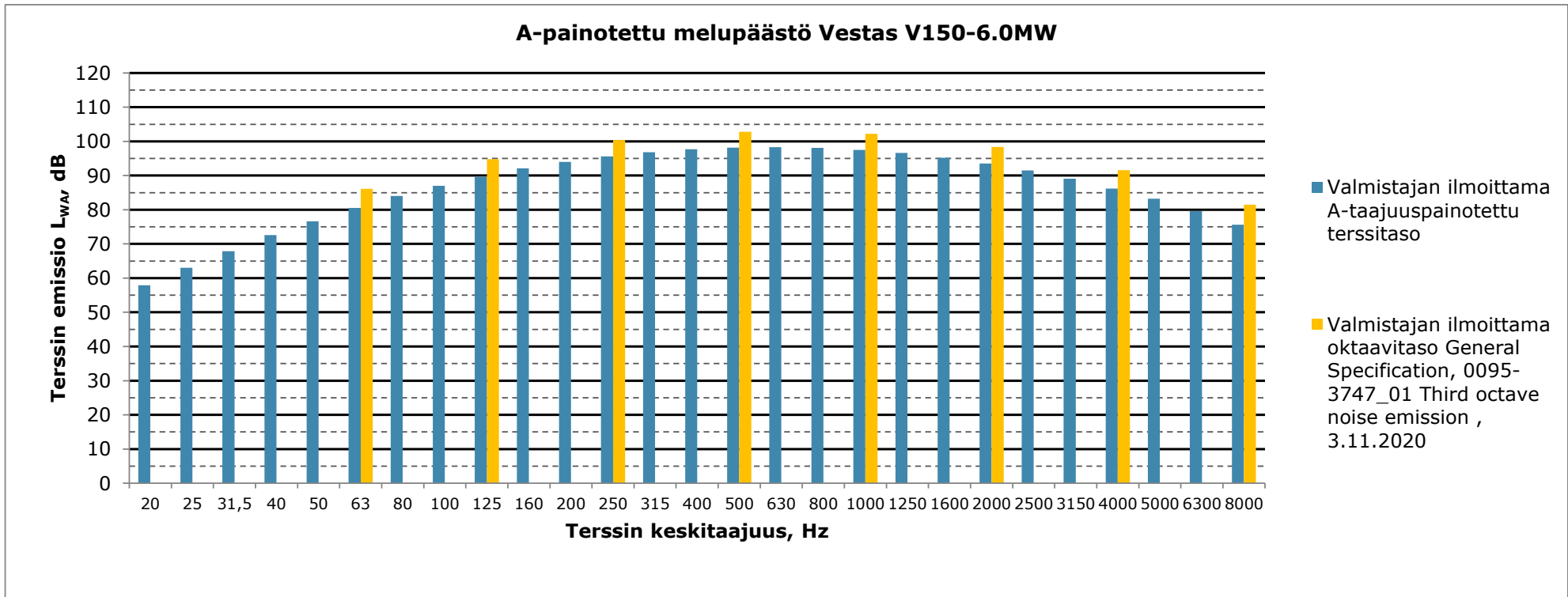


13.2.2023

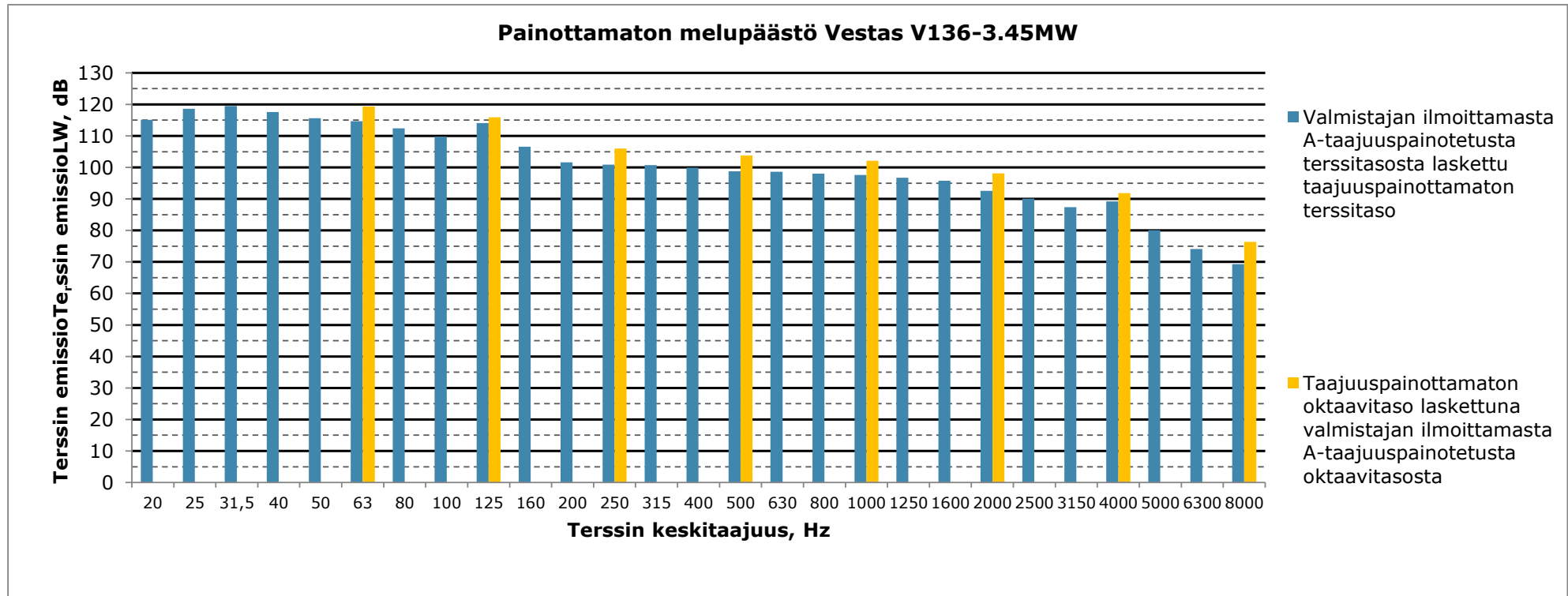
---

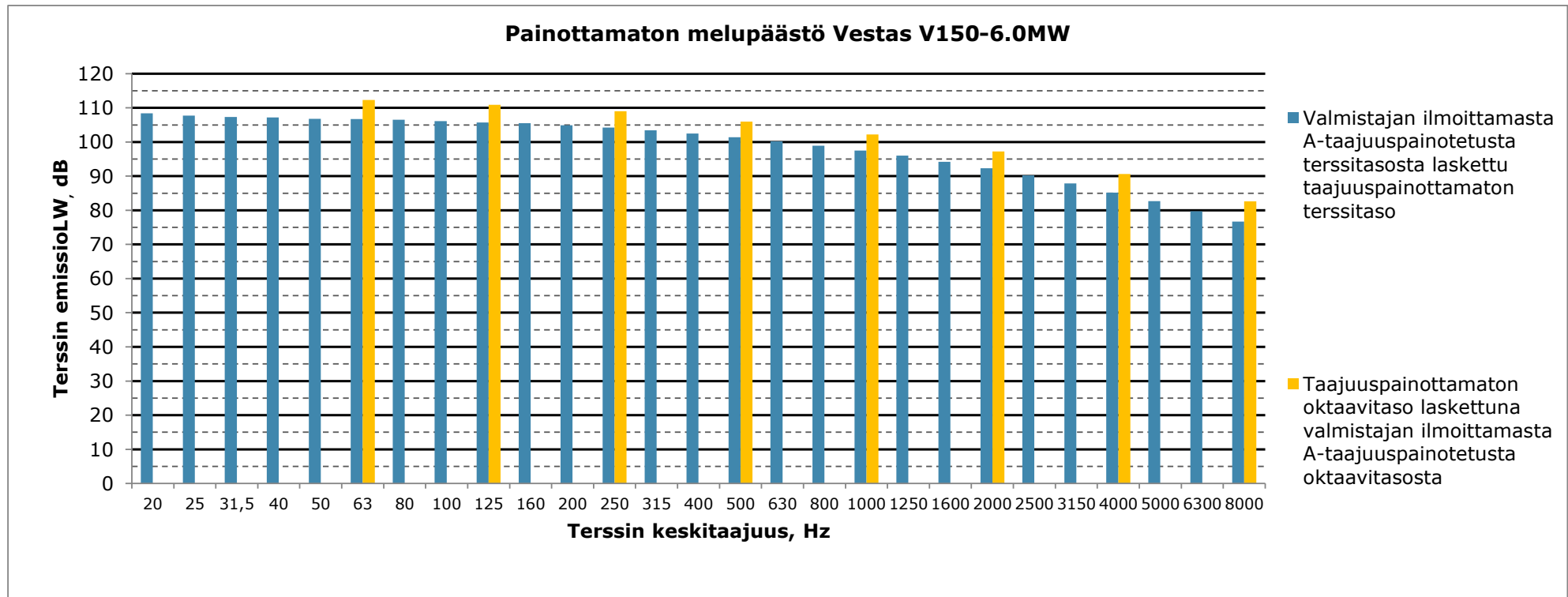
Liite 6. Purmon tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE1 V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.

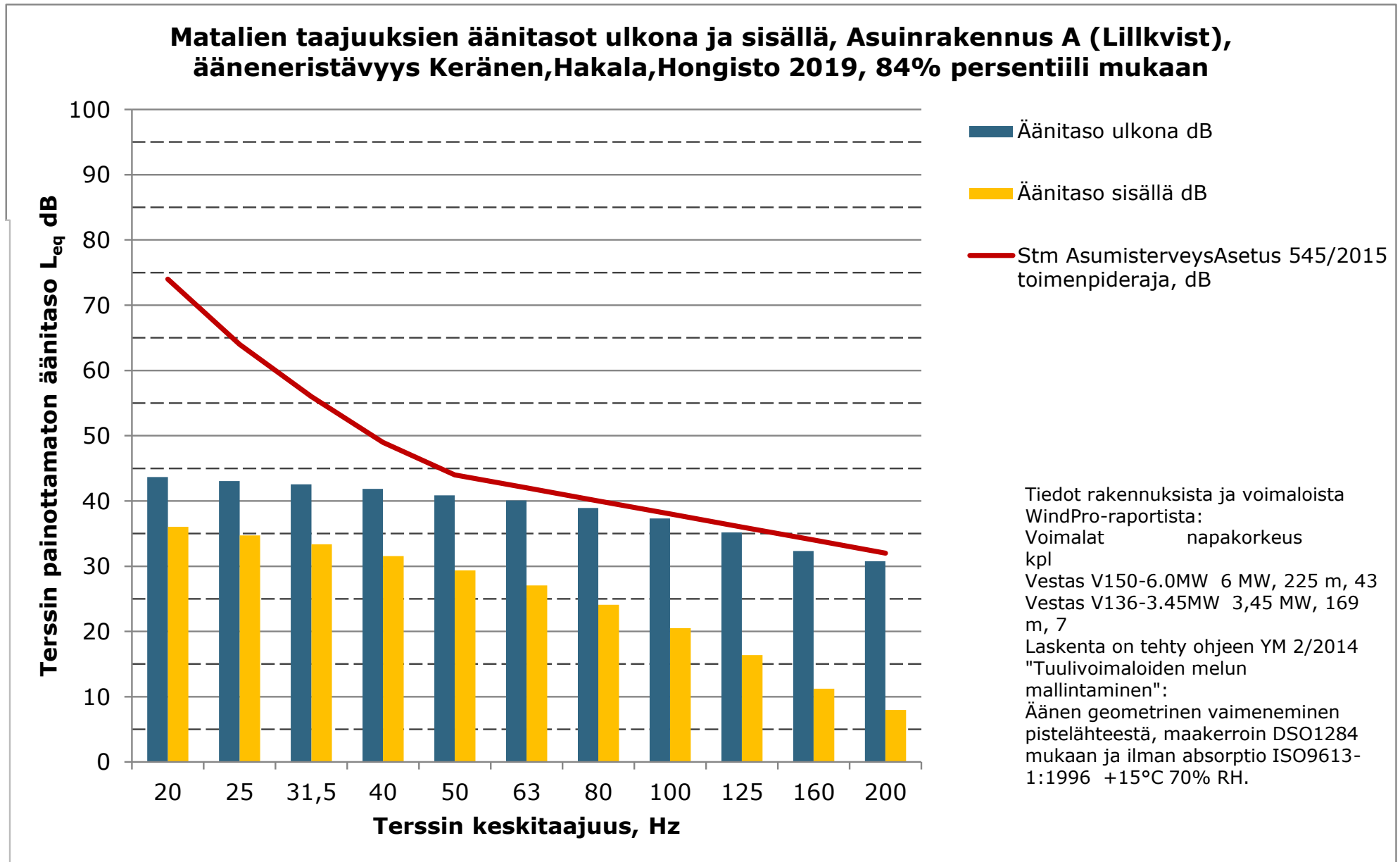




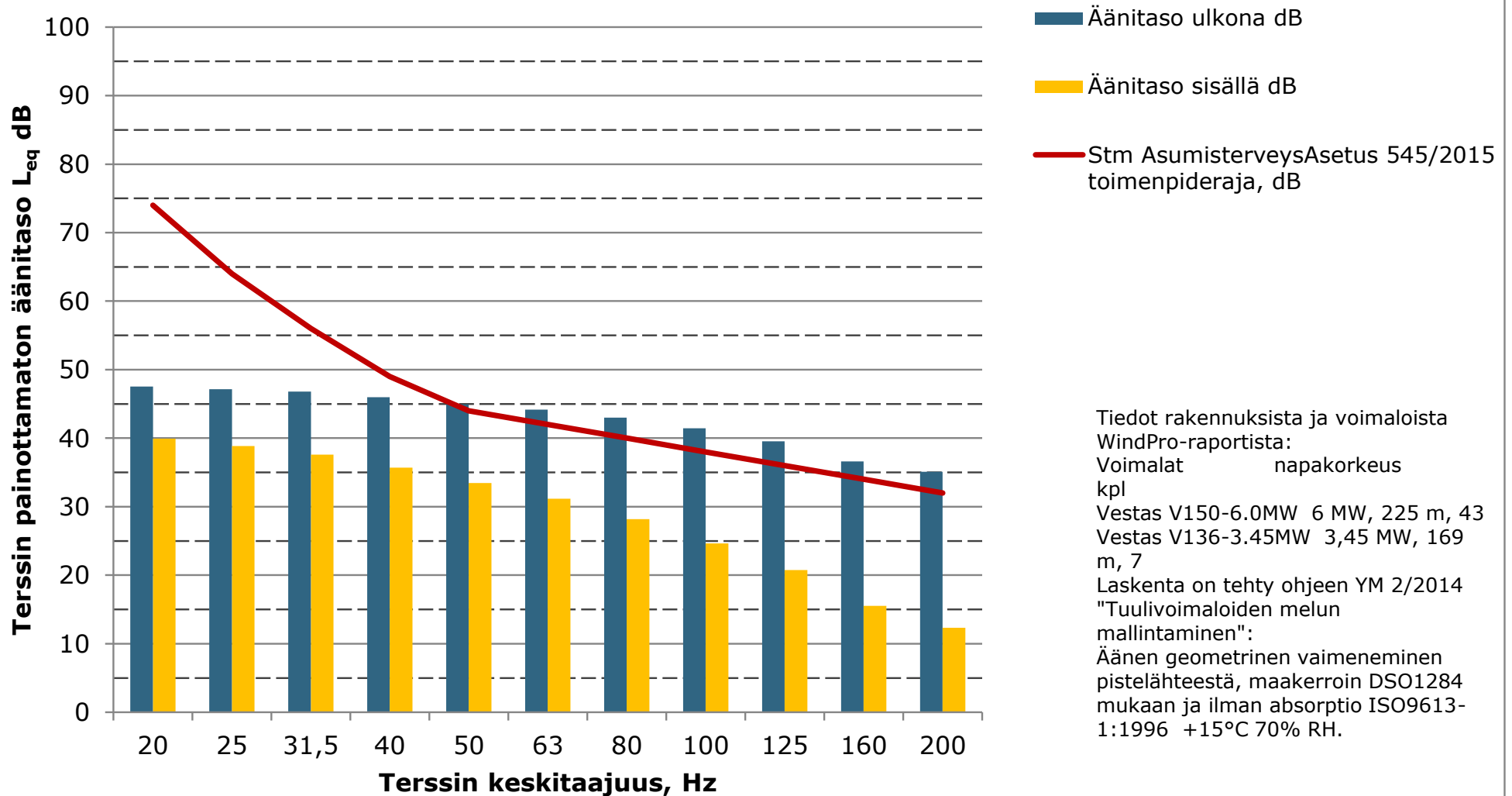


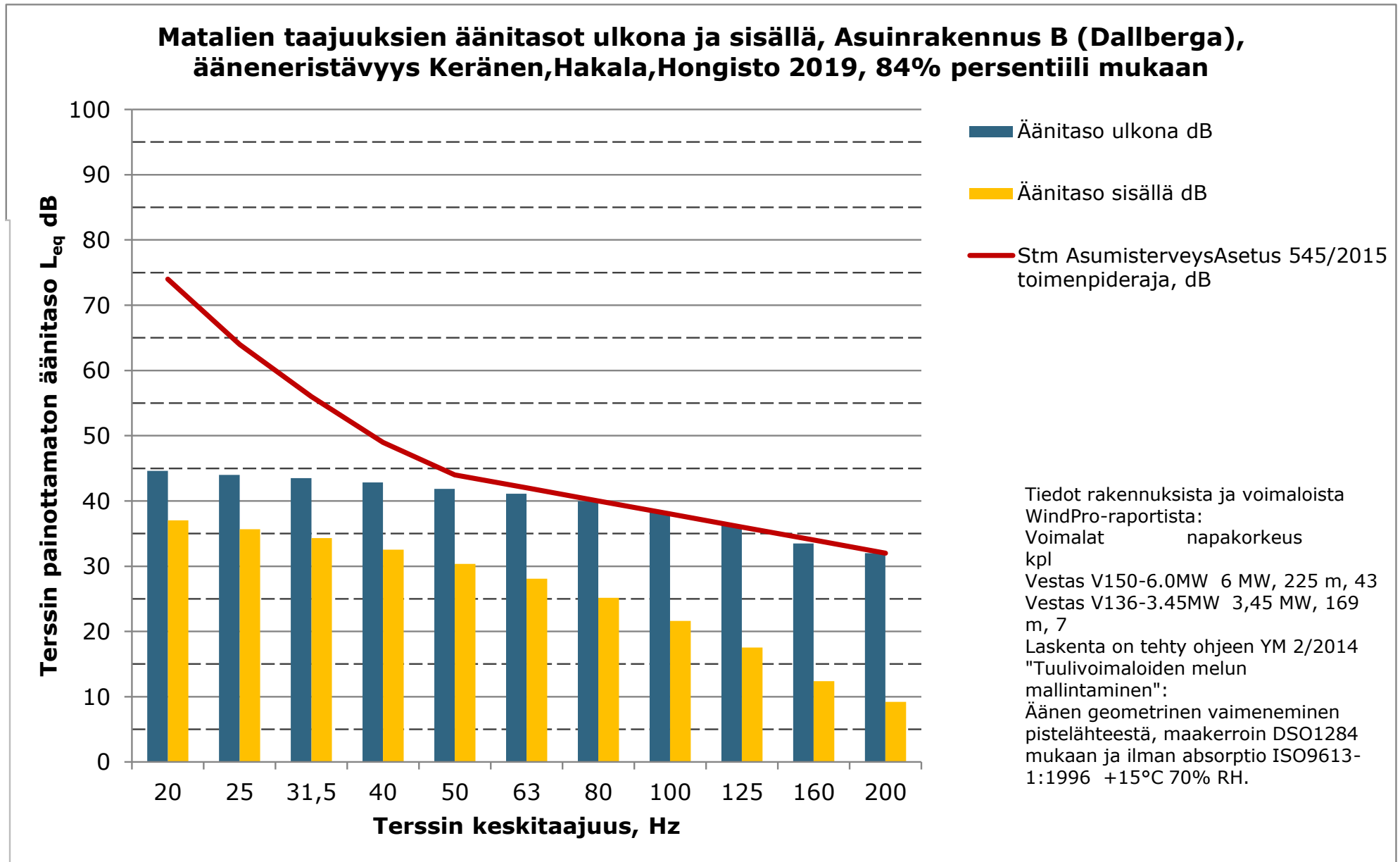




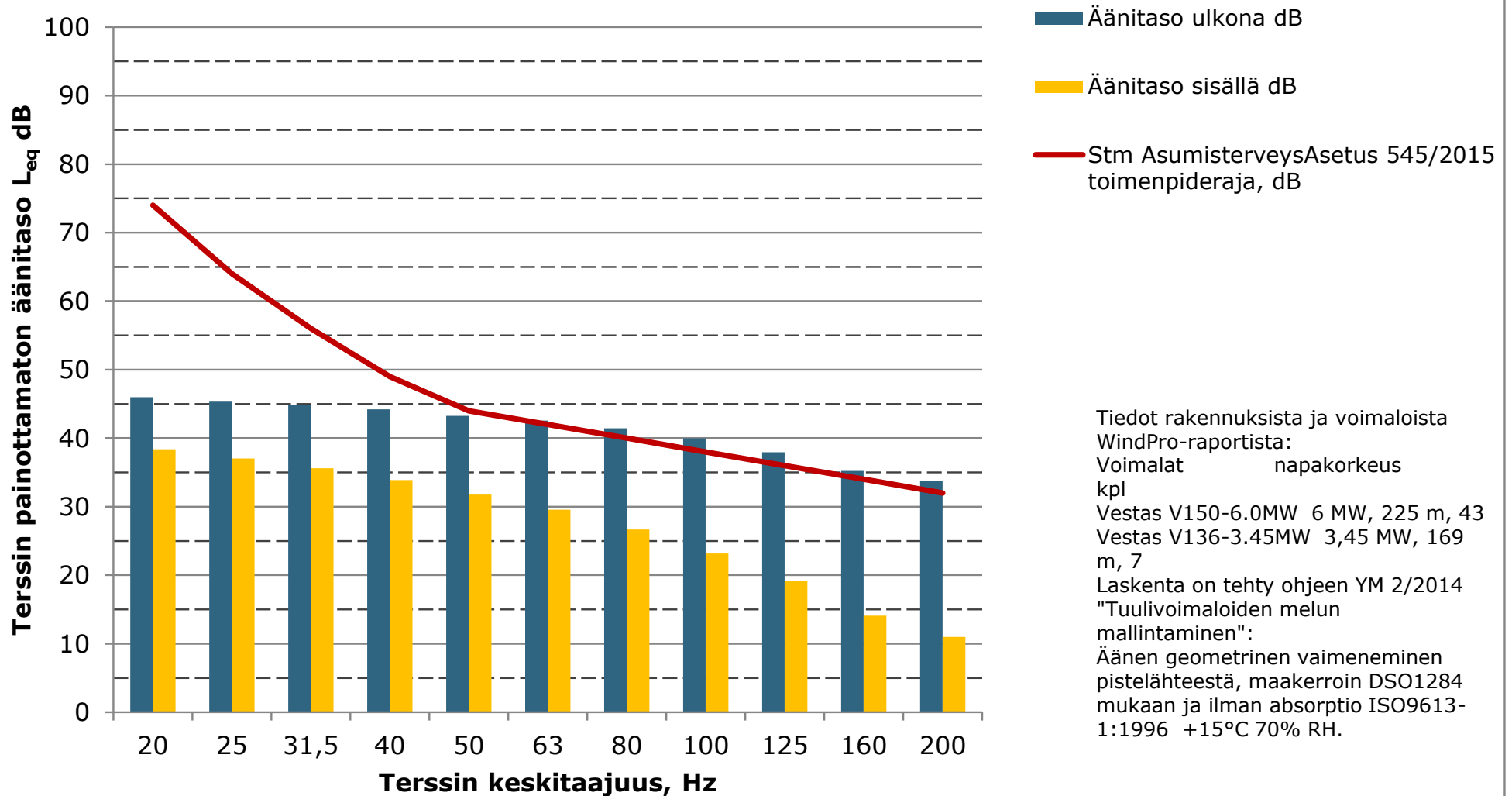


### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus AA (Kronkvist), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

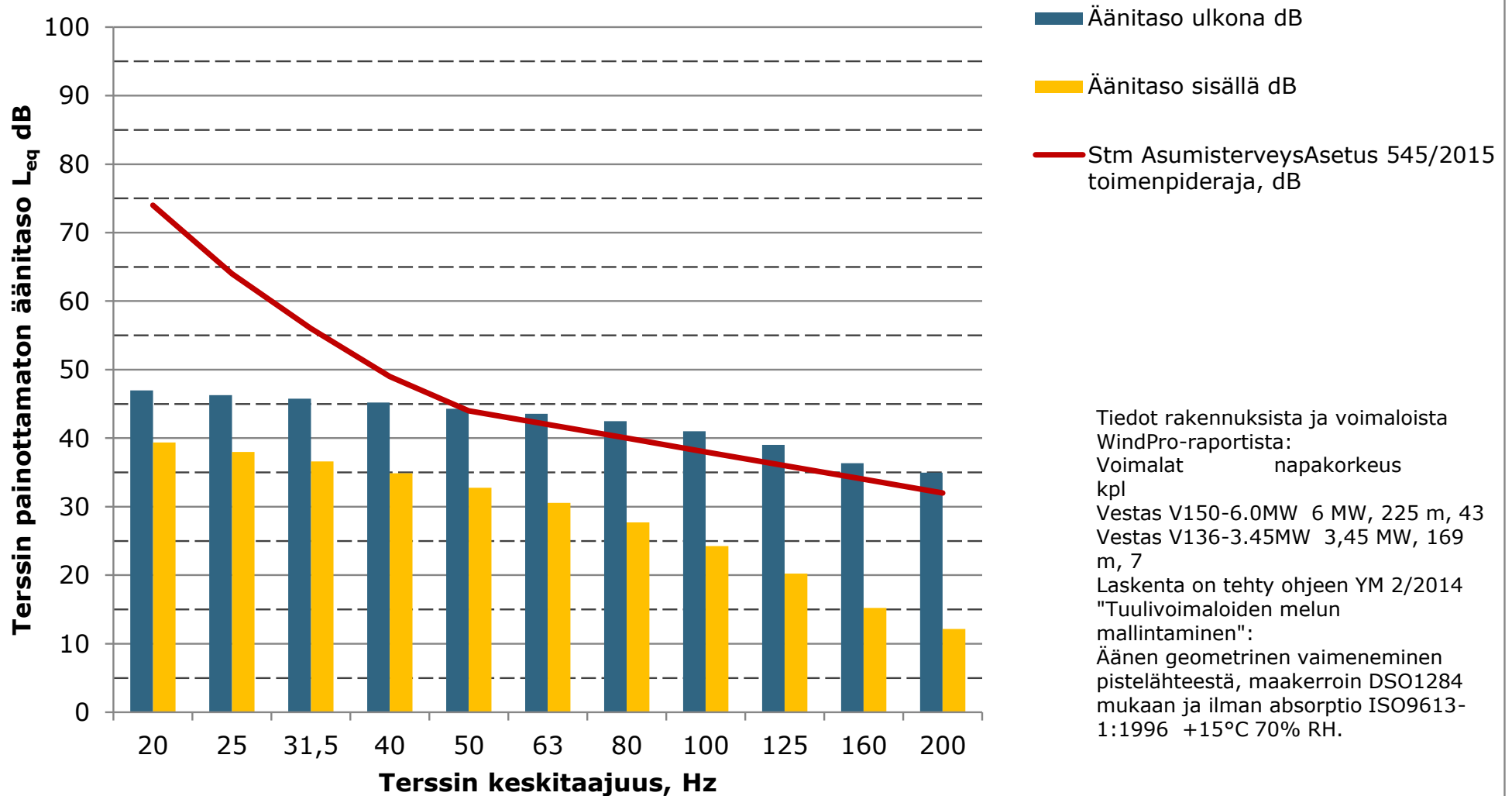




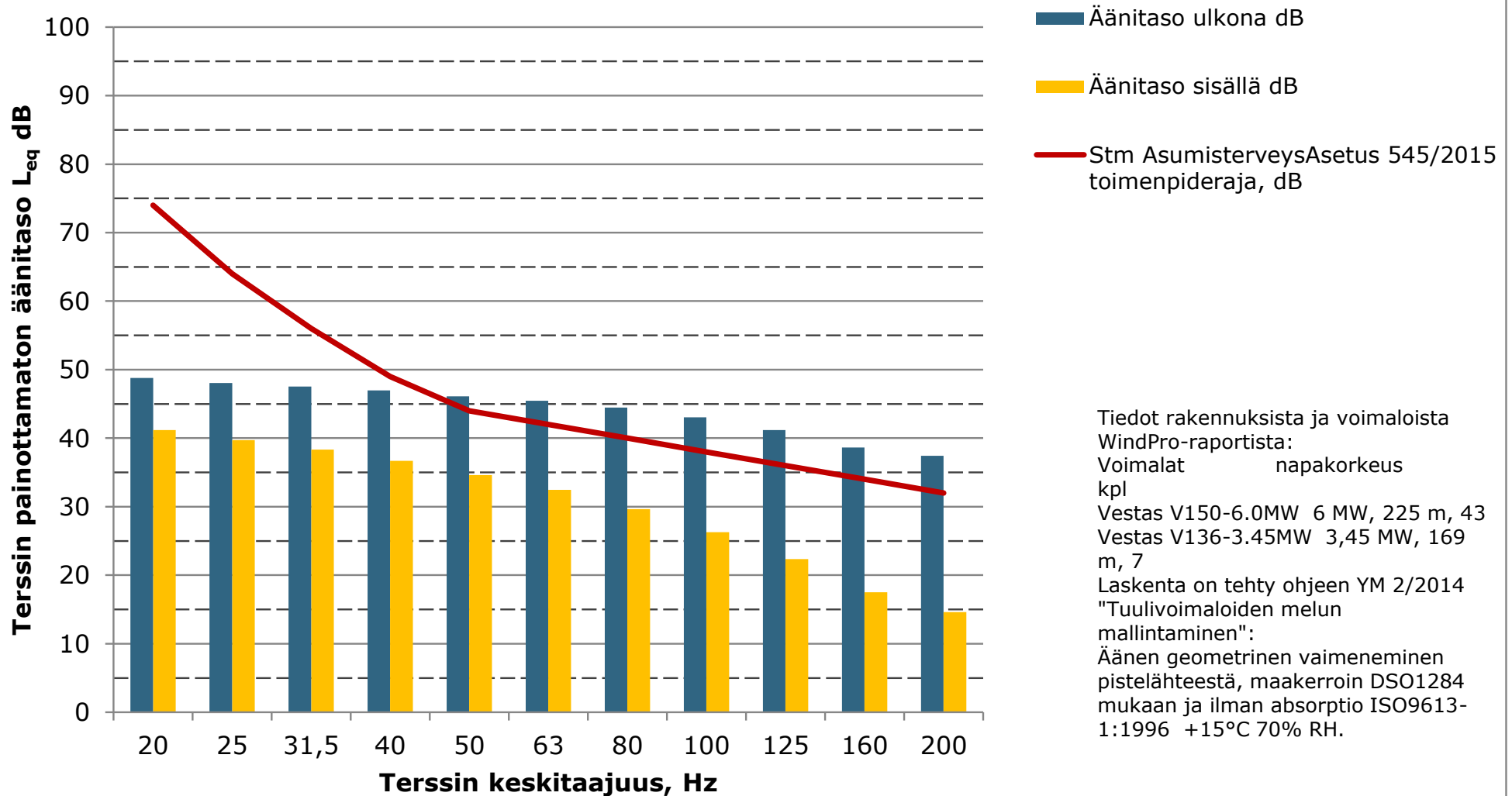
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C  
(Tormbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D  
(Kalltrdskvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

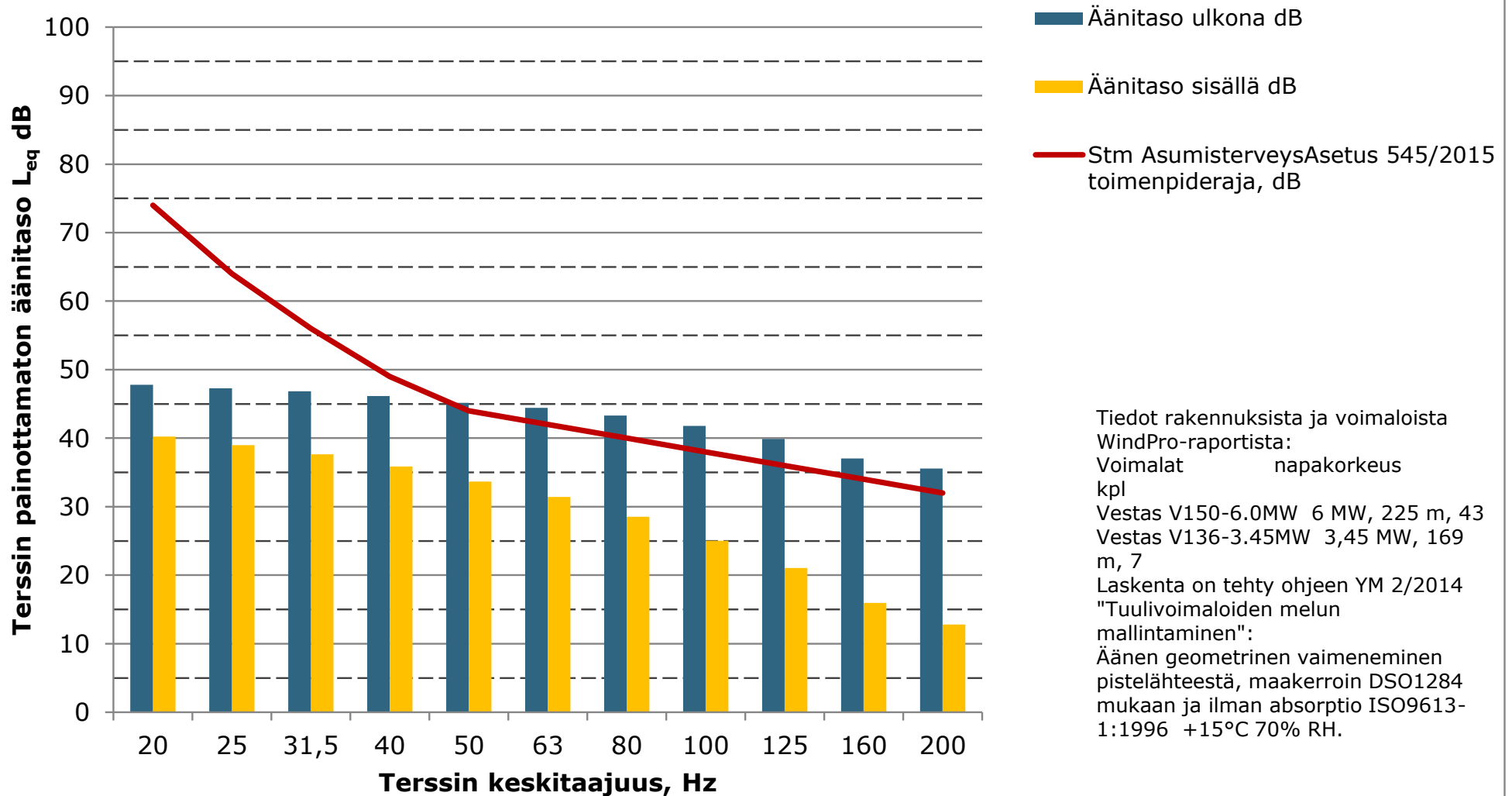


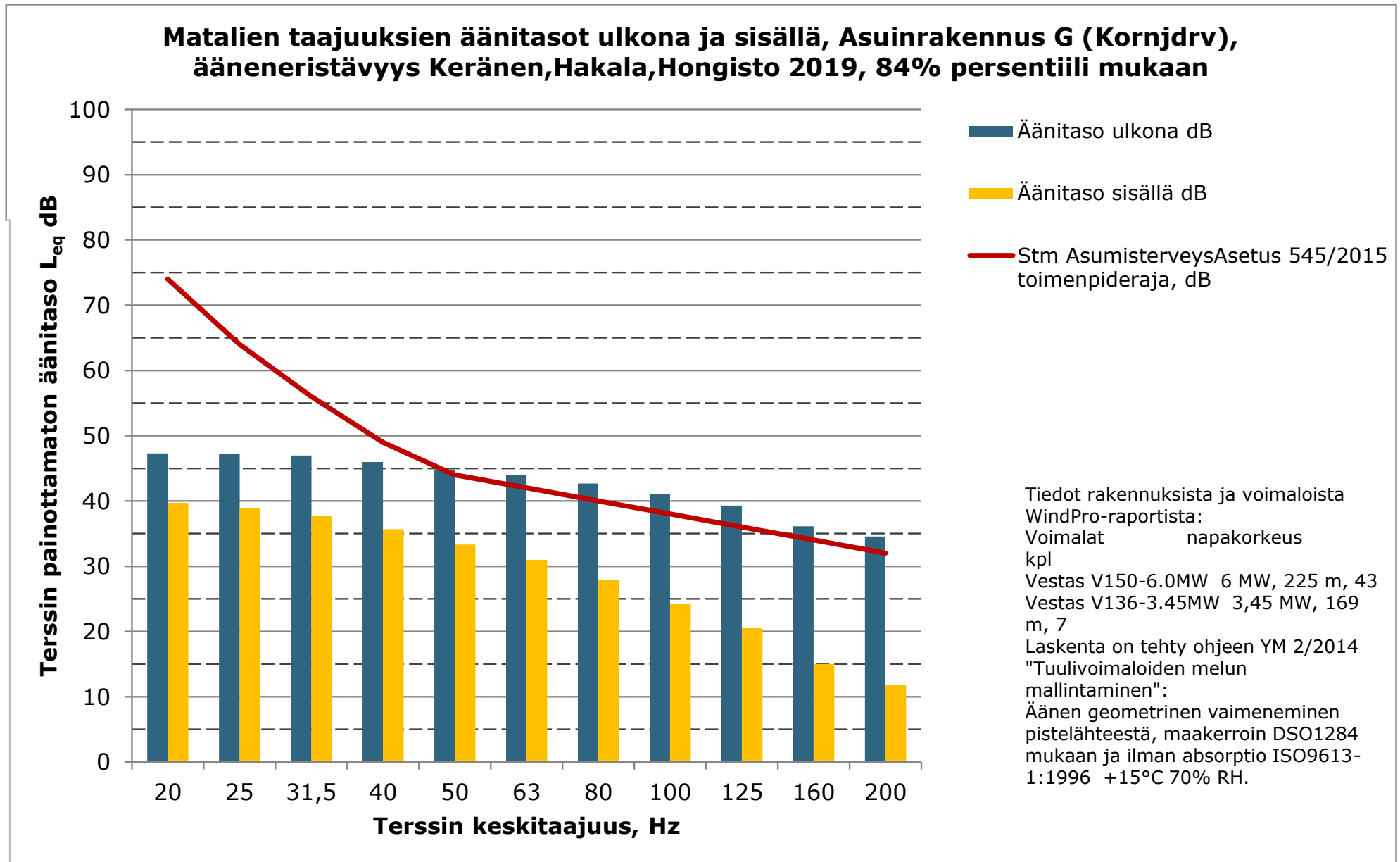
**Matalien taajuuksien äänitasot ulkona ja sisällä, Metsästysmaja E  
(Kejsarbacken), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**



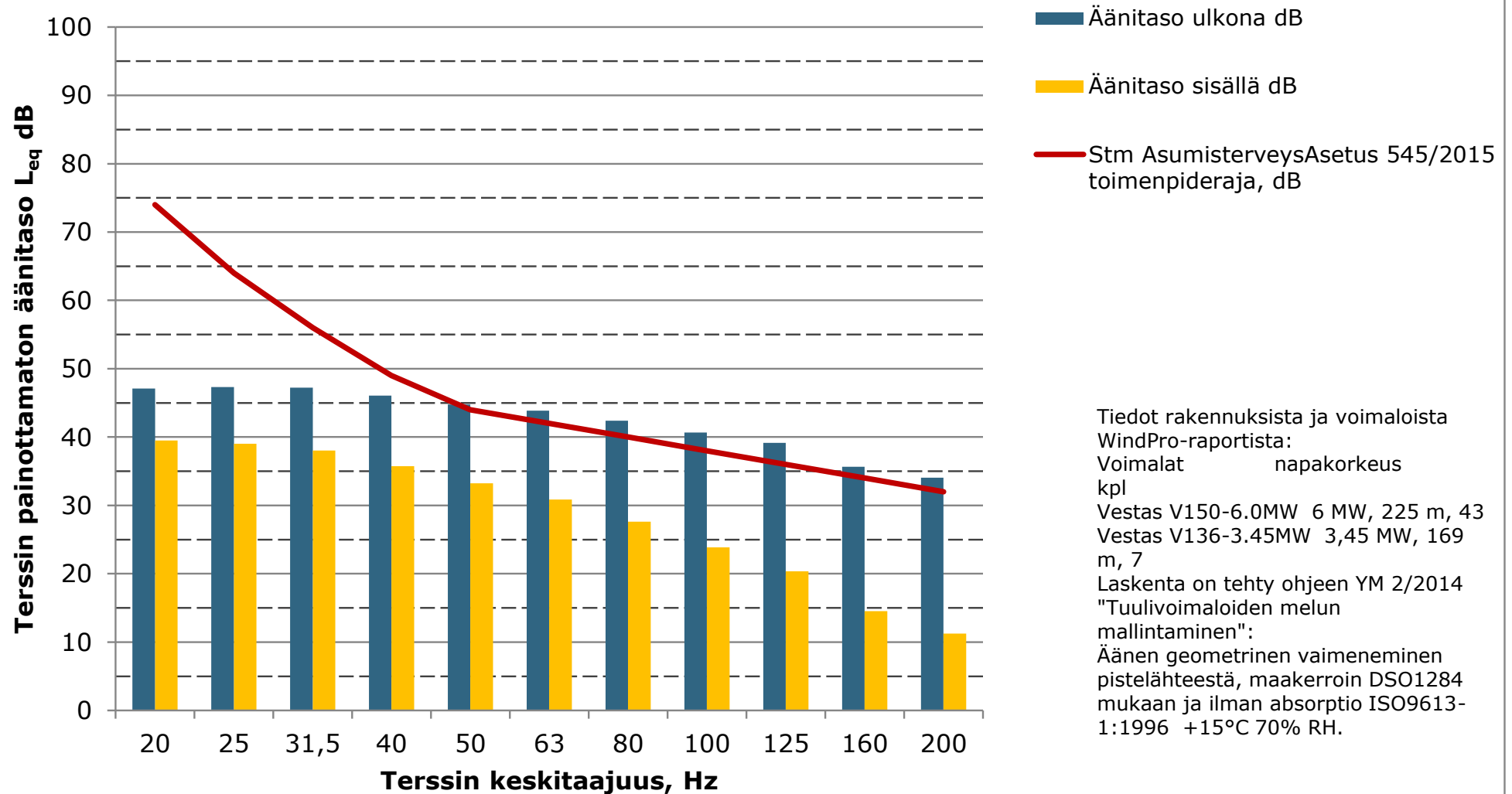


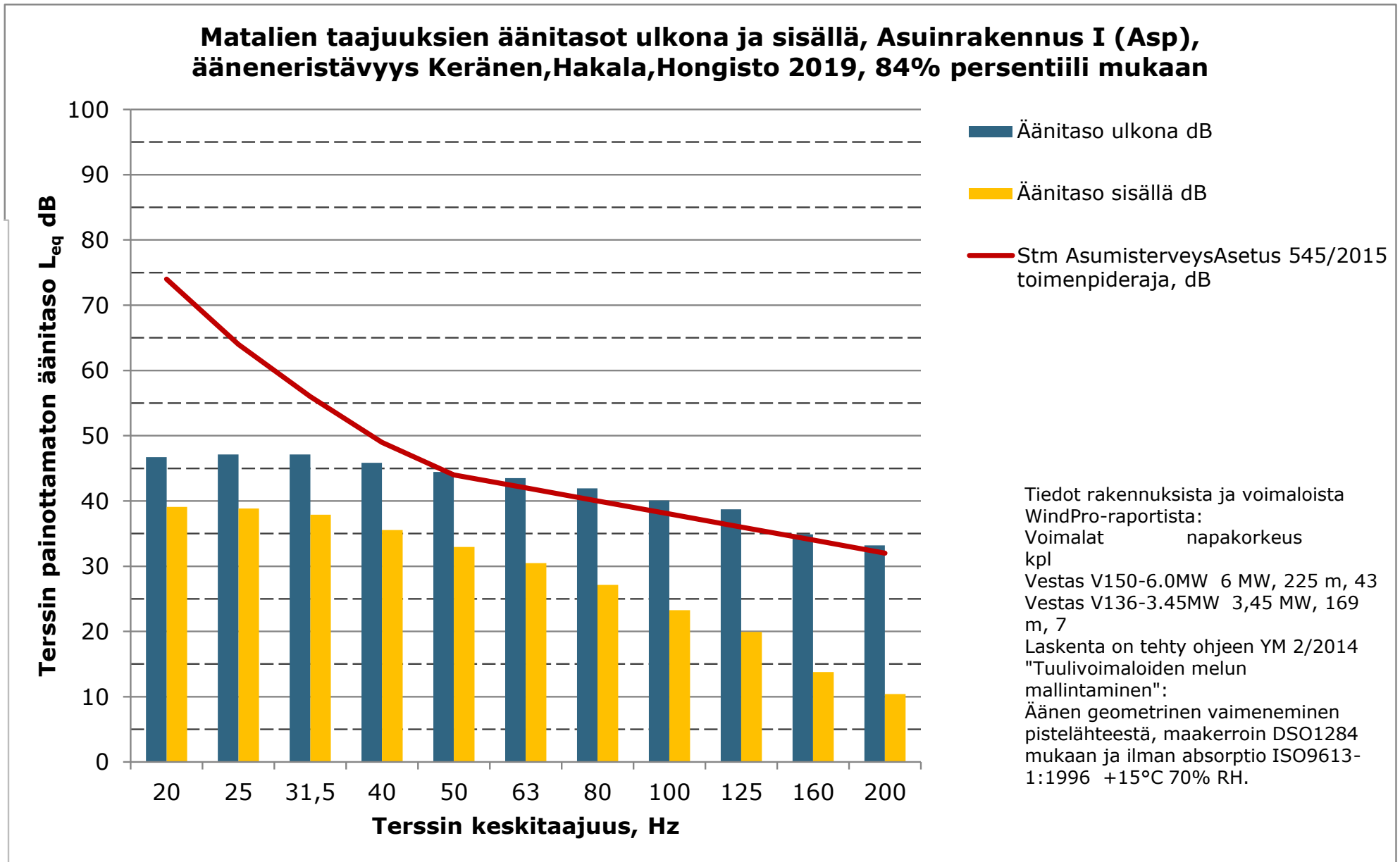
### Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus F (Kdillbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan

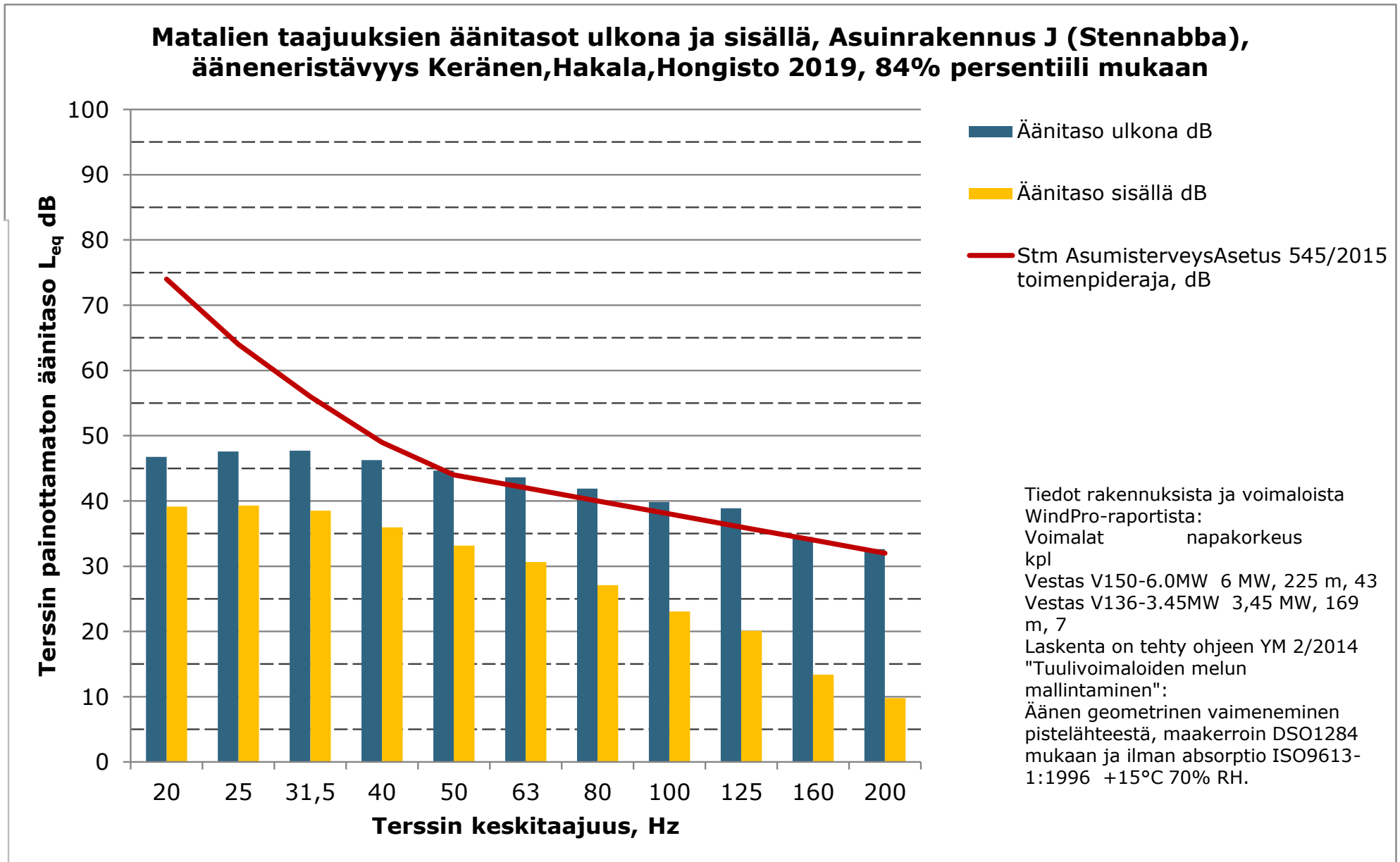




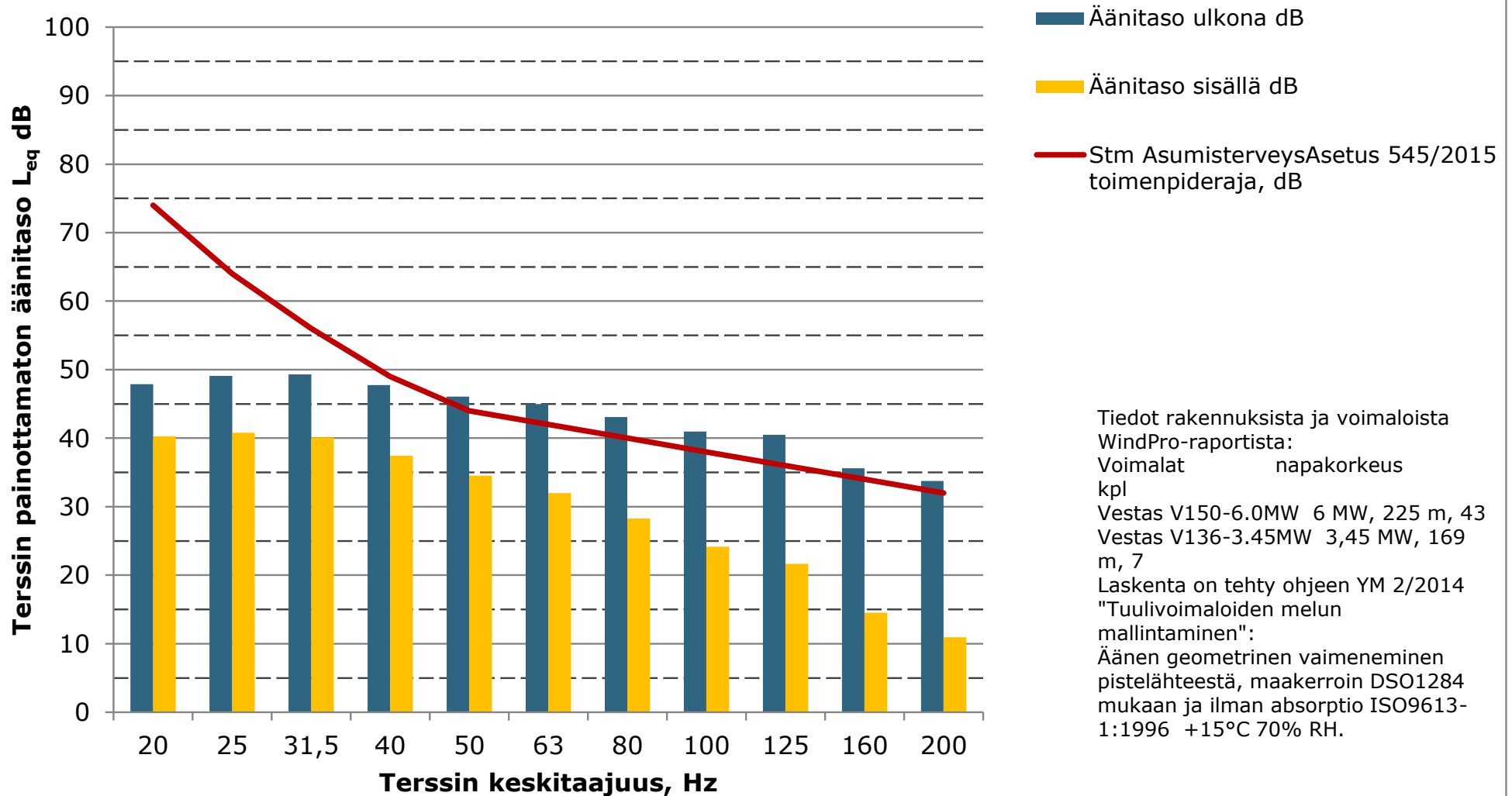
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Sandnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



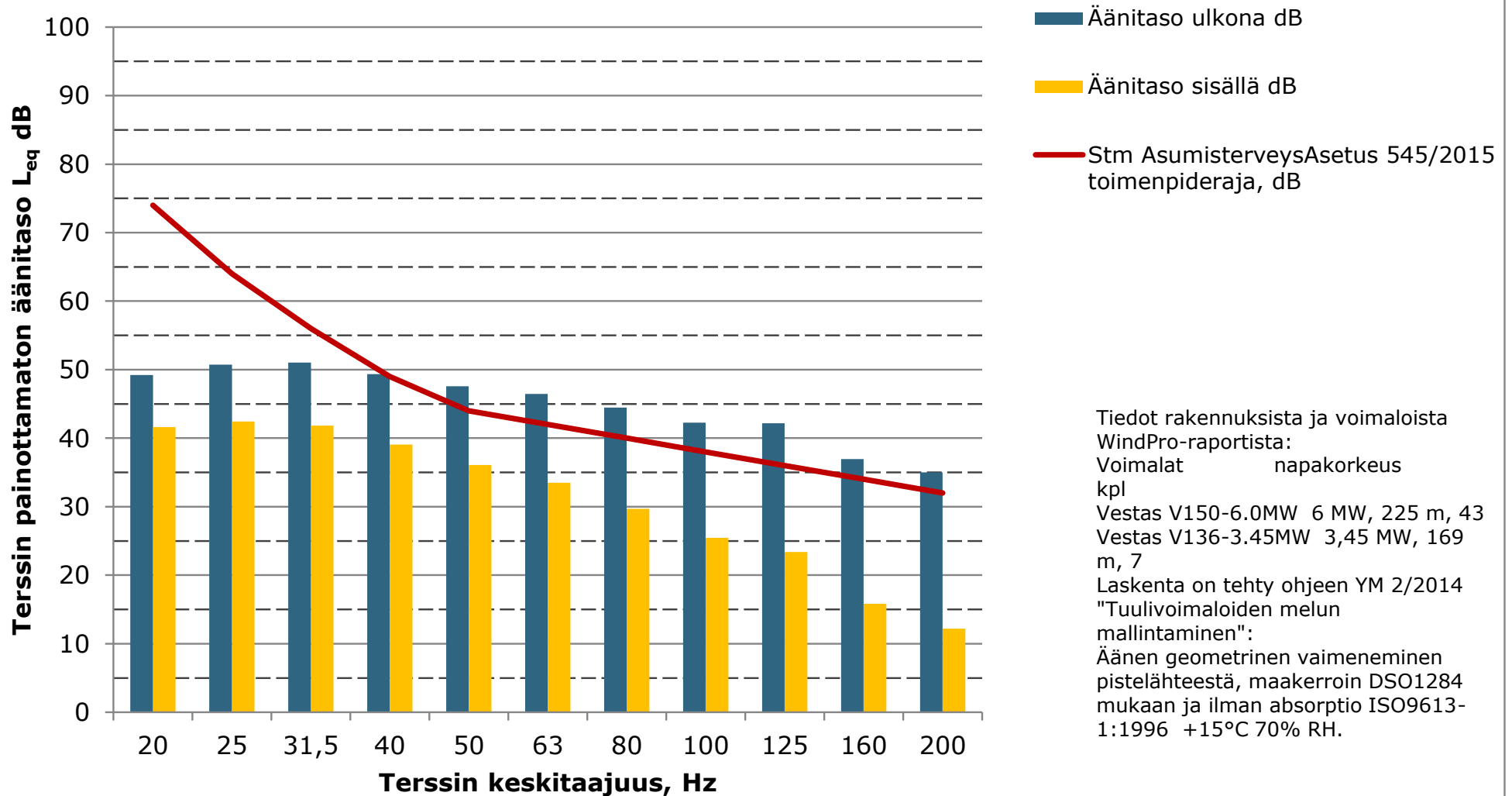




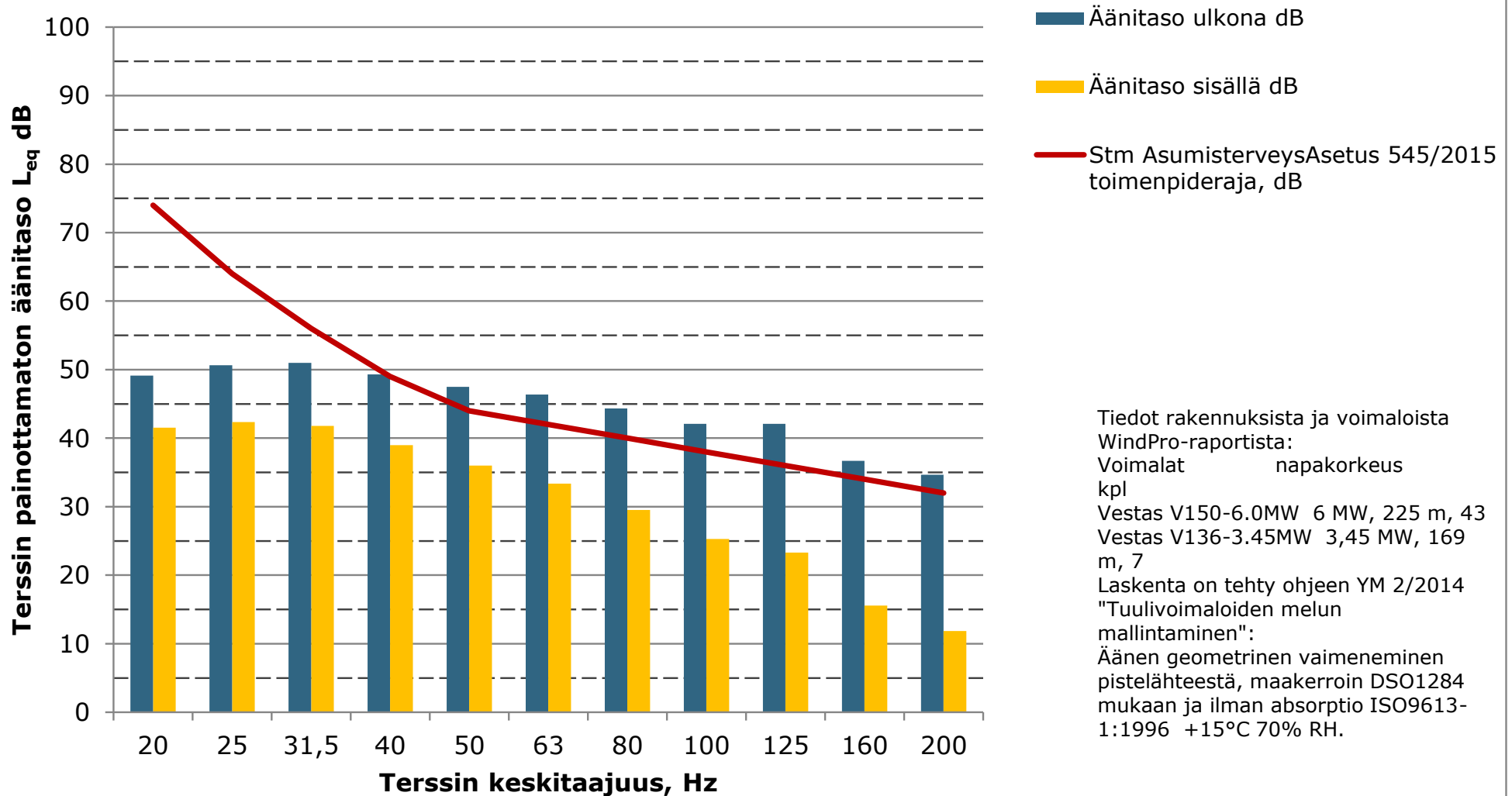
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Lengnabba), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



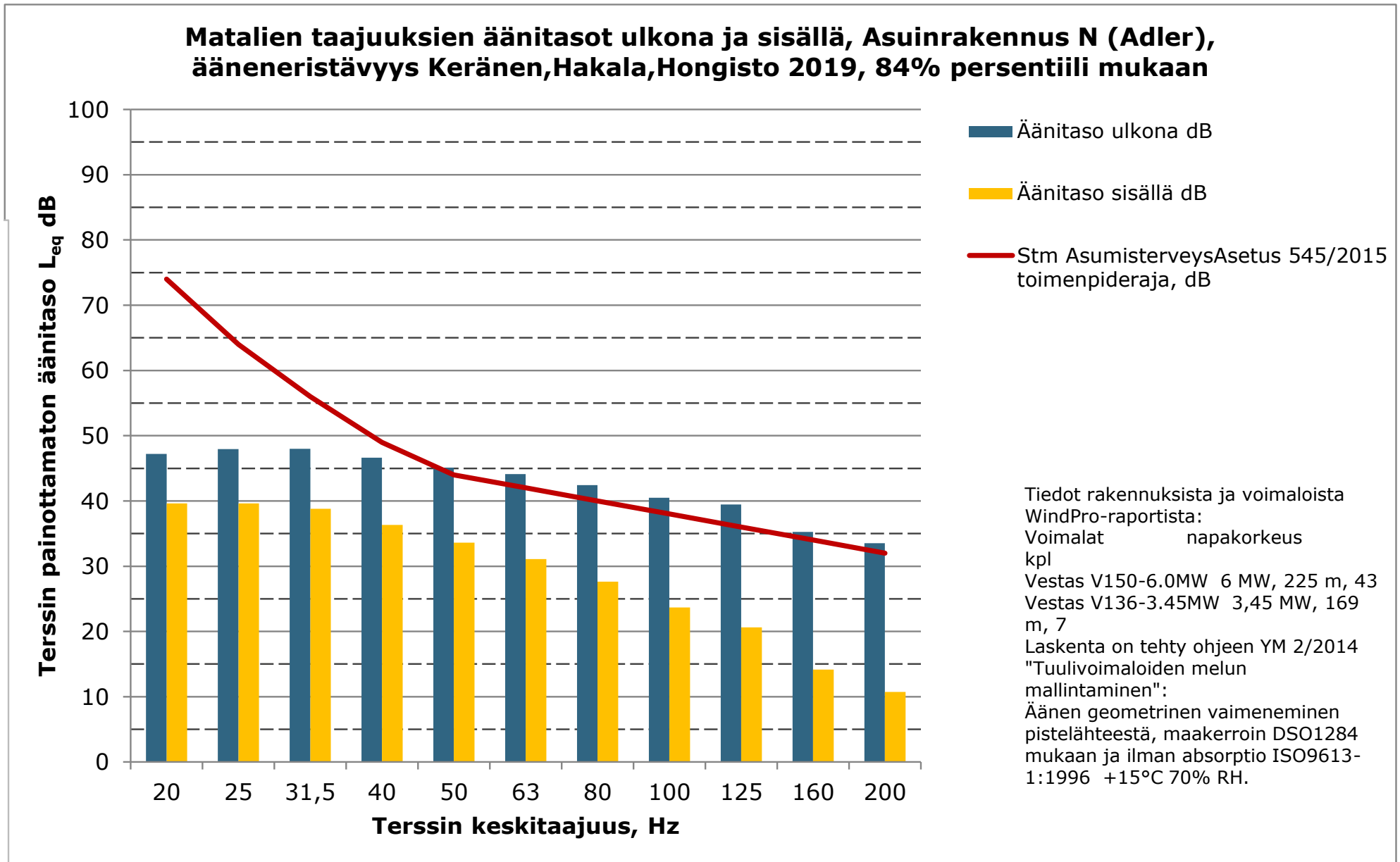
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus L  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**



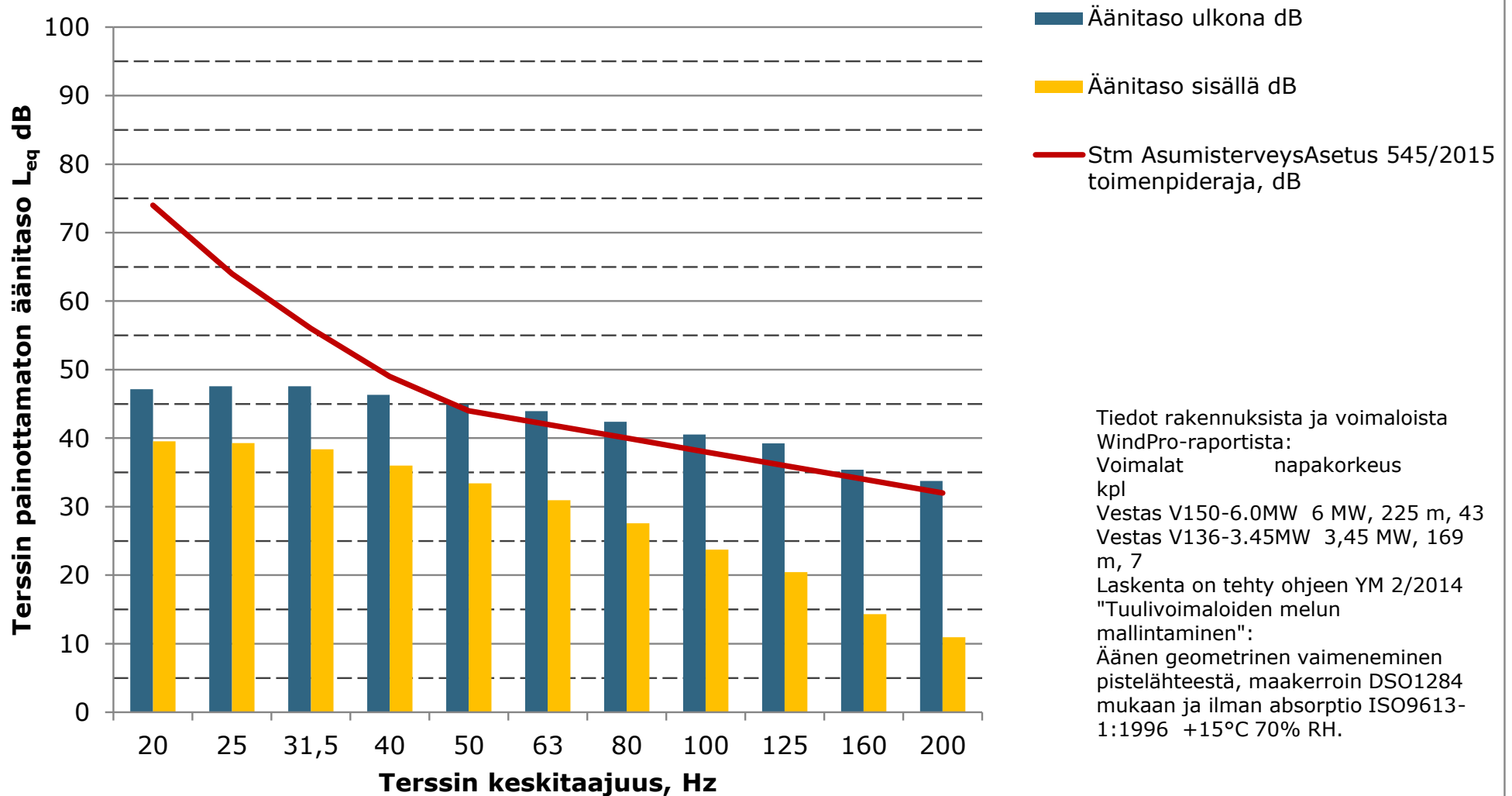
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M (Stenbacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili mukaan



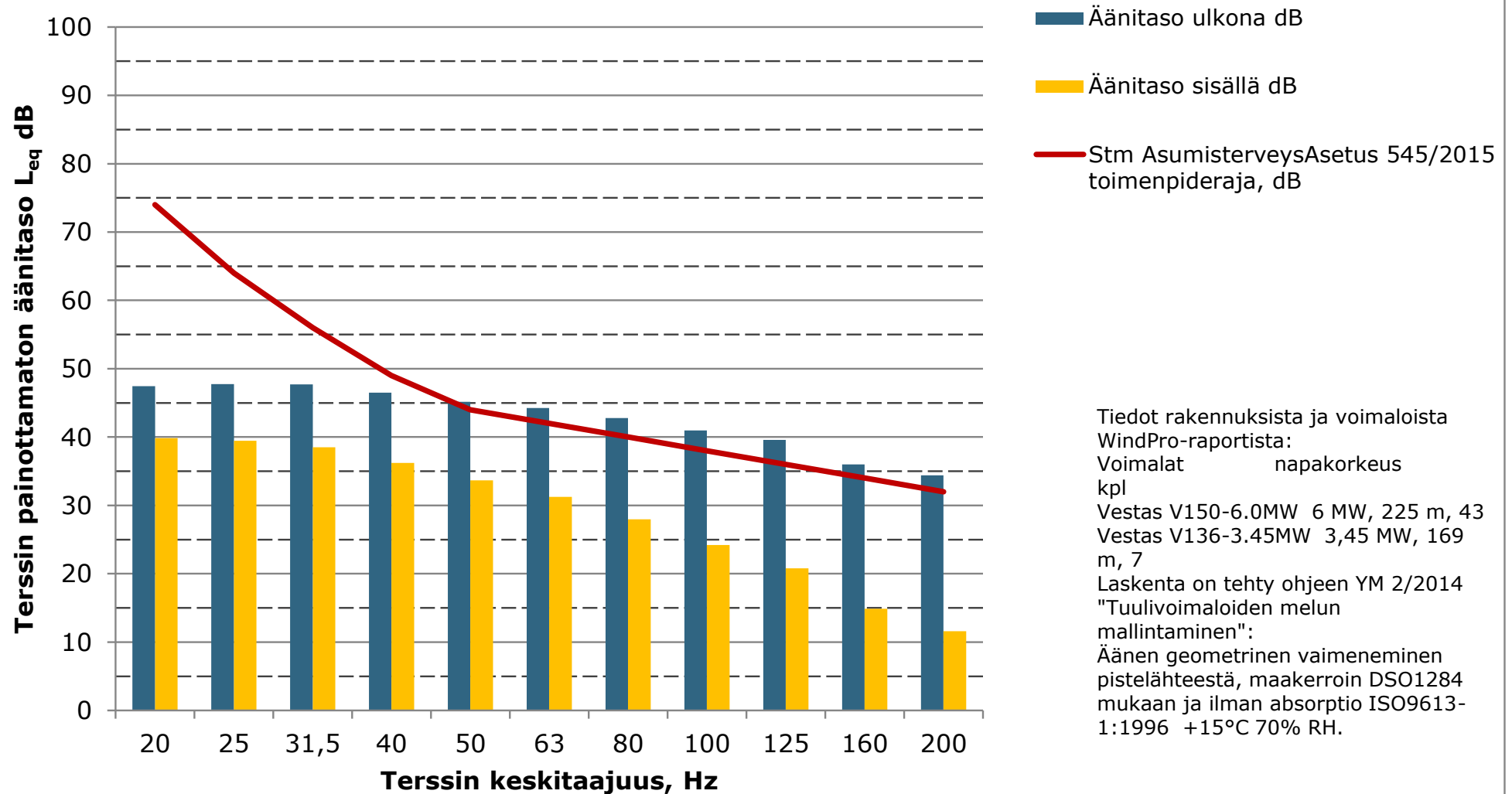




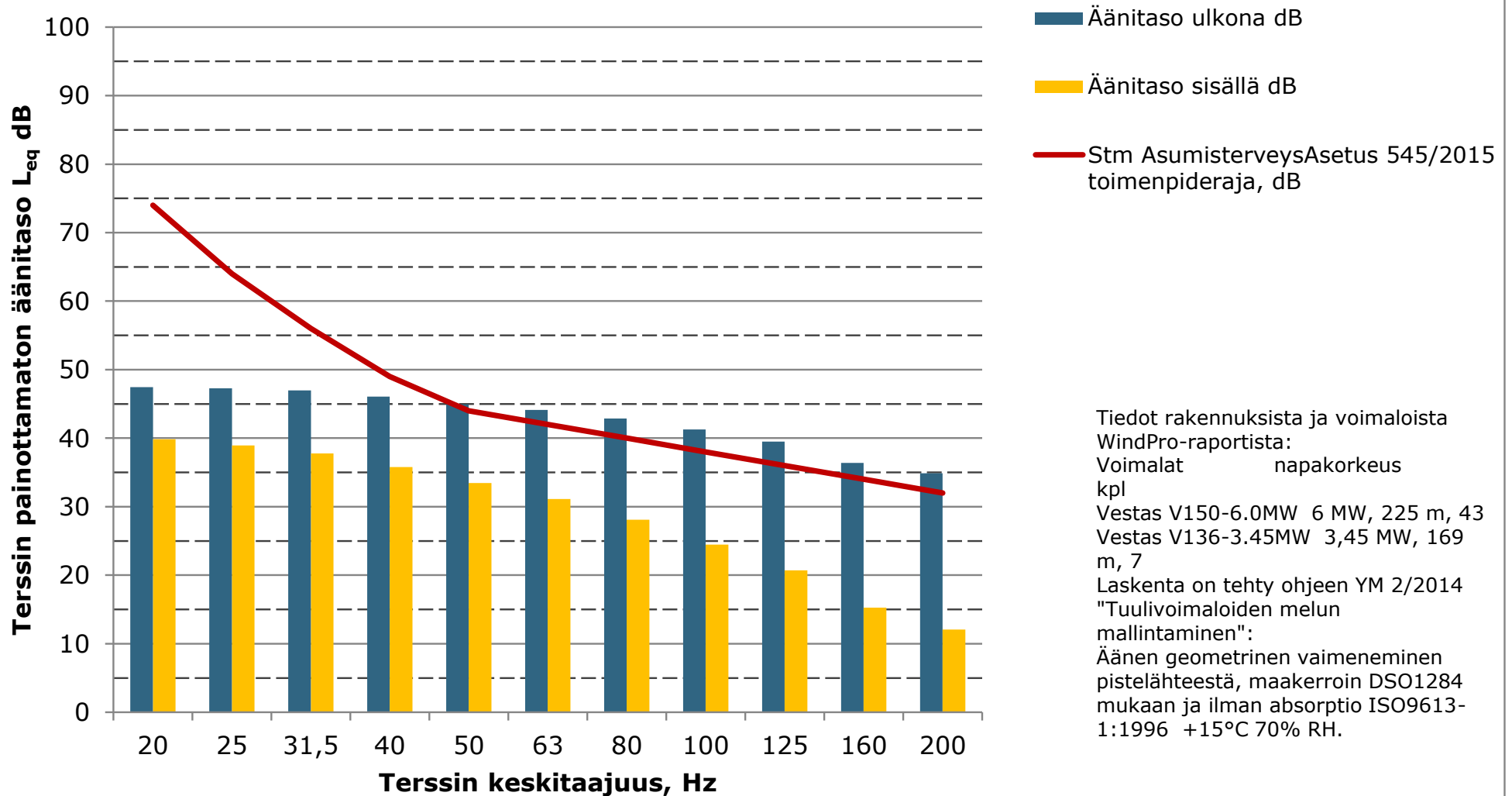
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

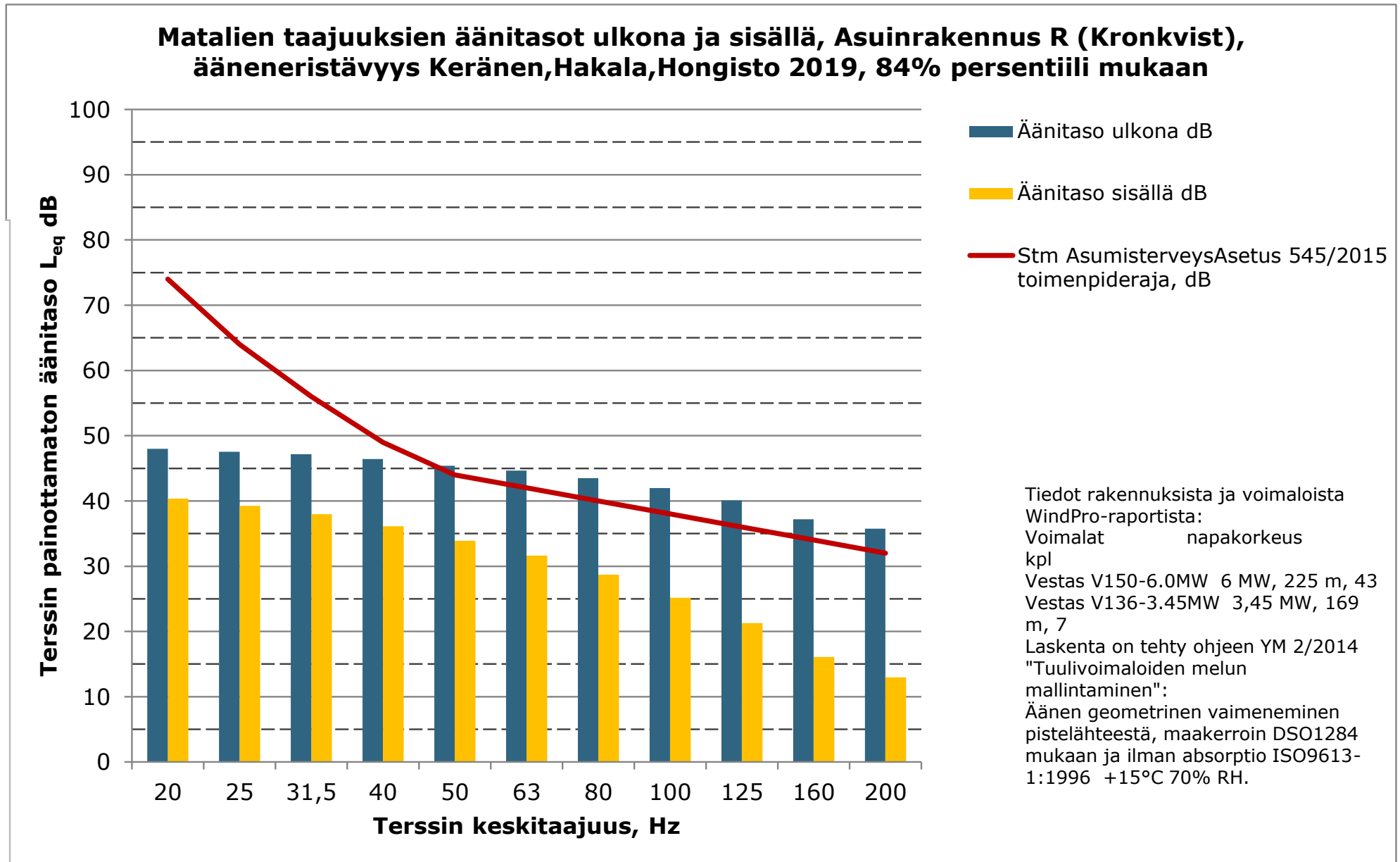


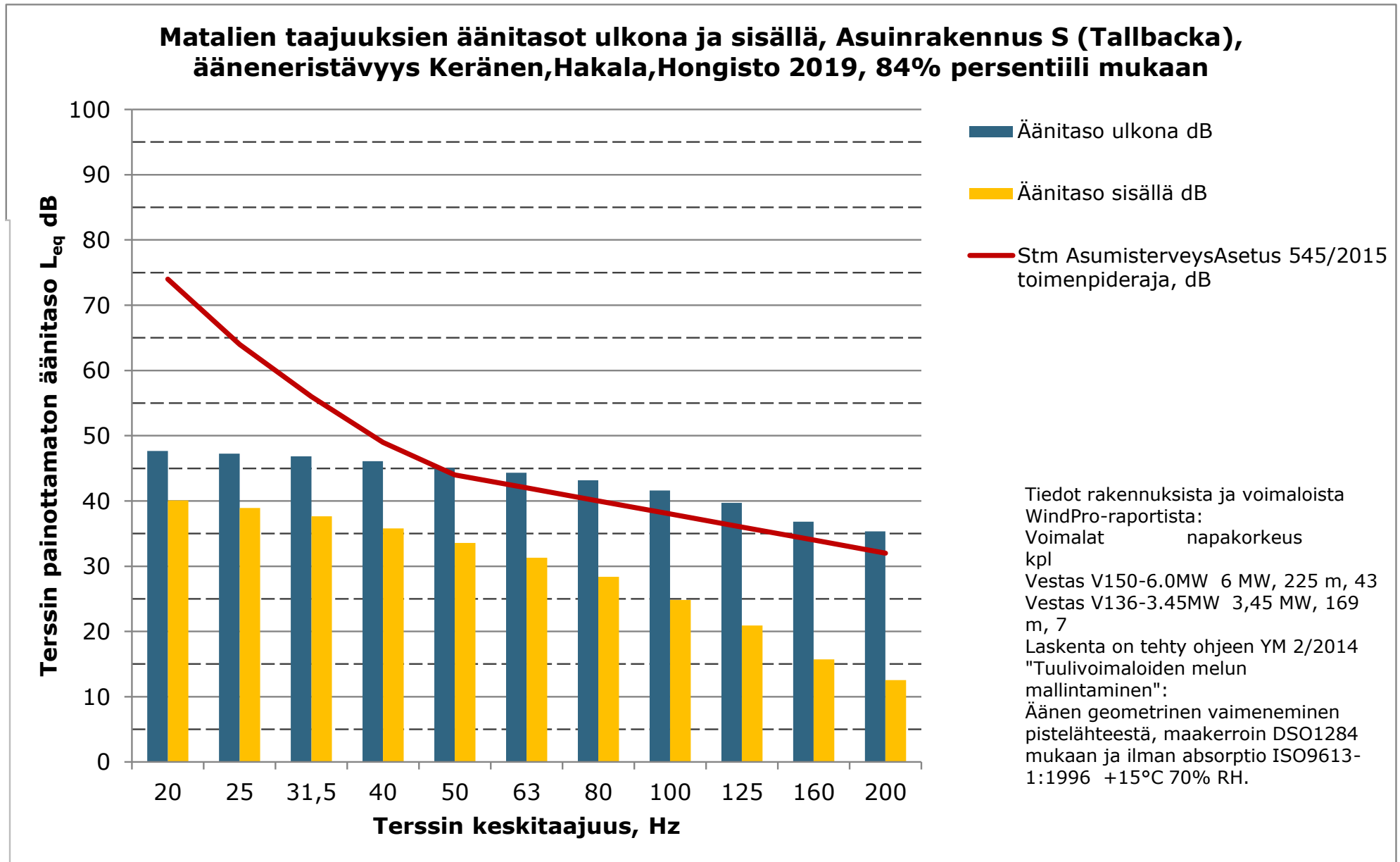
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Finnabbavdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

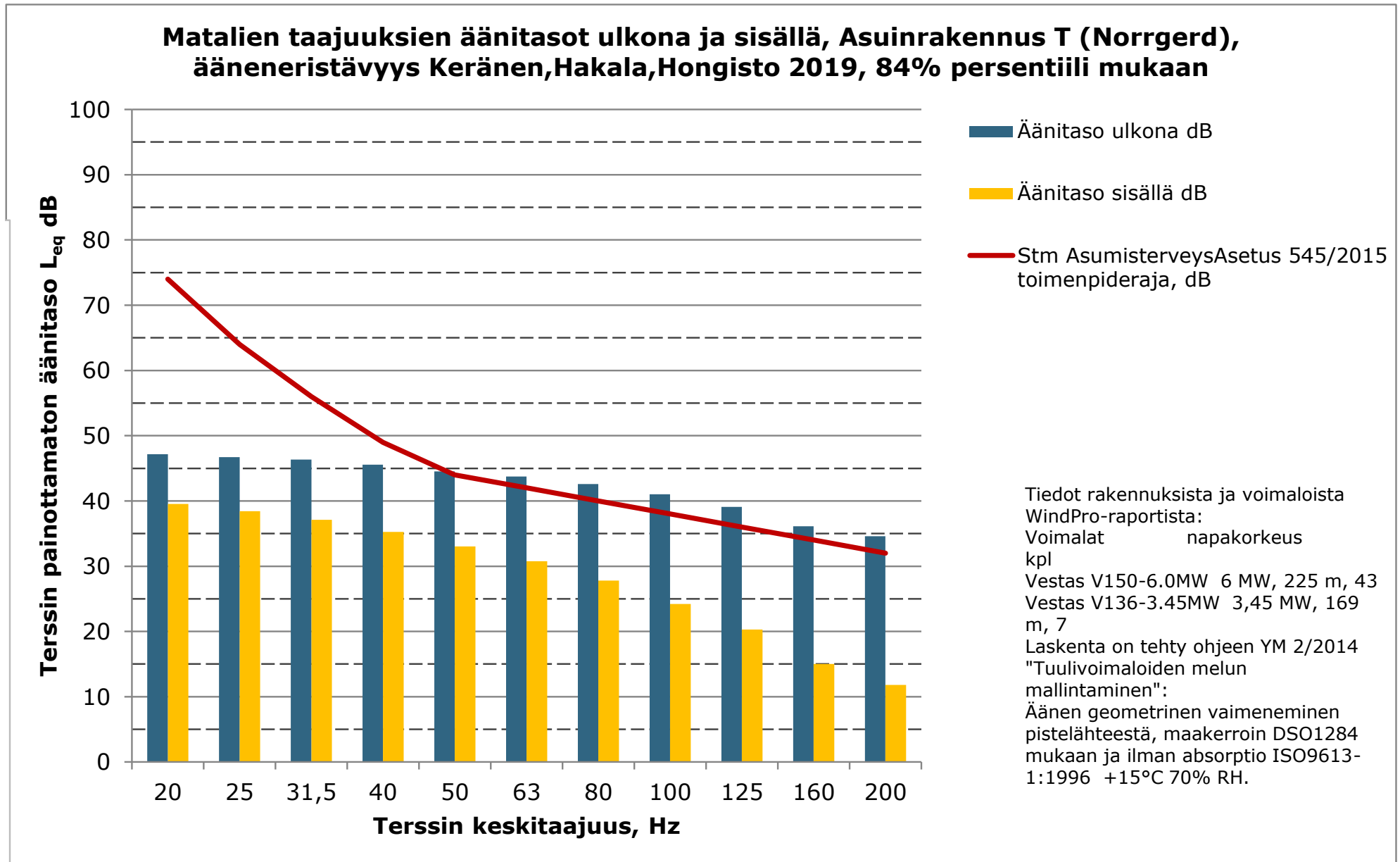


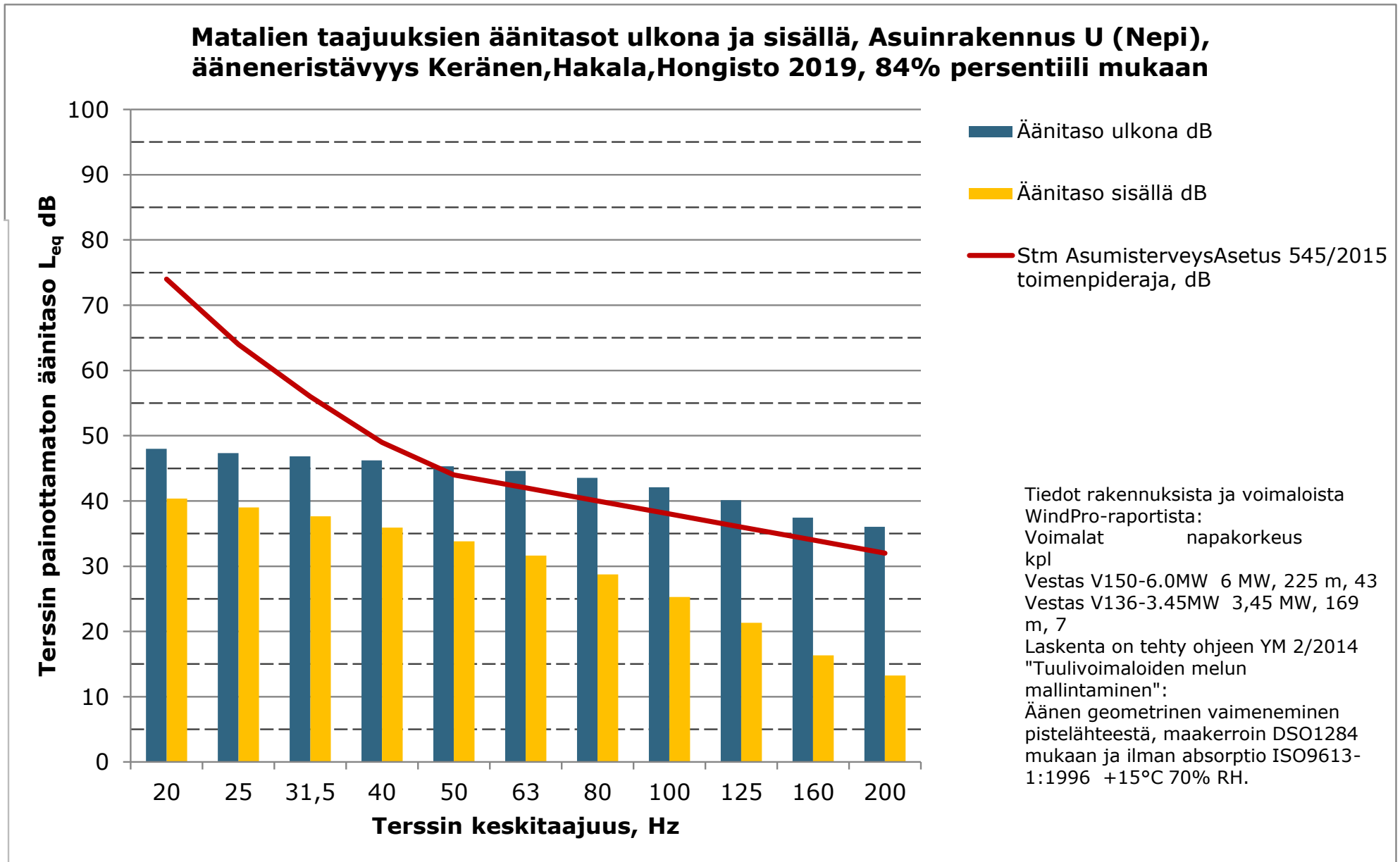
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q (Dalabacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili mukaan



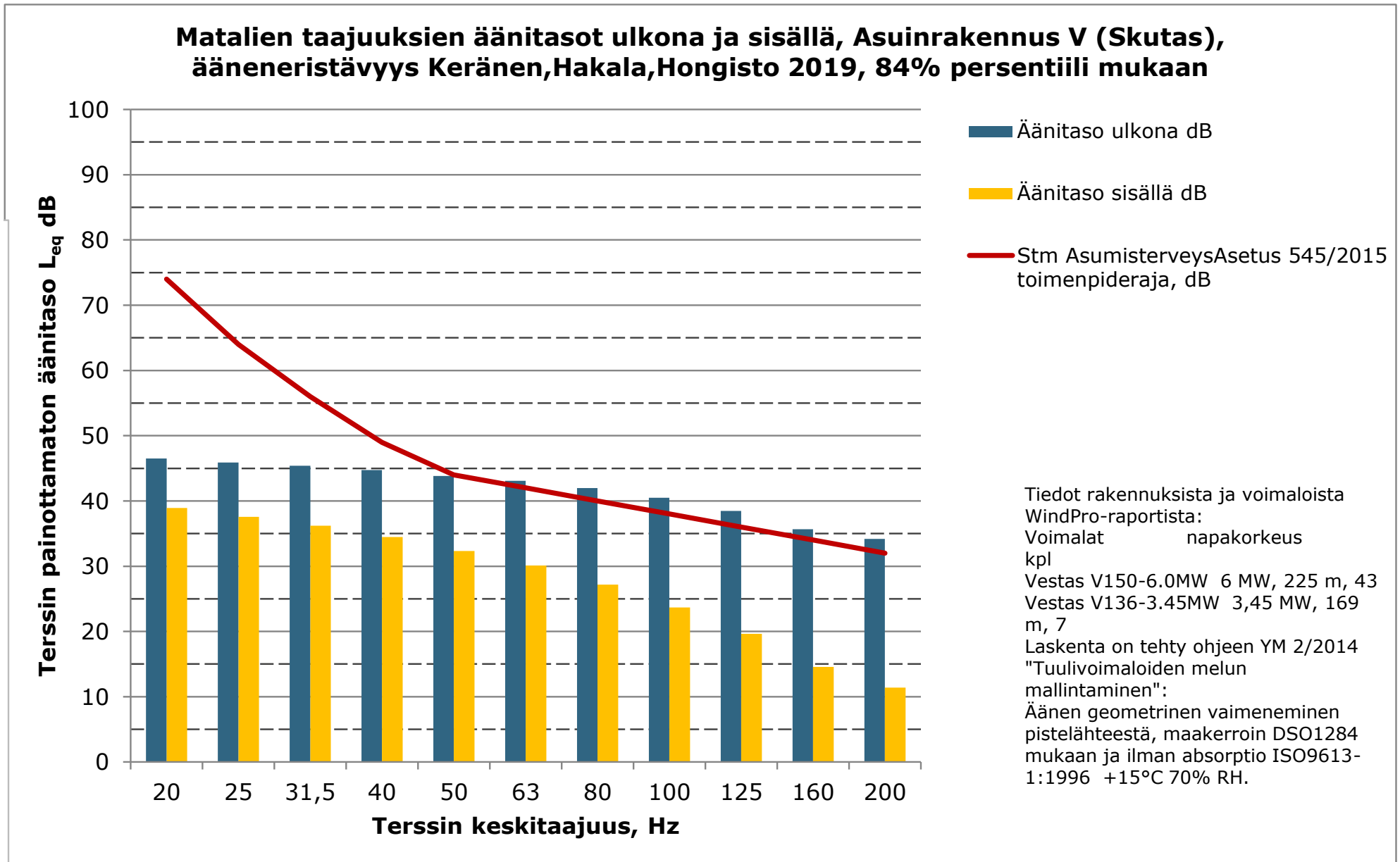


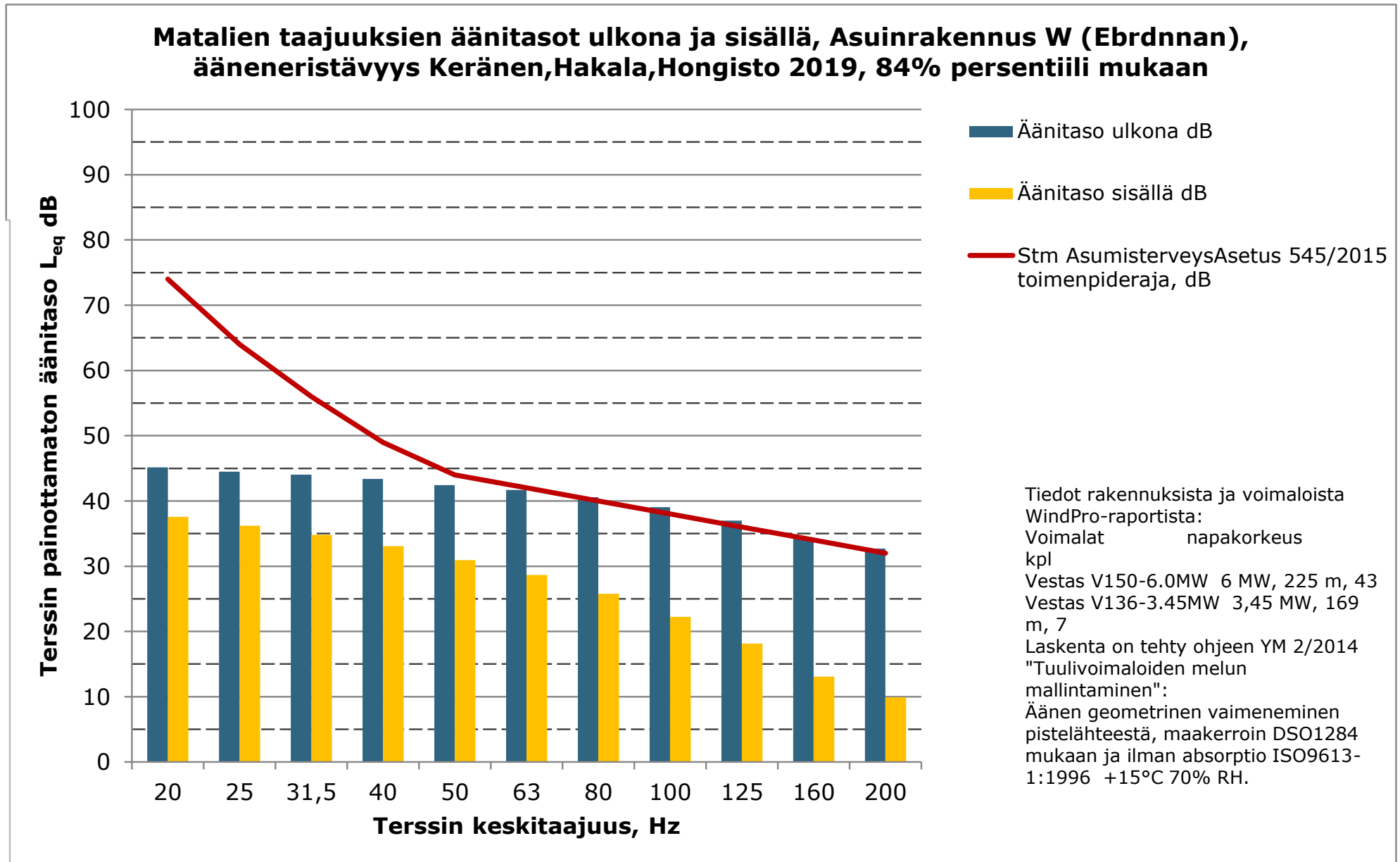


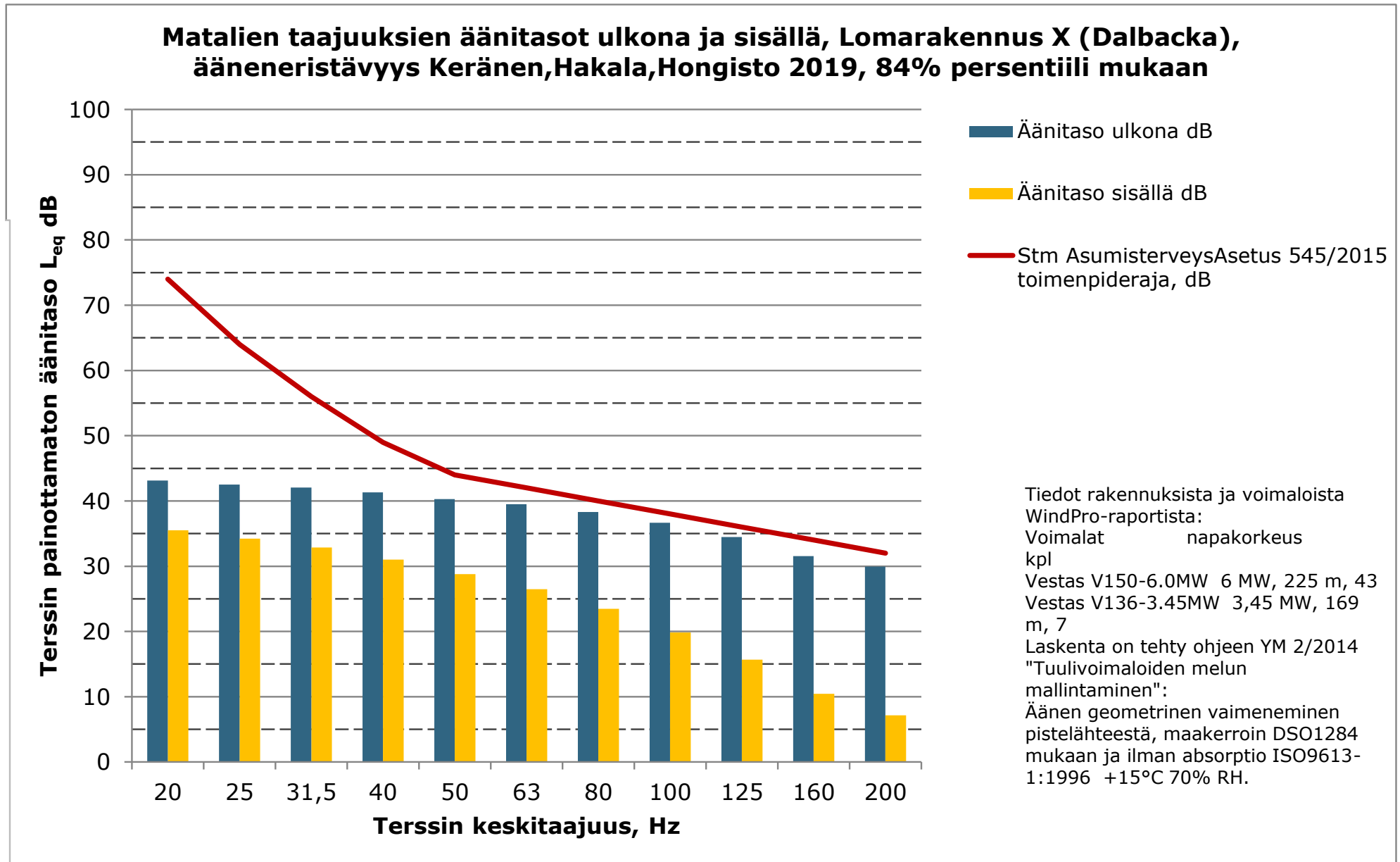


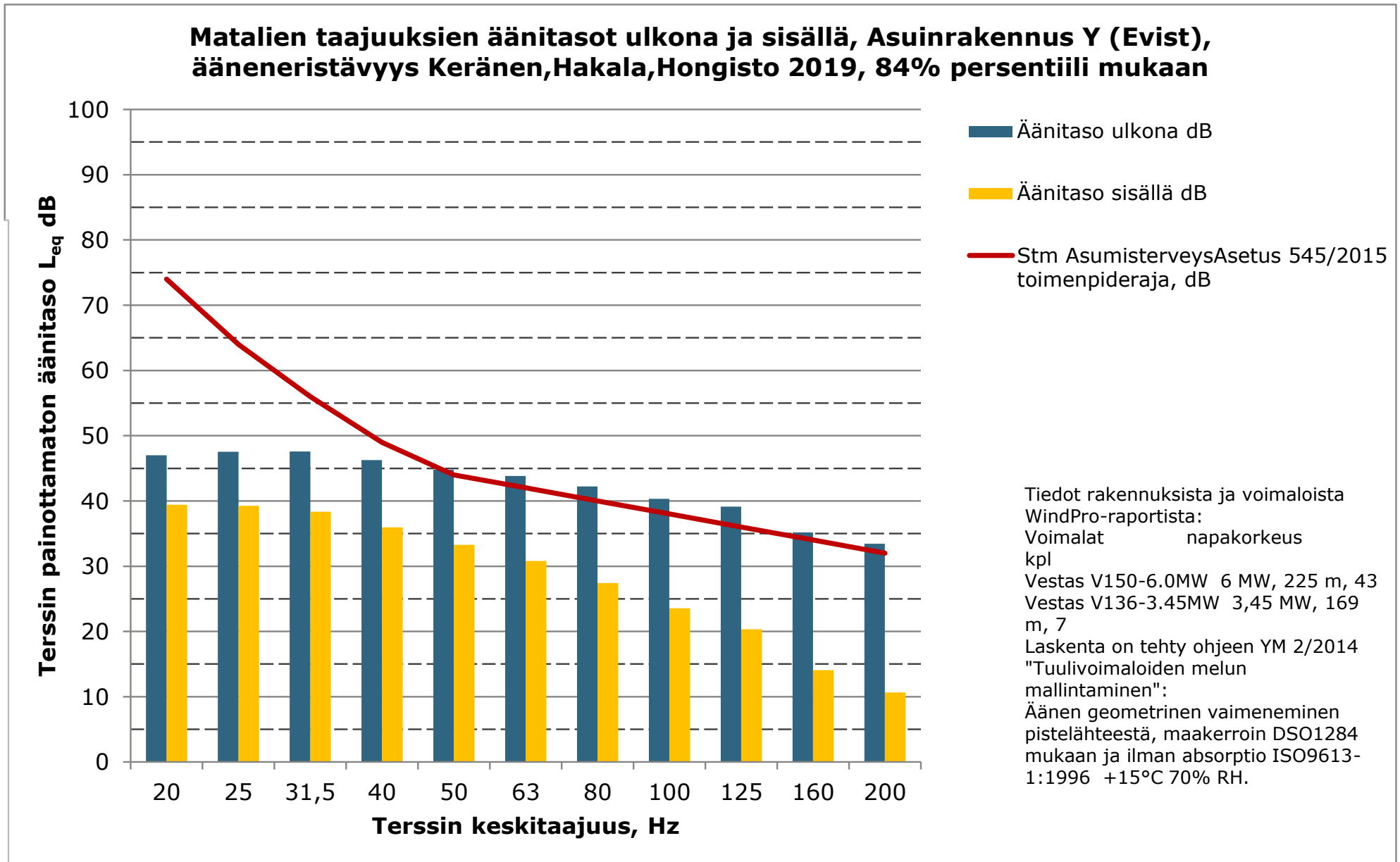


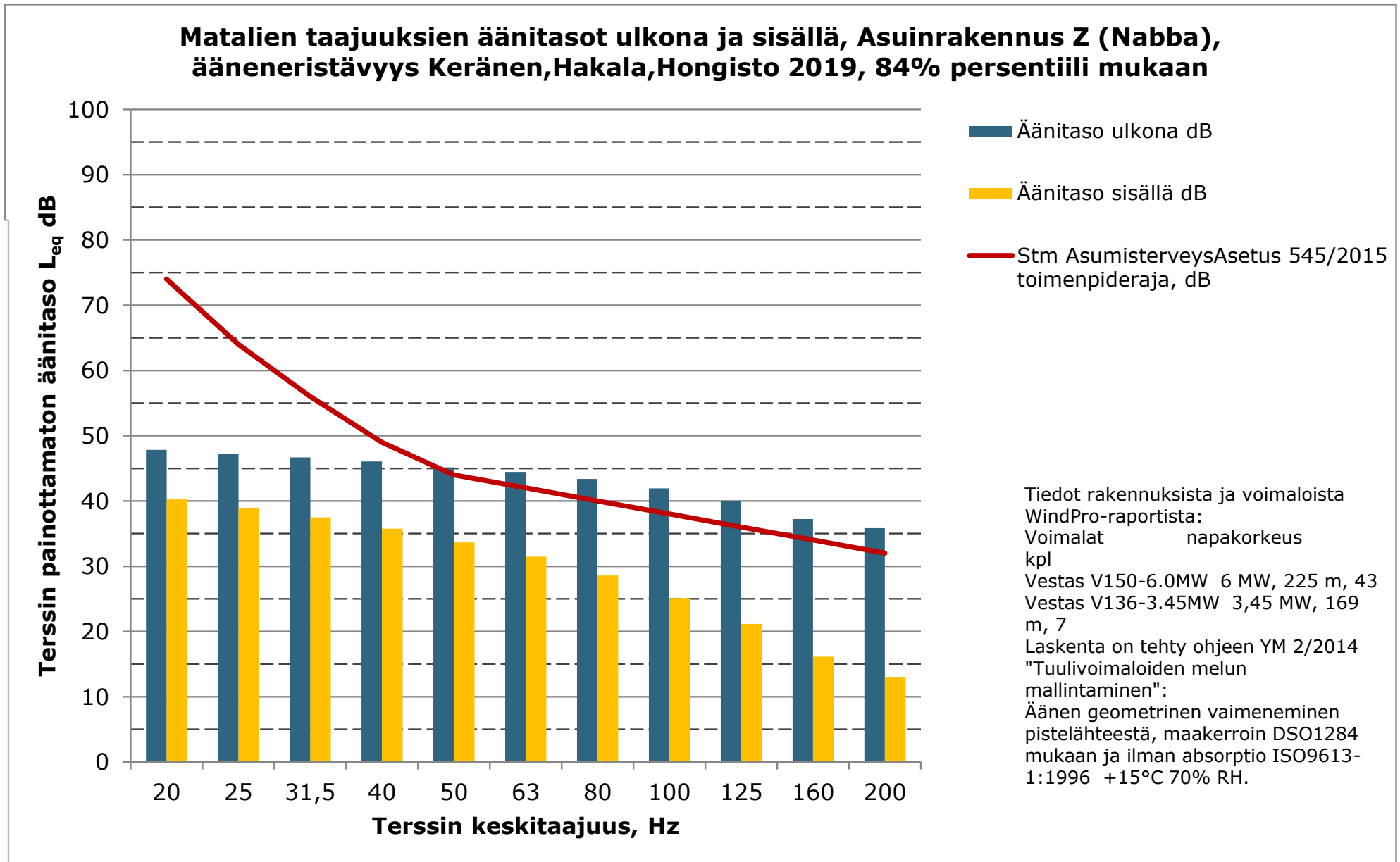








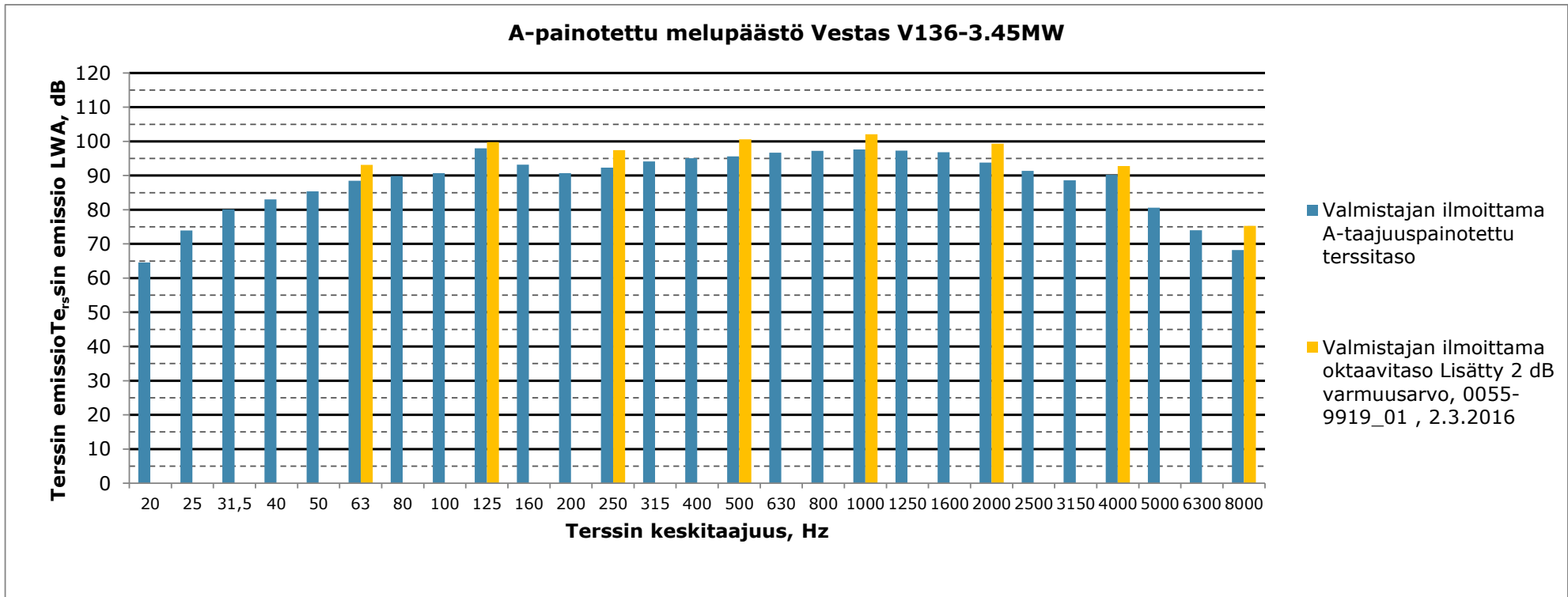


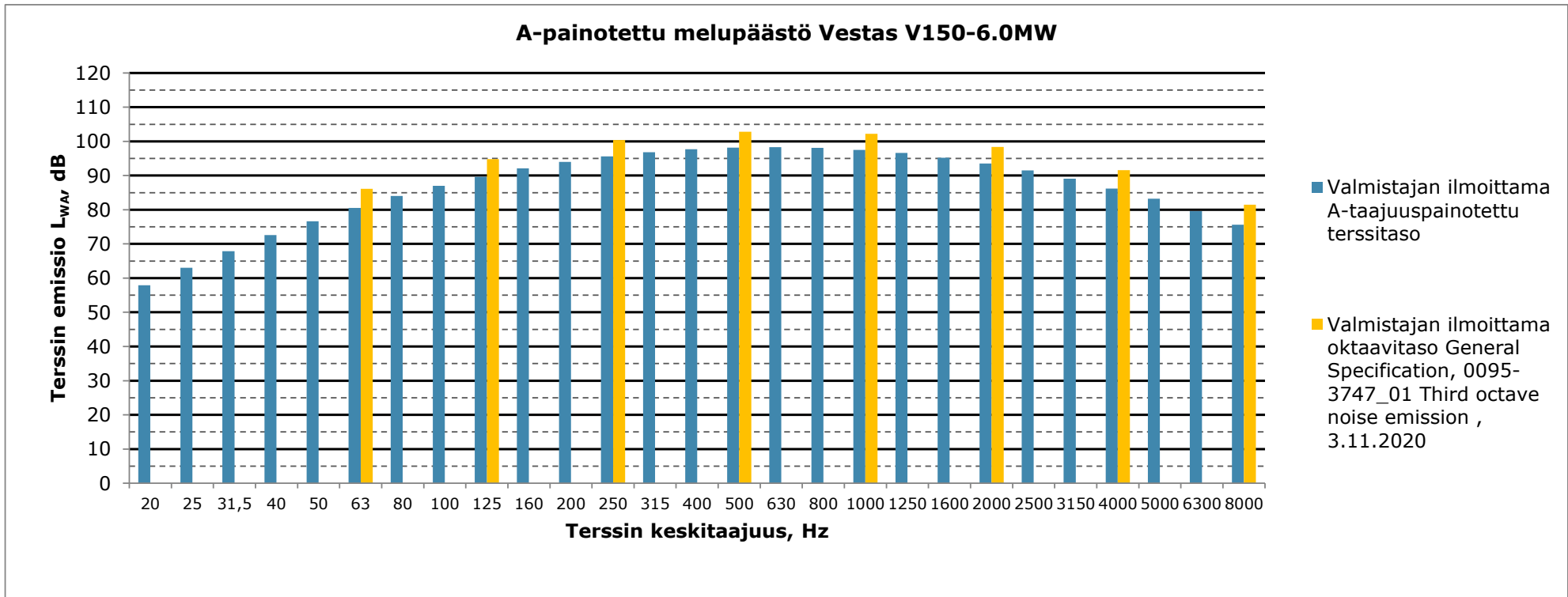


13.2.2023

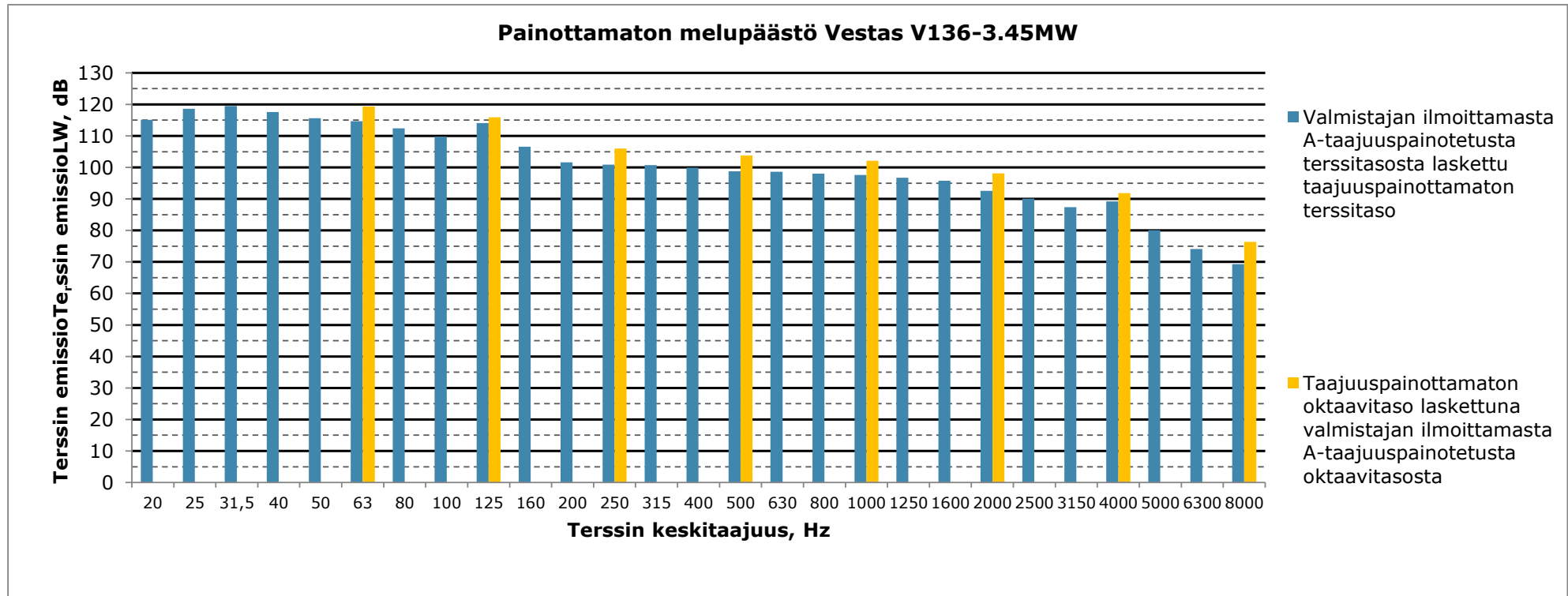
---

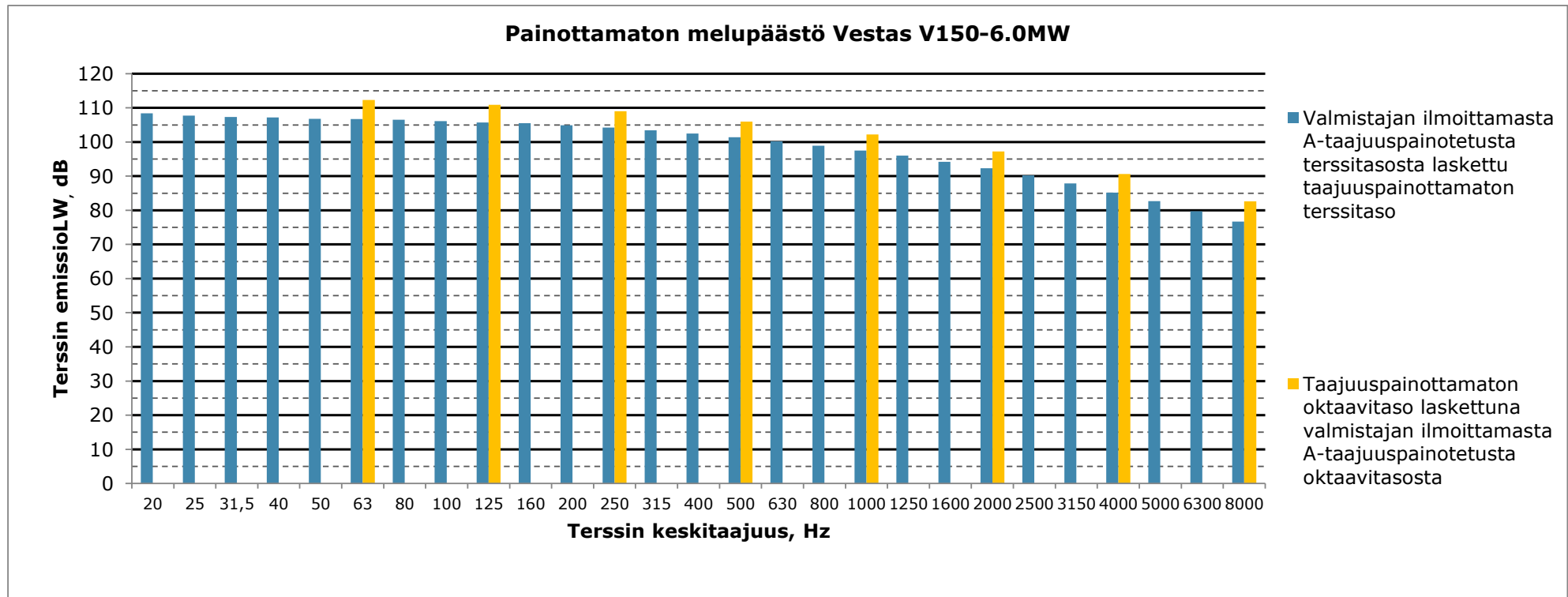
Liite 7. Purmon tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE2 V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.

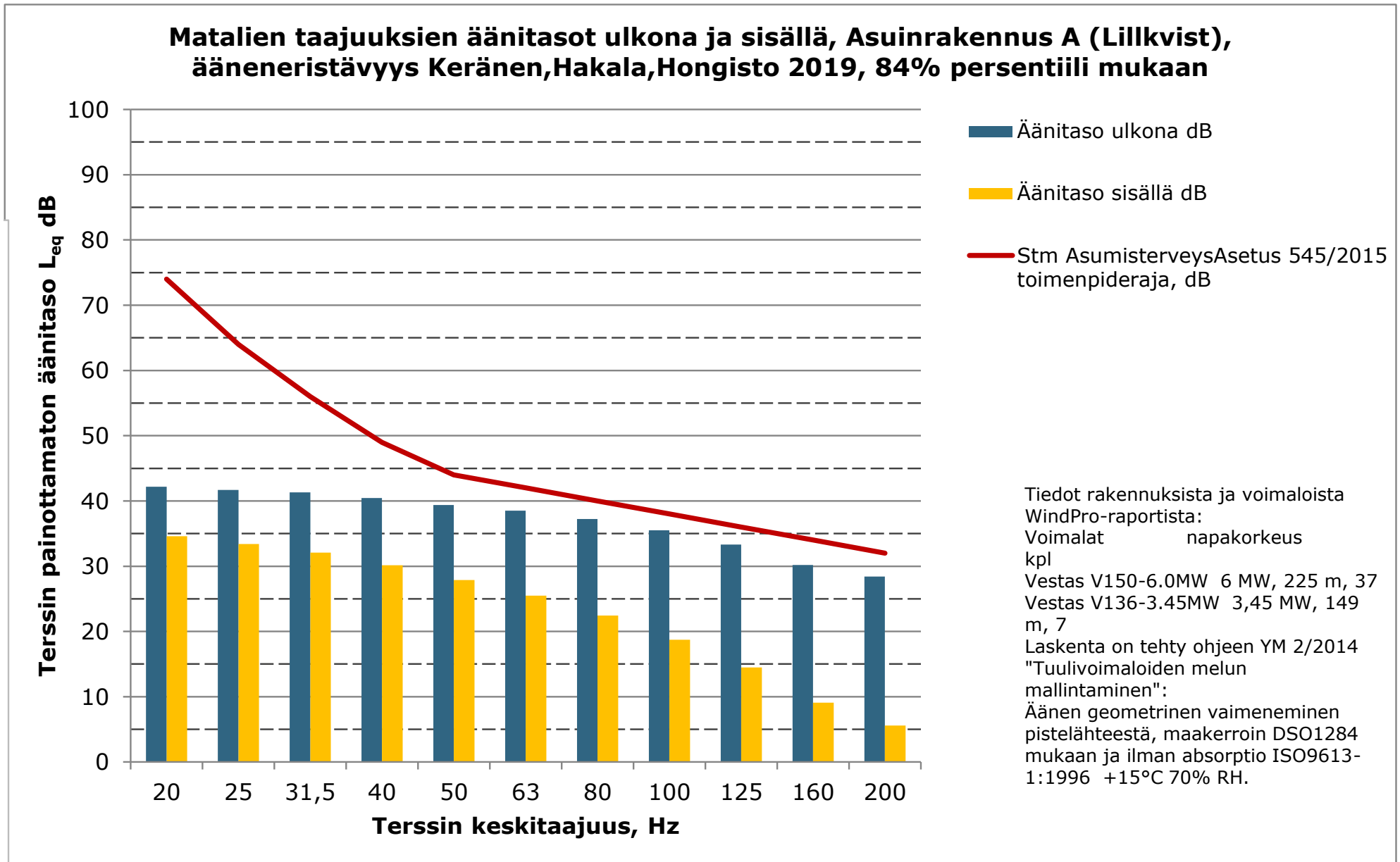




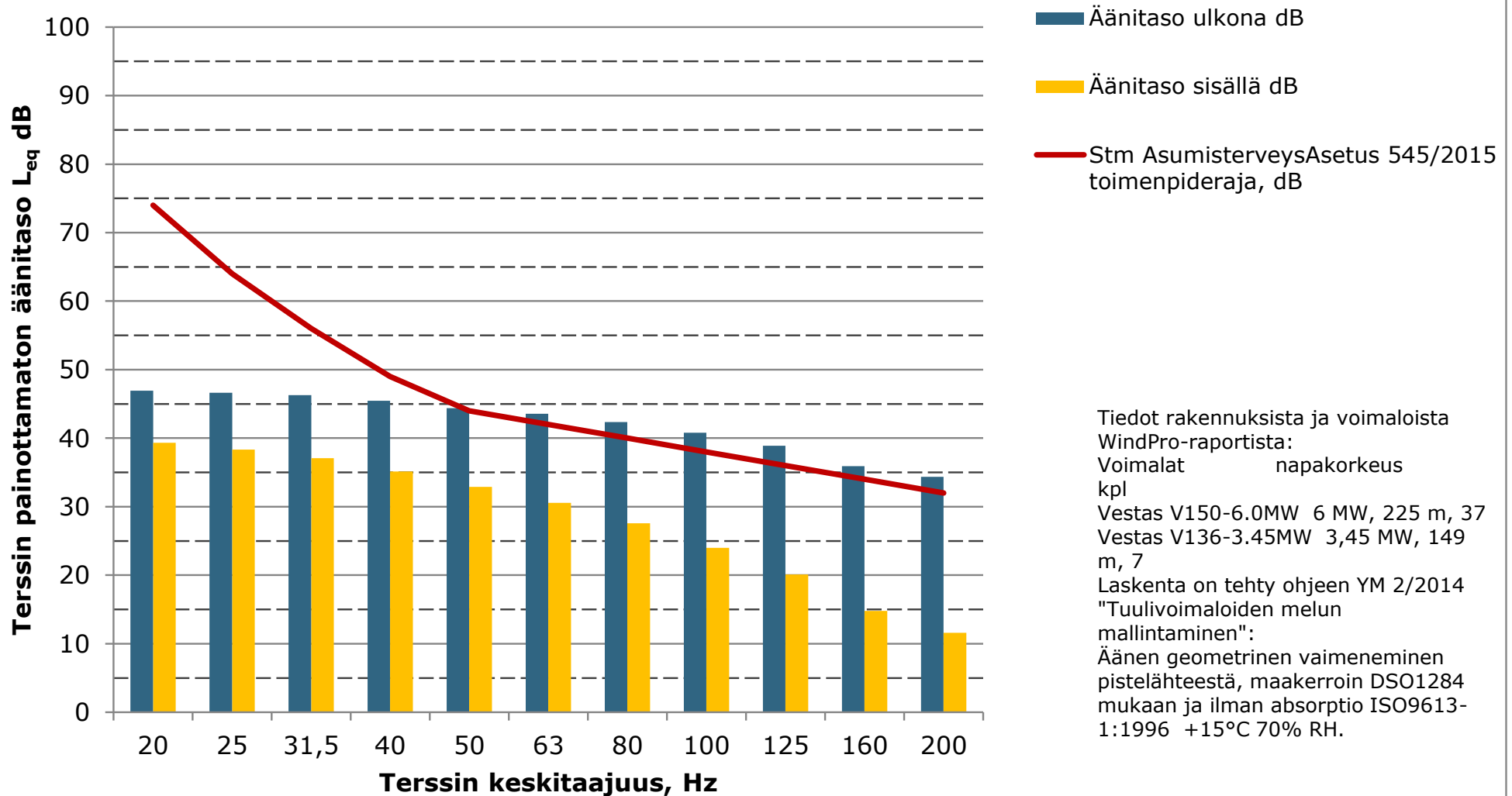


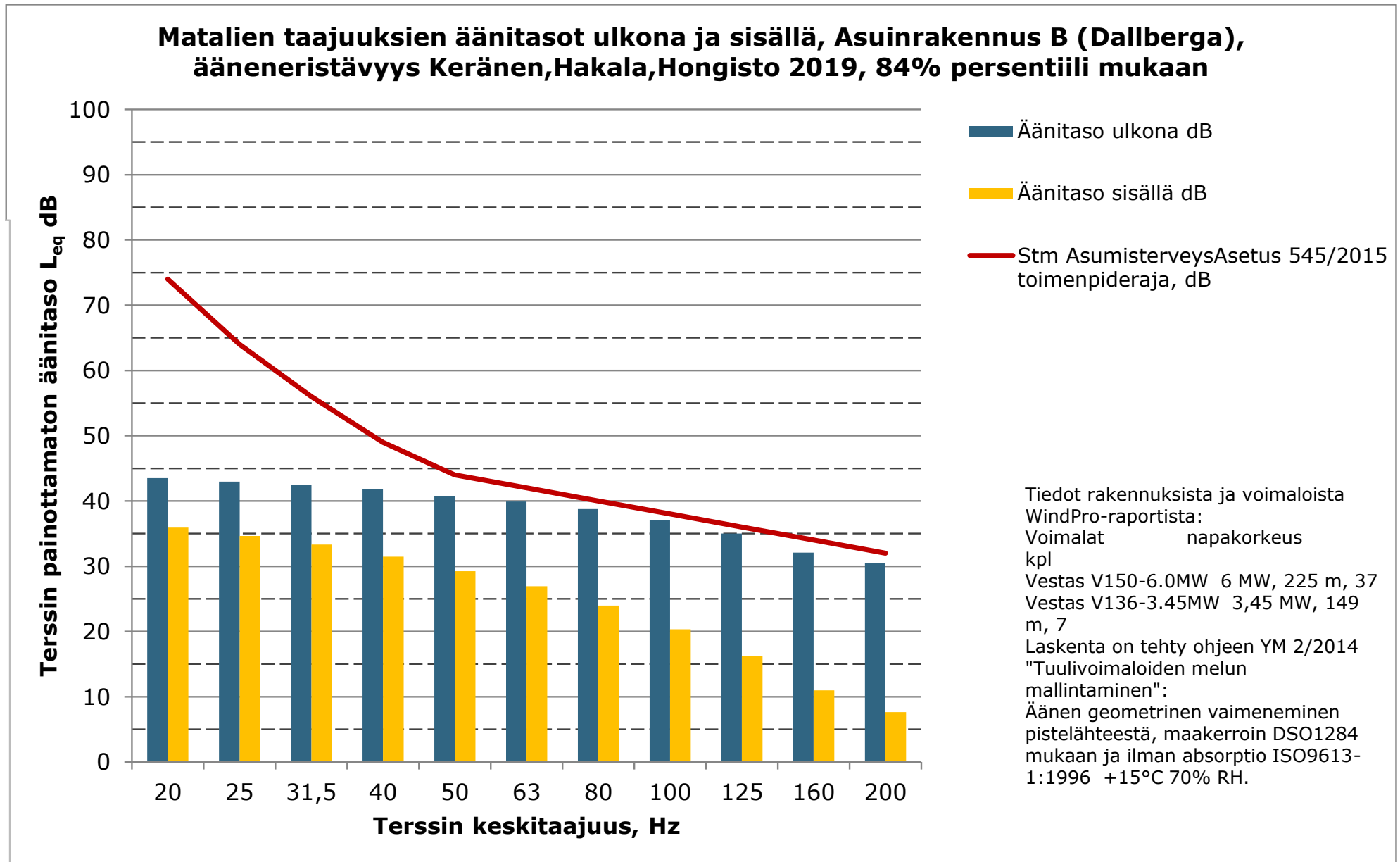




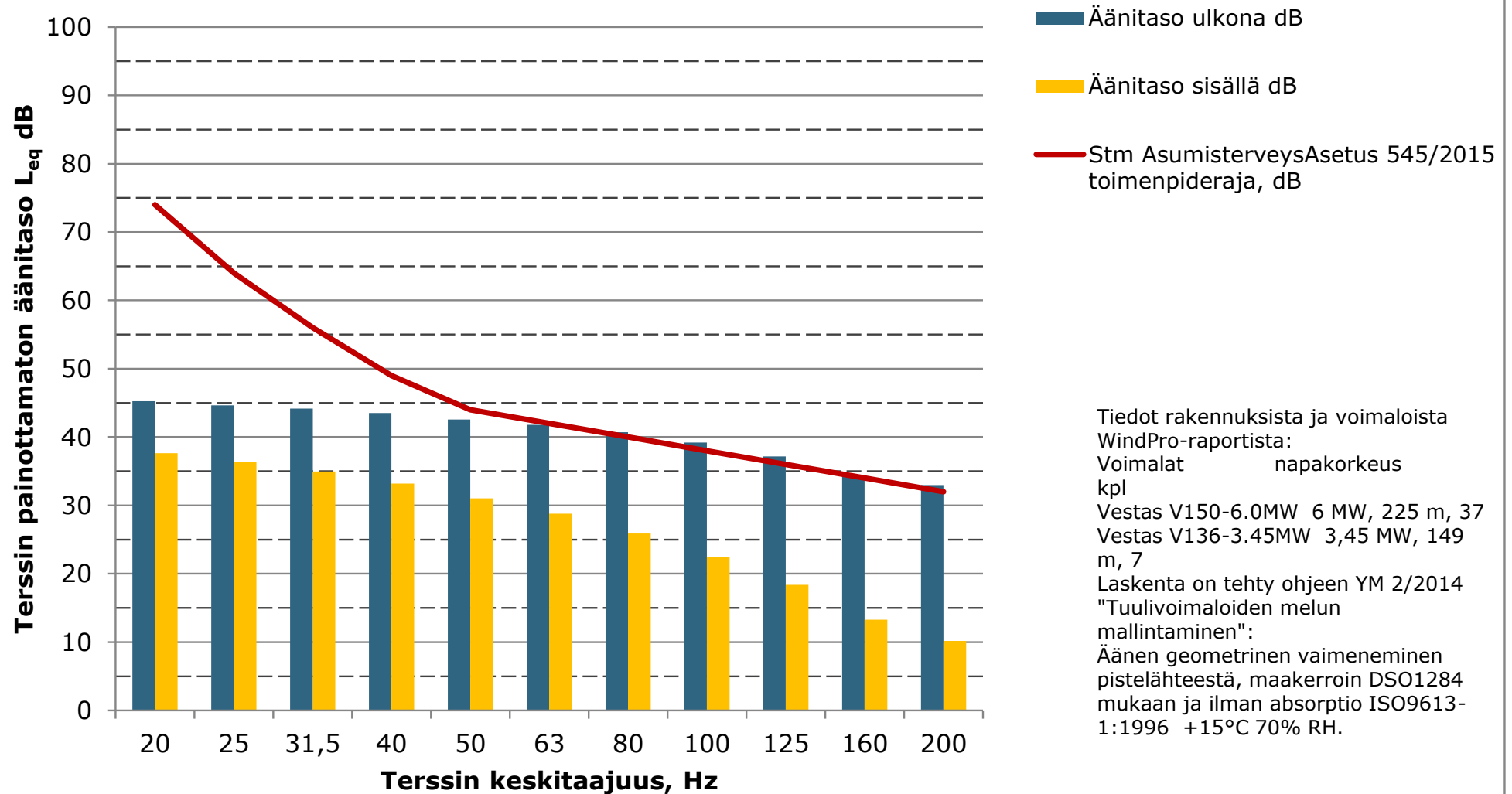


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus AA  
(Kronkvist), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

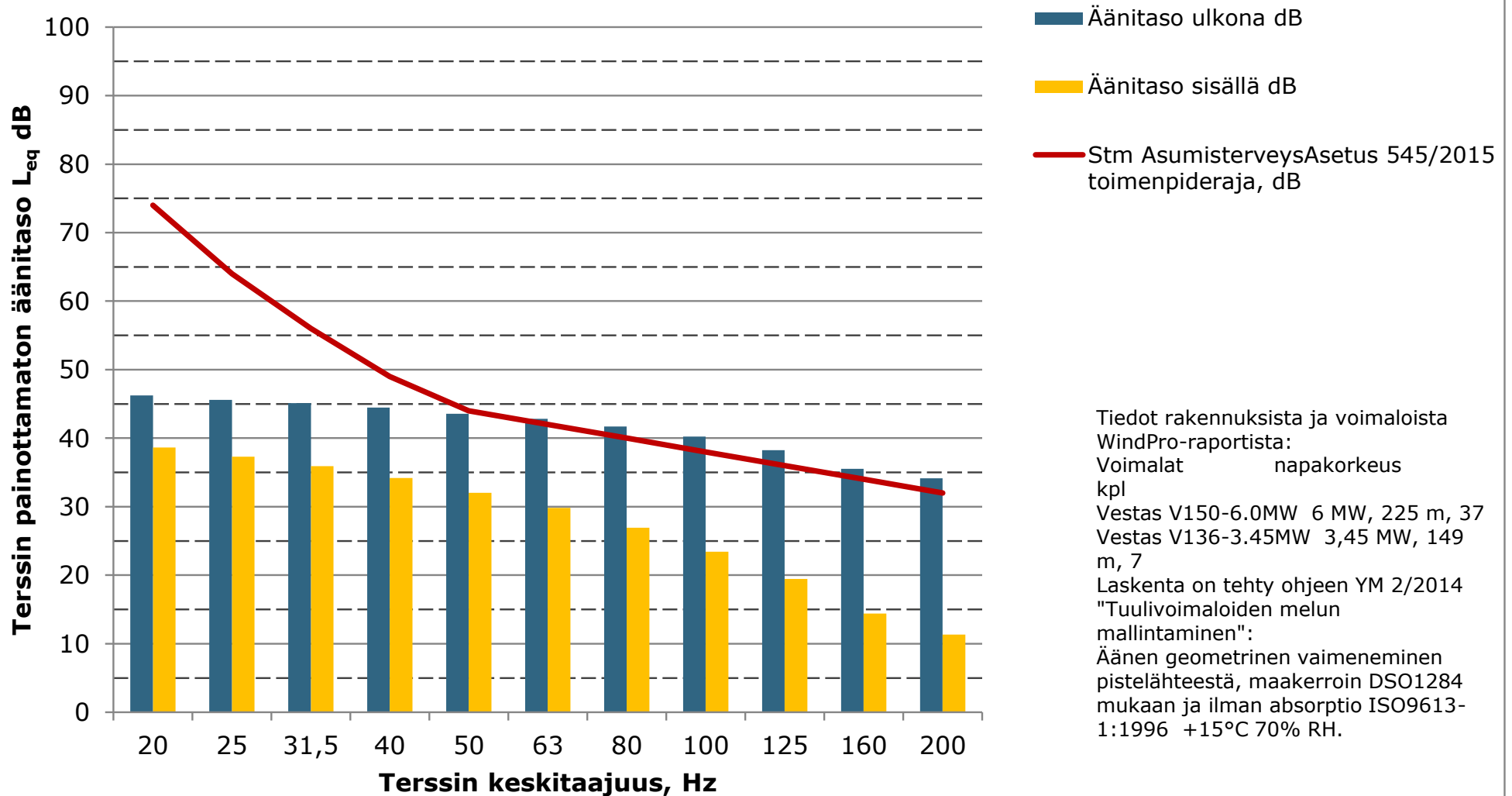




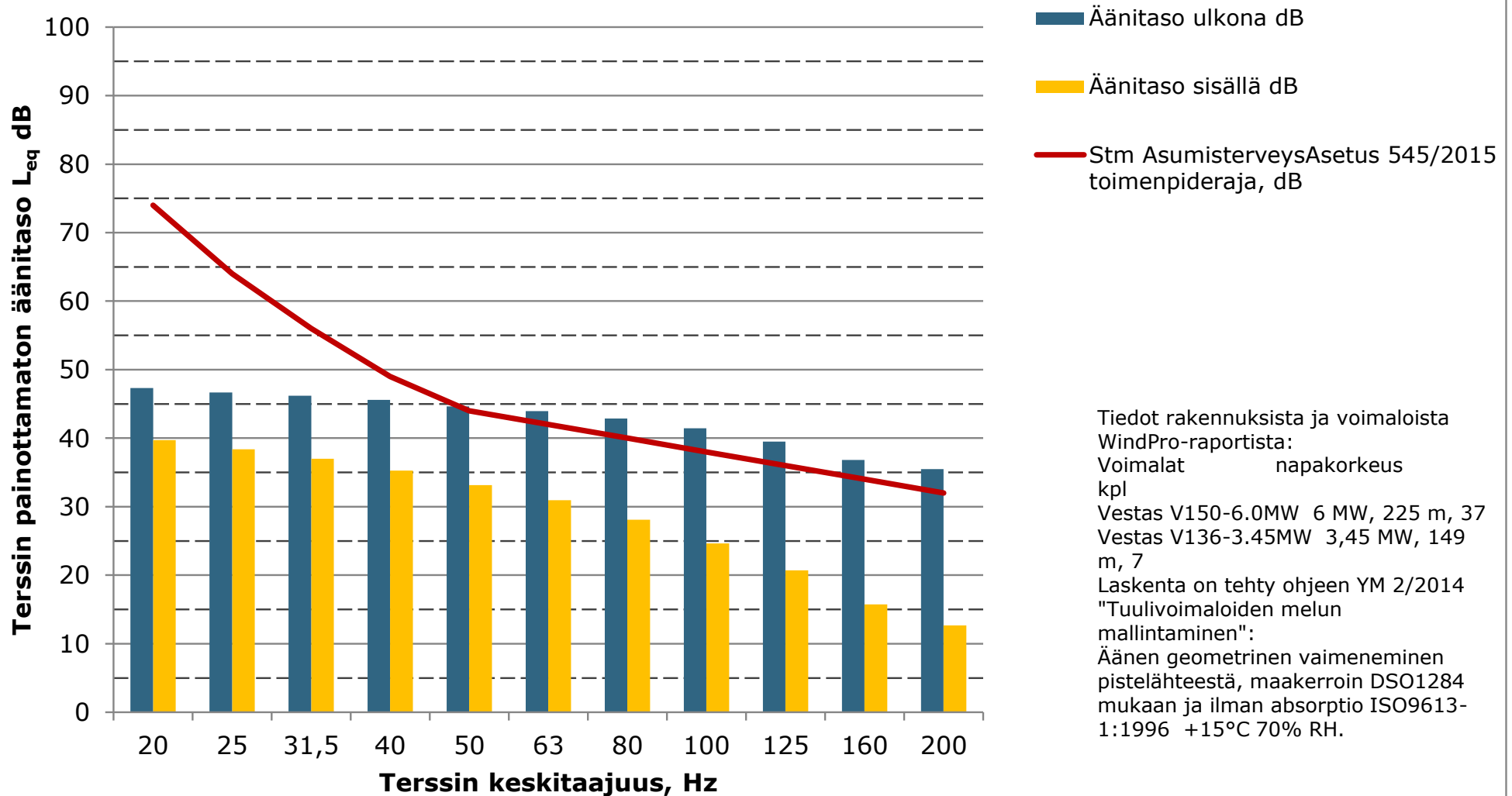
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Tormbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D  
(Kalltrdskvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

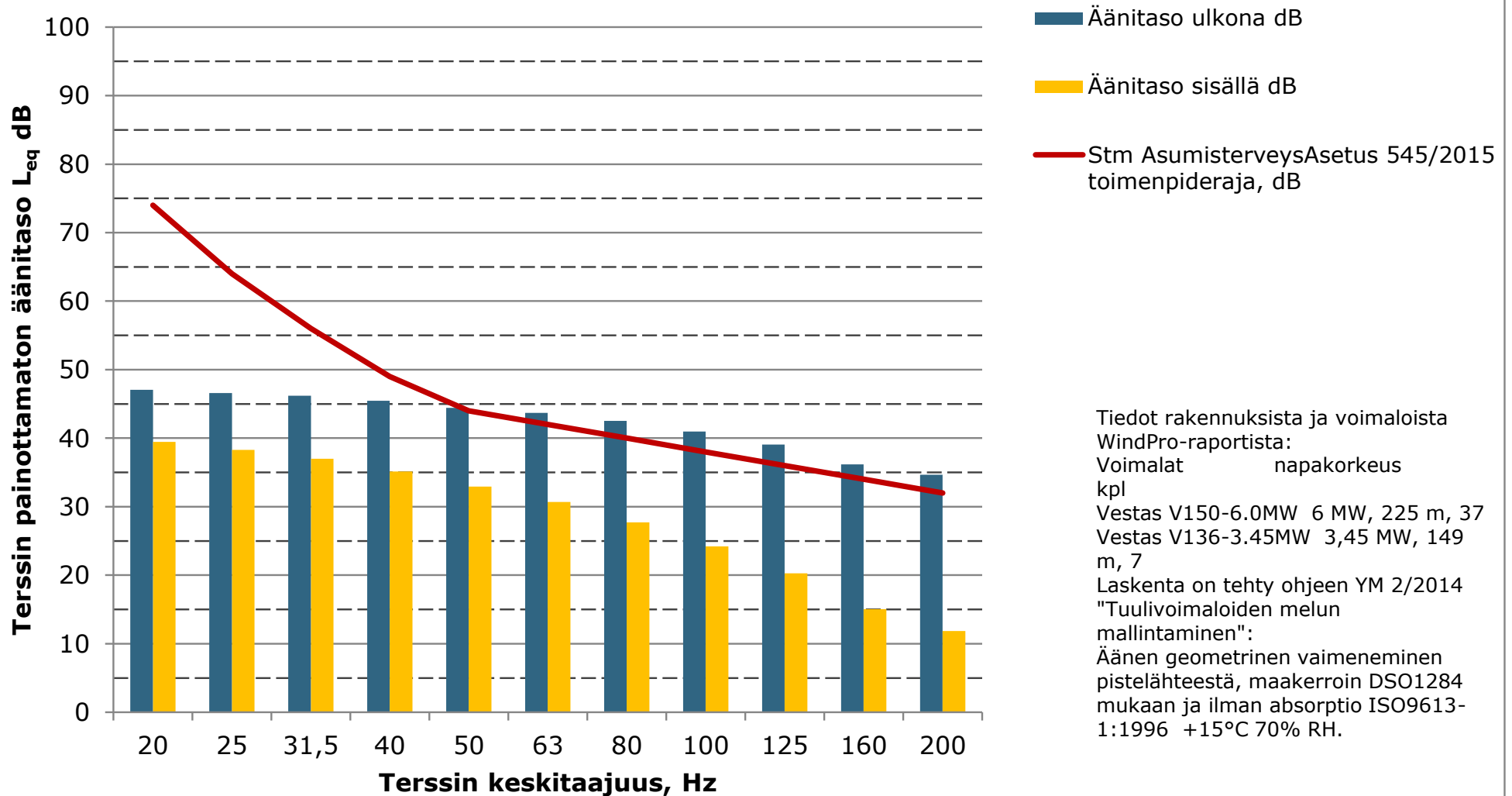


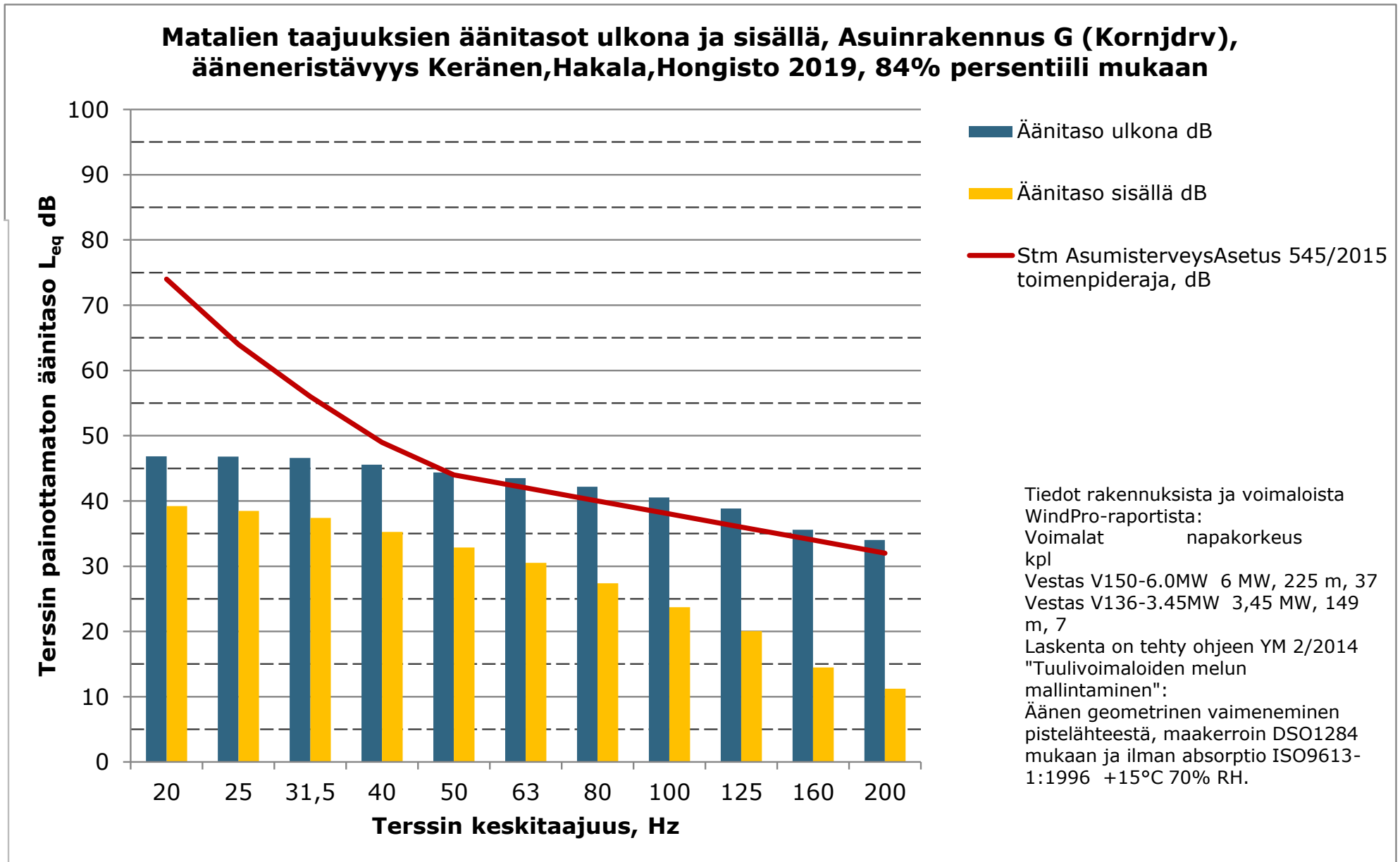
**Matalien taajuuksien äänitasot ulkona ja sisällä, Metsästysmaja E  
(Kejsarbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**



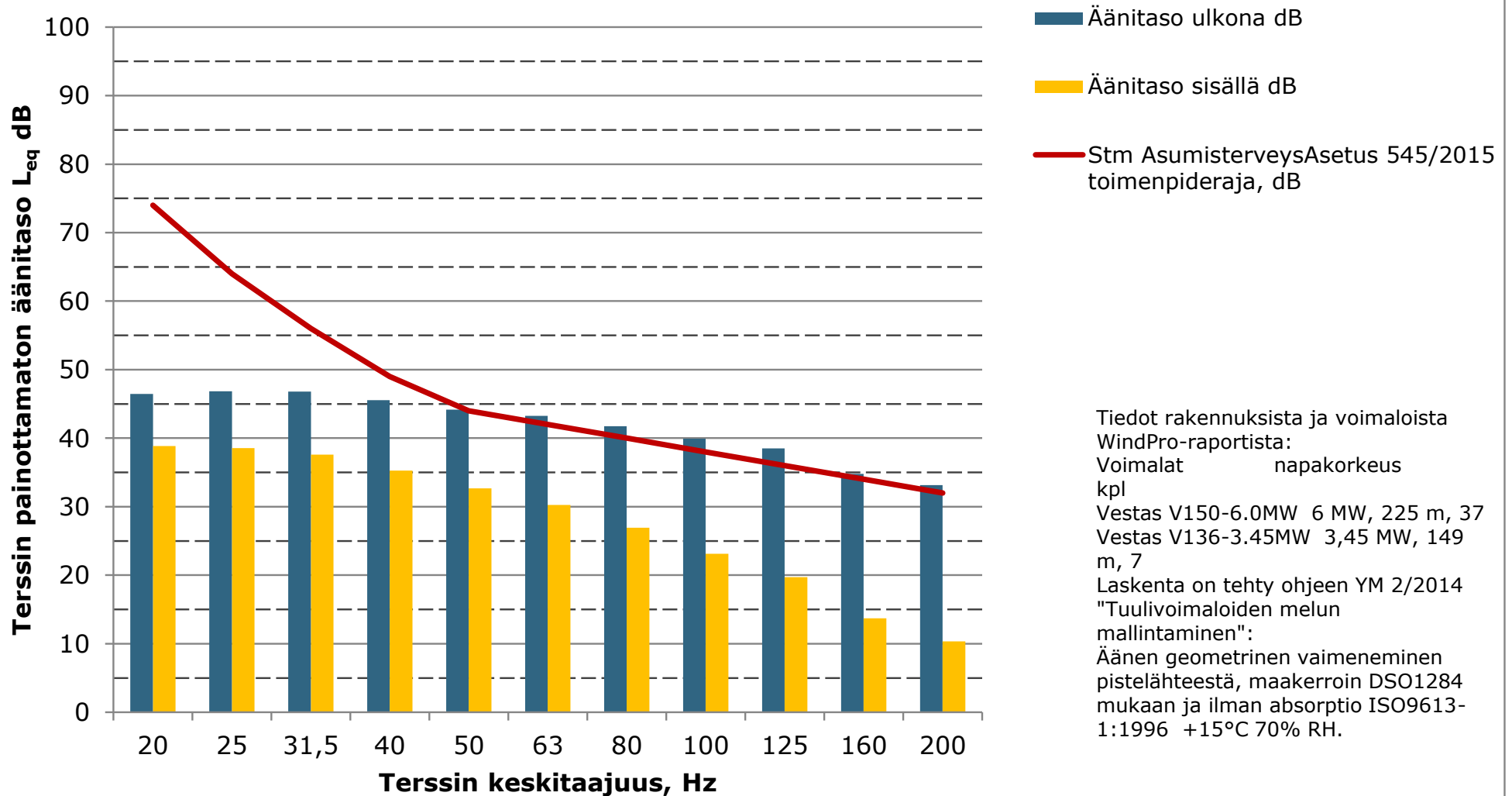


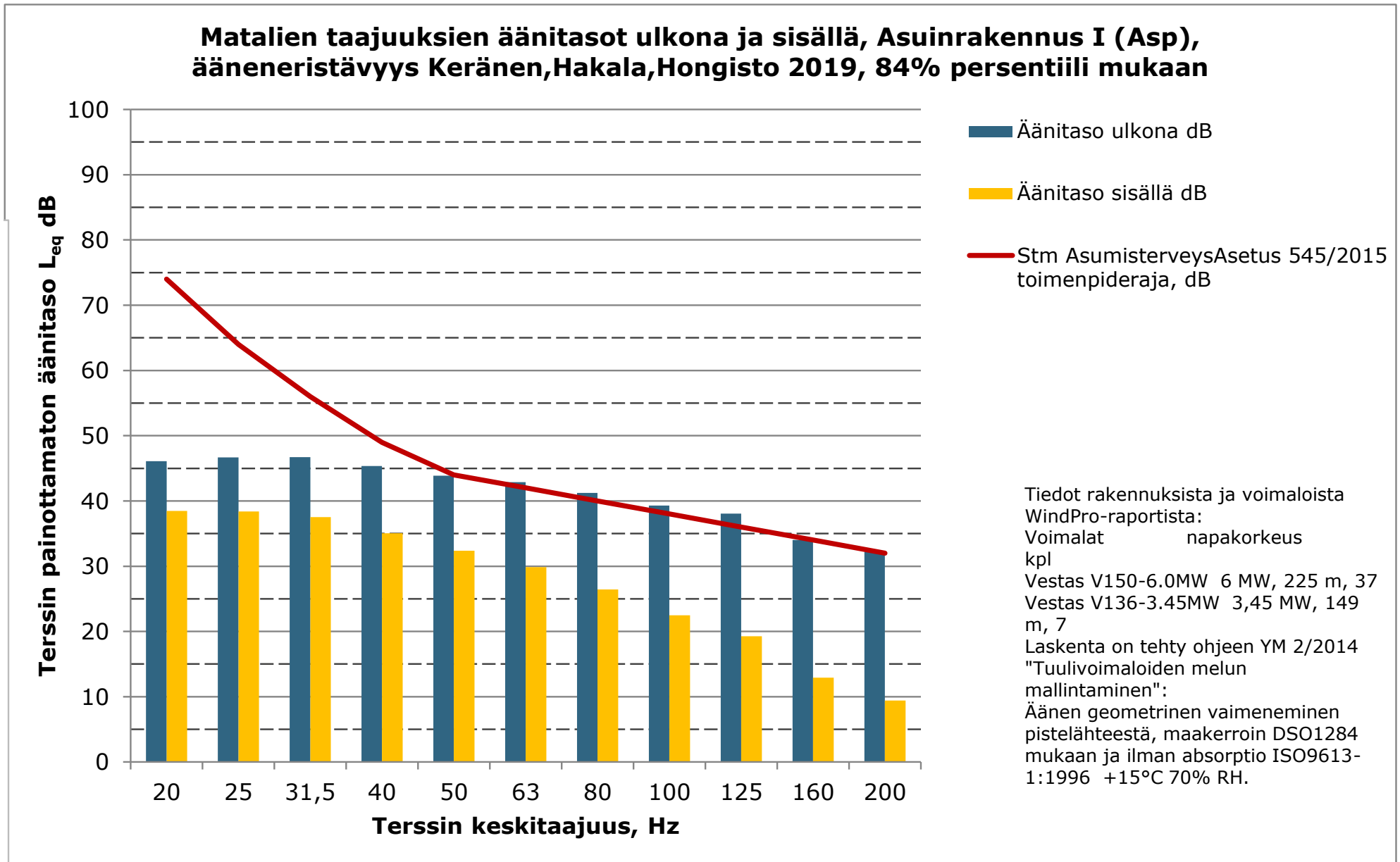
### Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus F (Kdillbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan

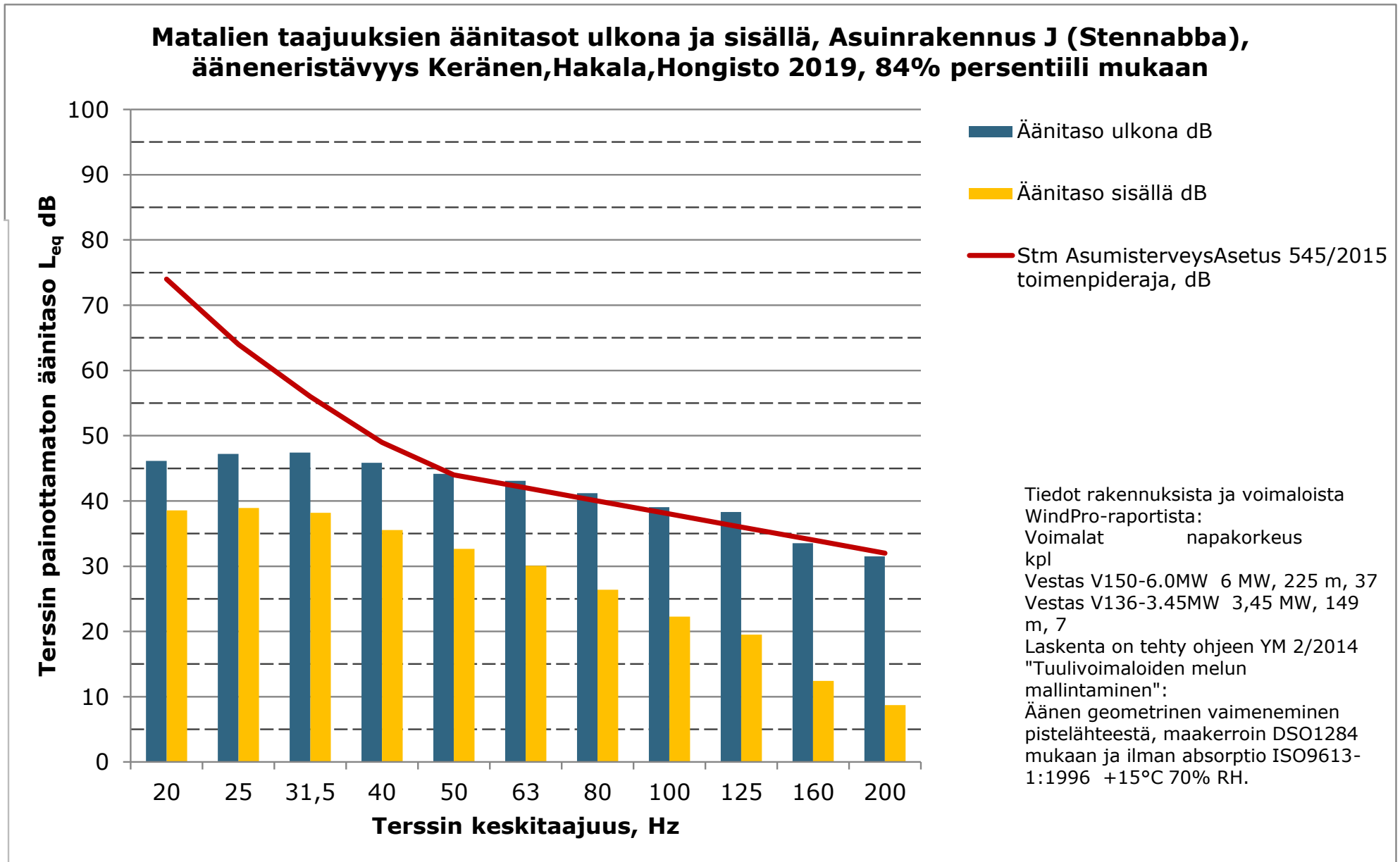




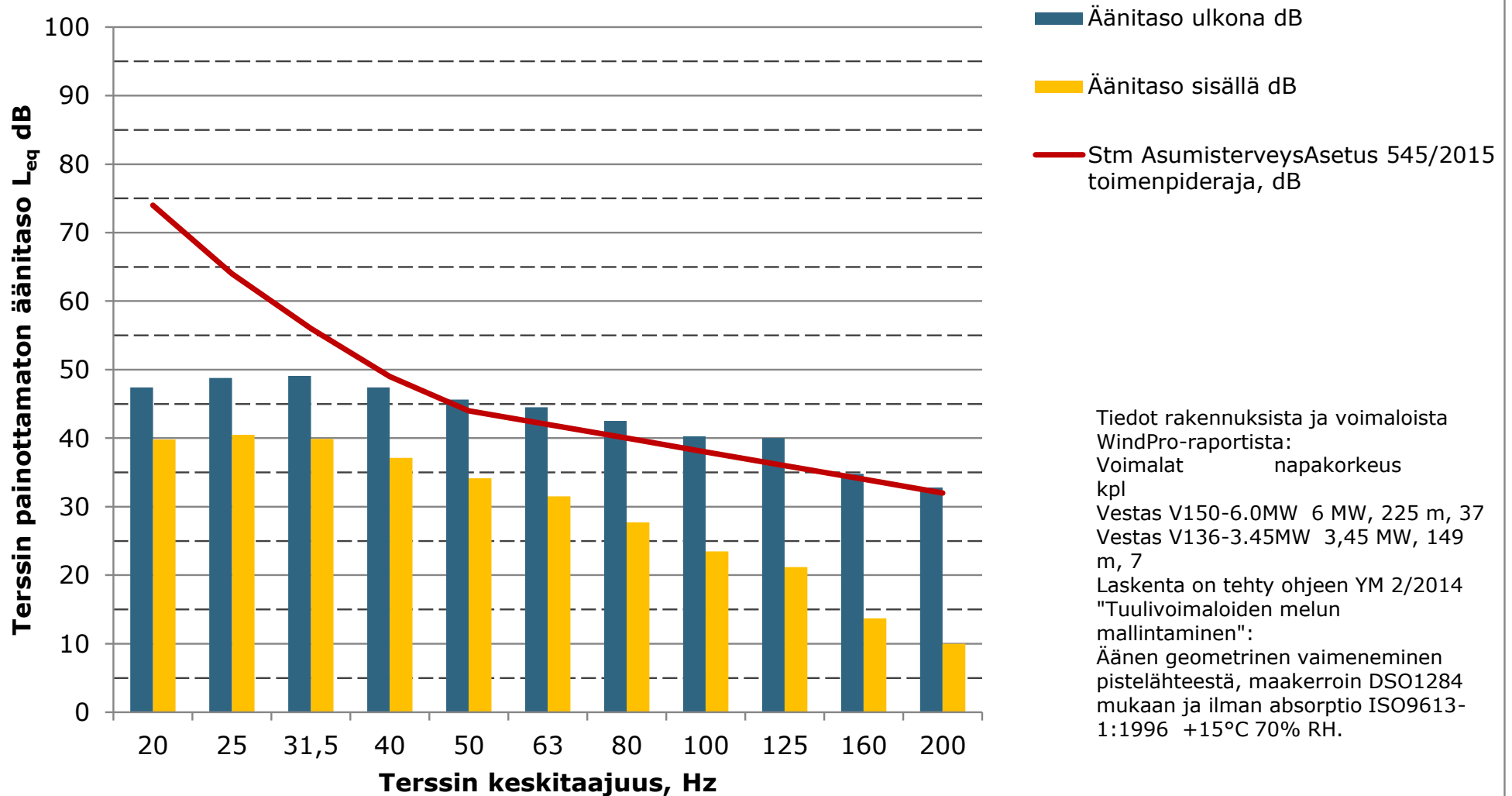
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Sandnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



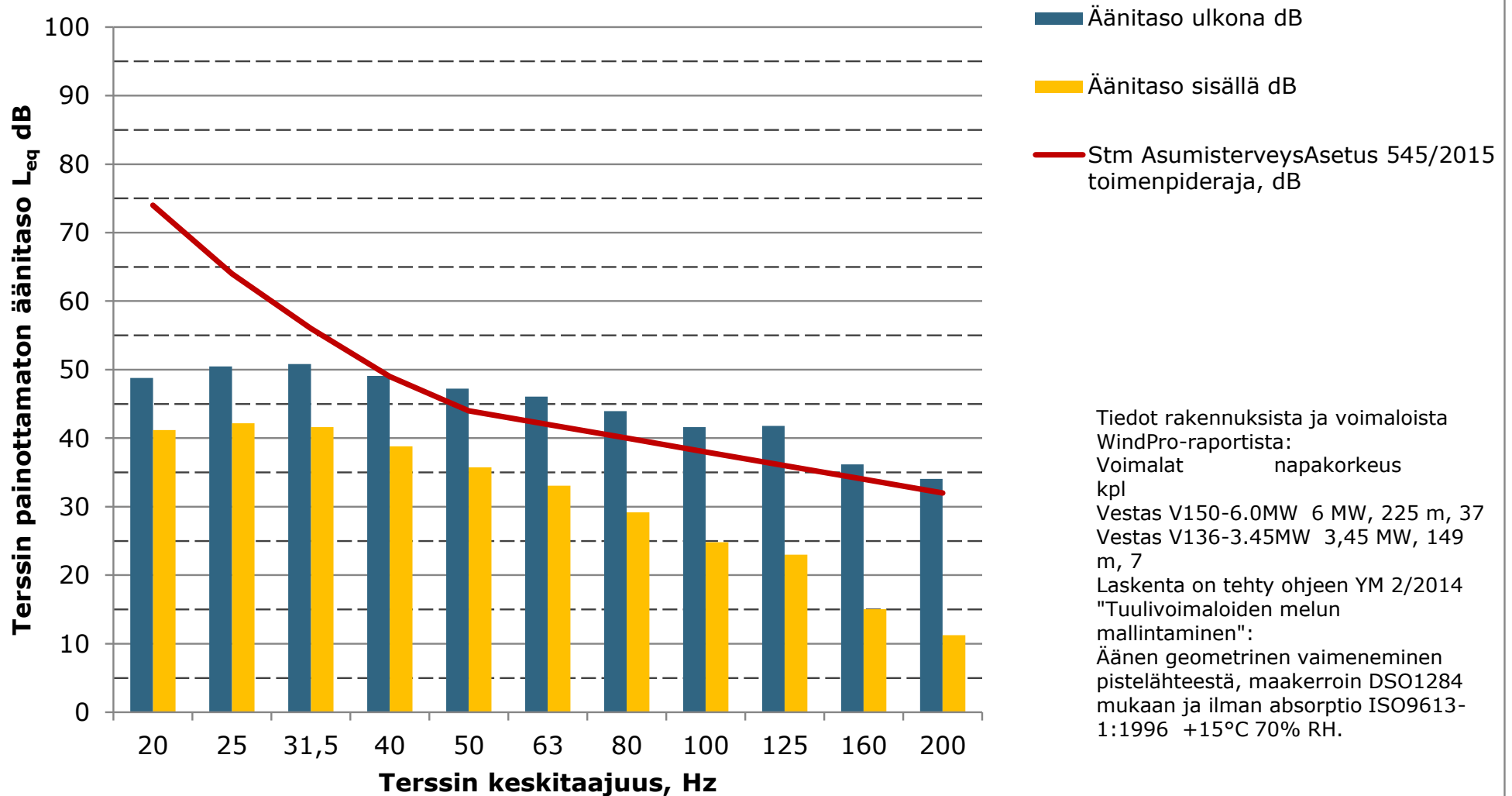




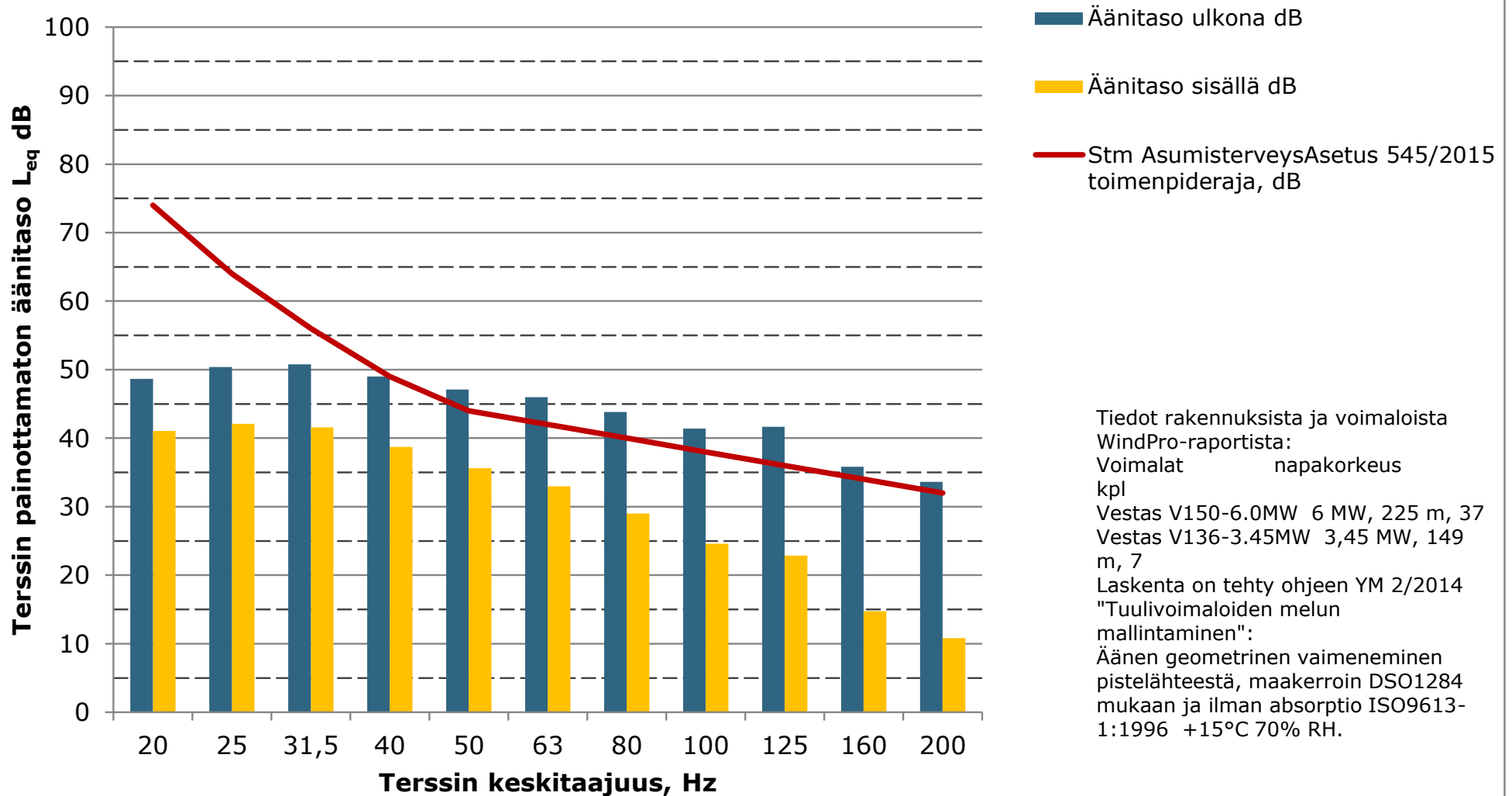
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Lengnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



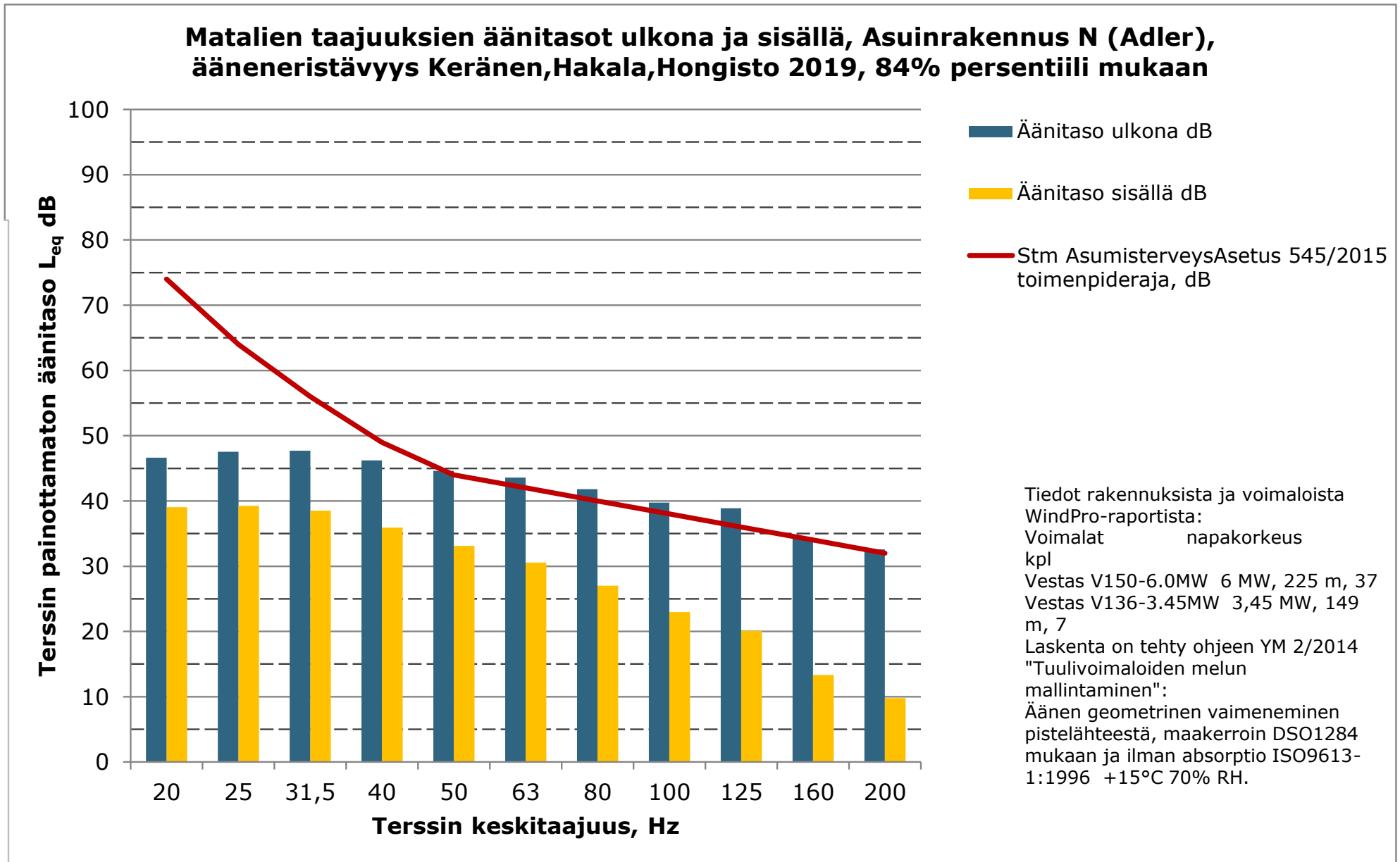
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus L  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**



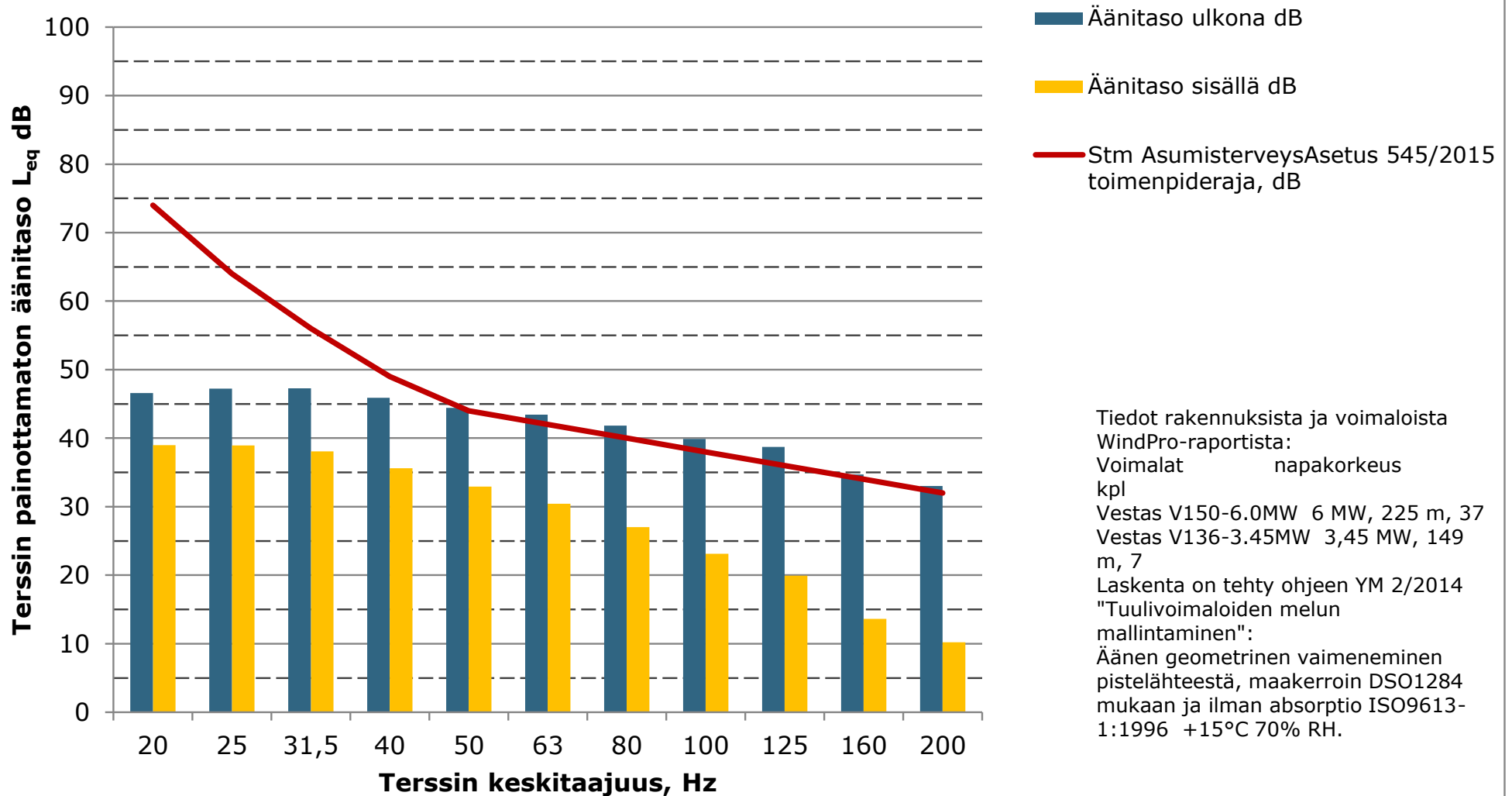
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M (Stenbacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persenttiili mukaan



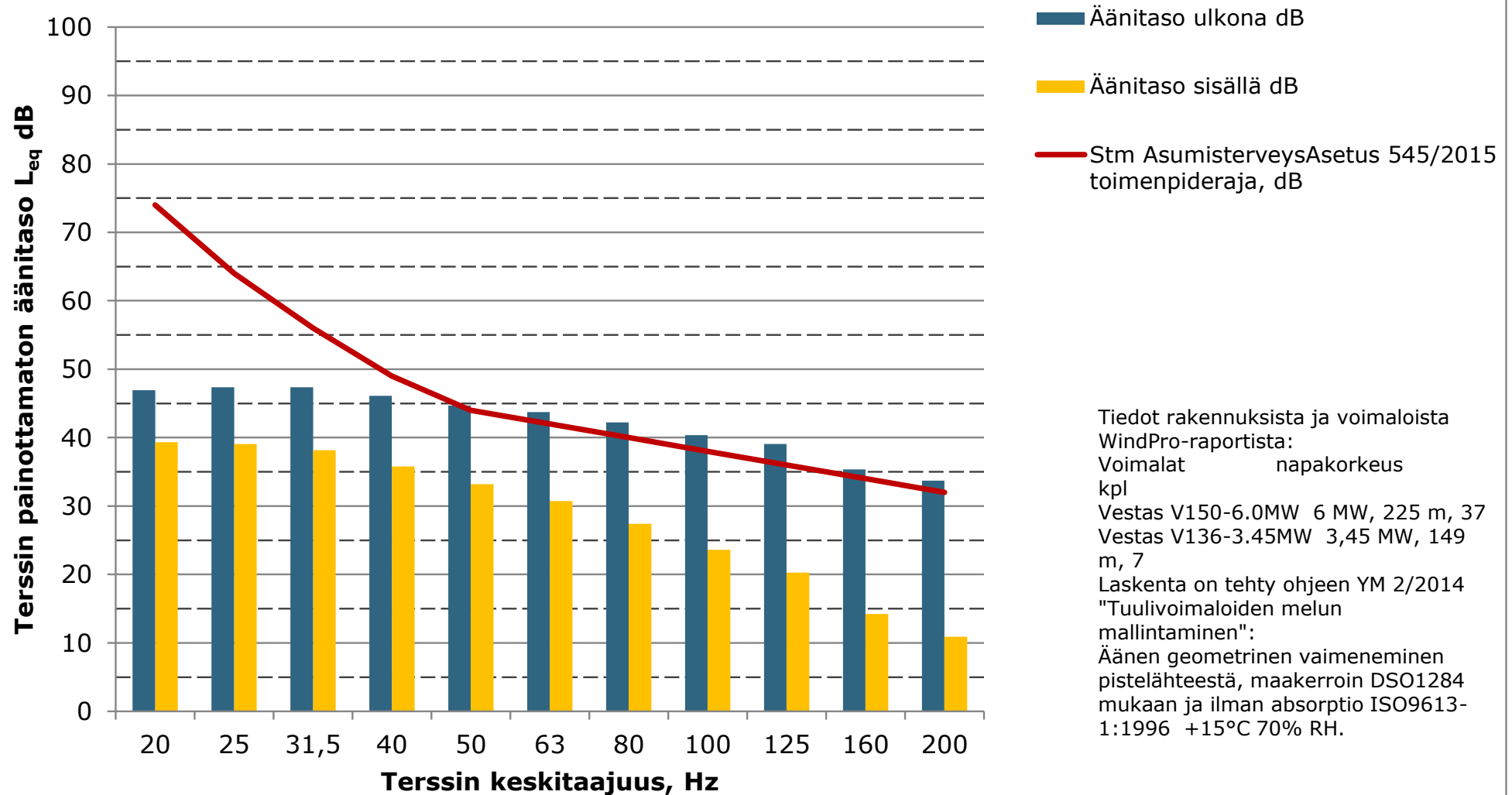




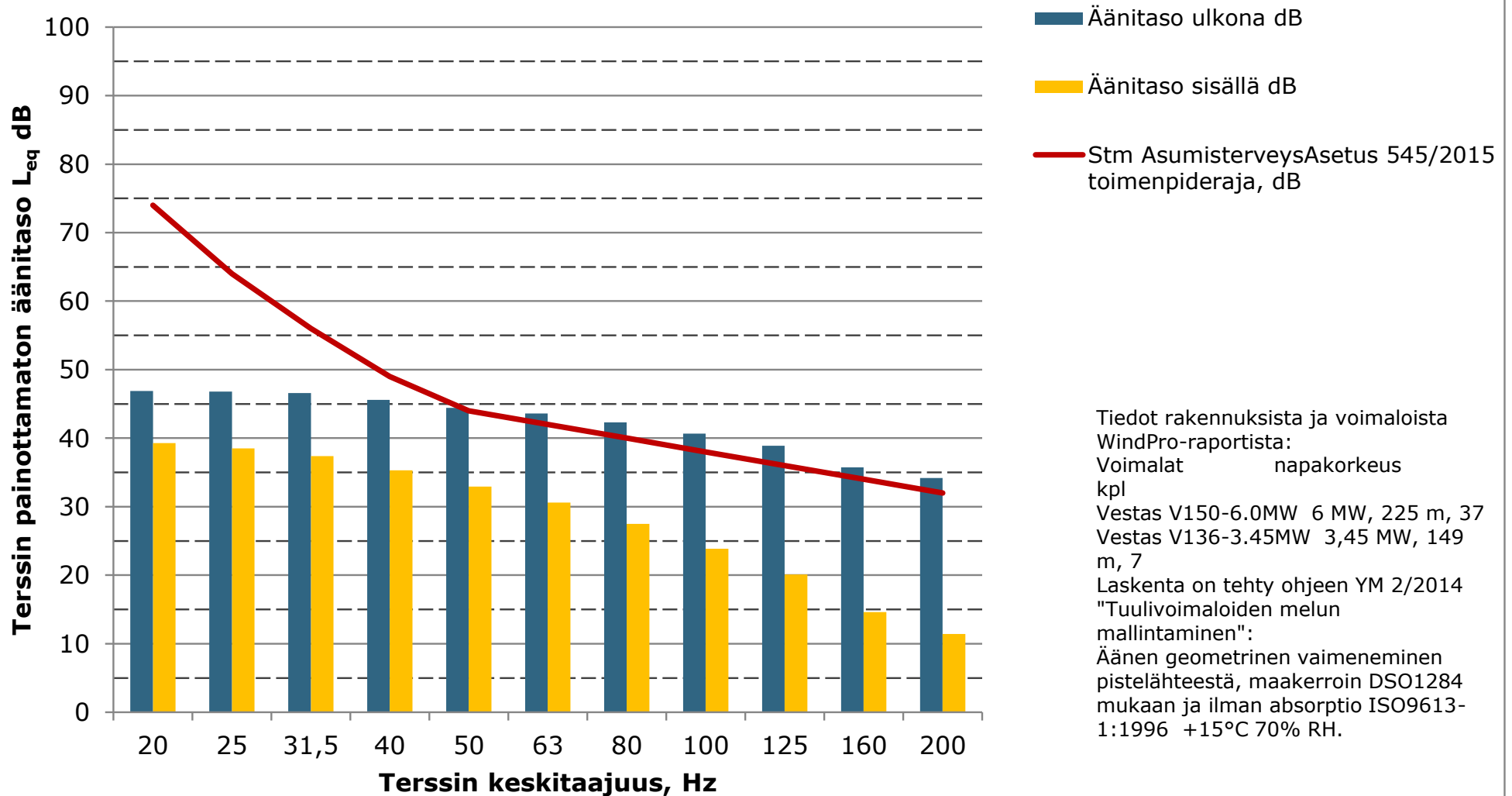
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

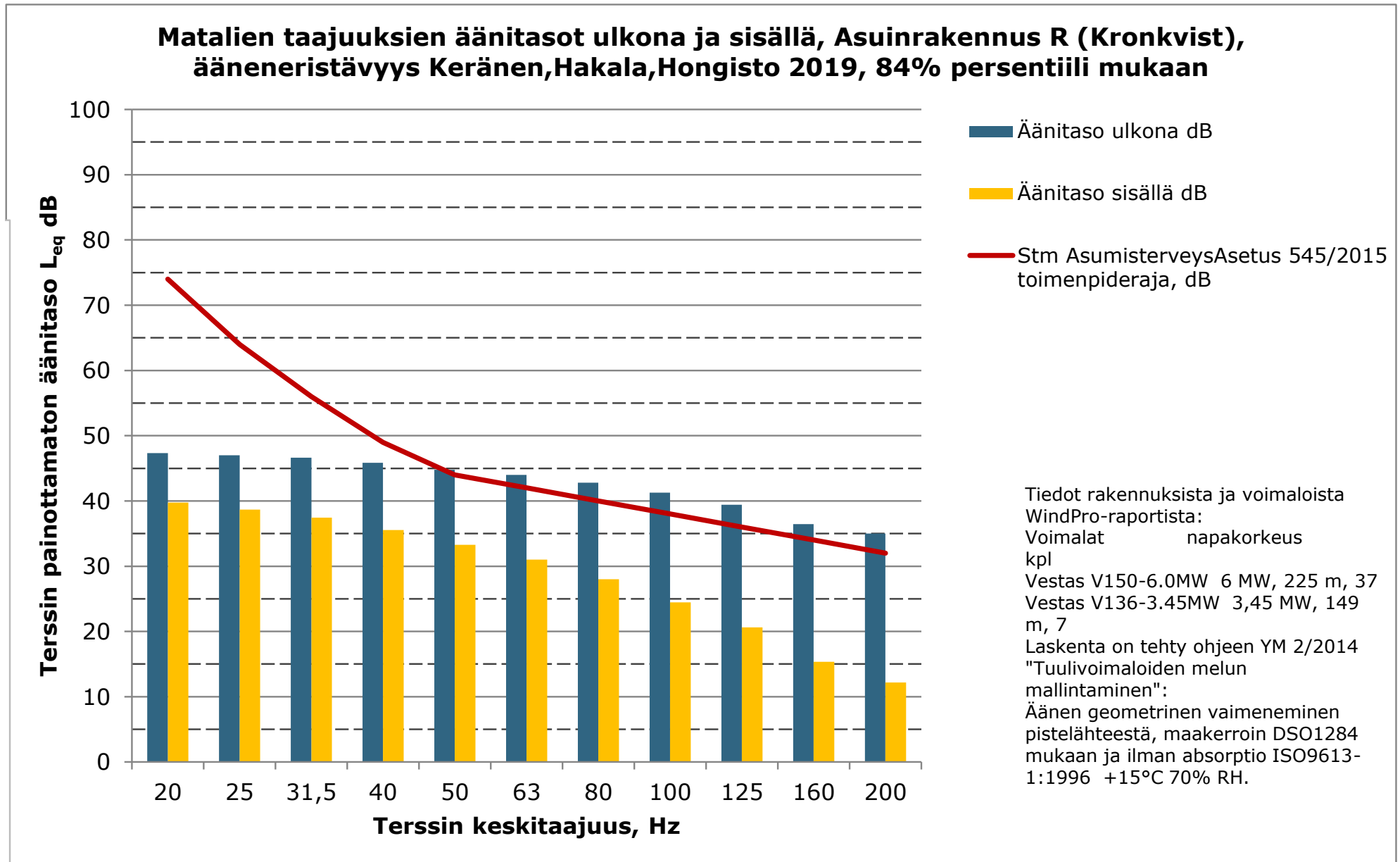


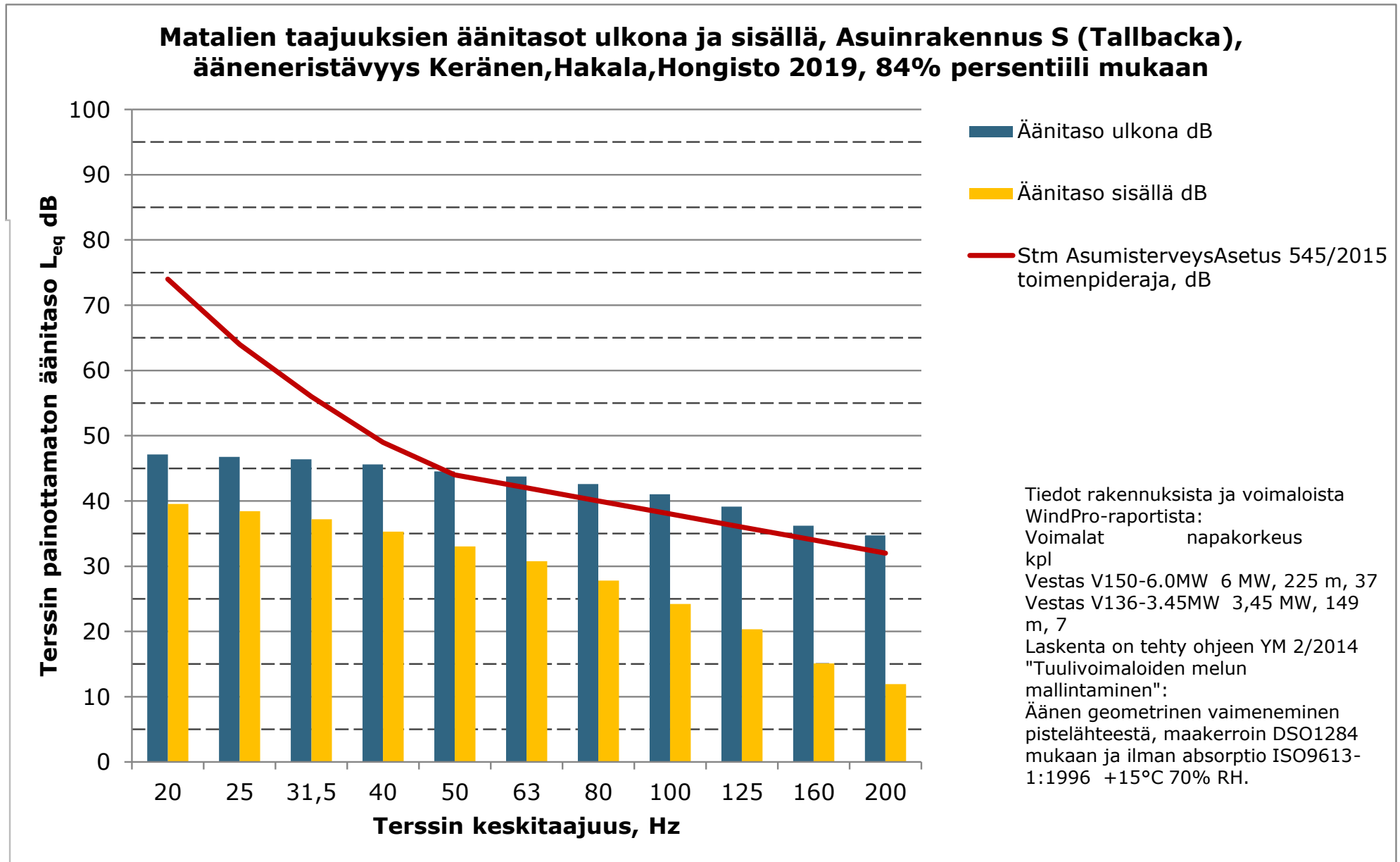
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Finnabbavdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

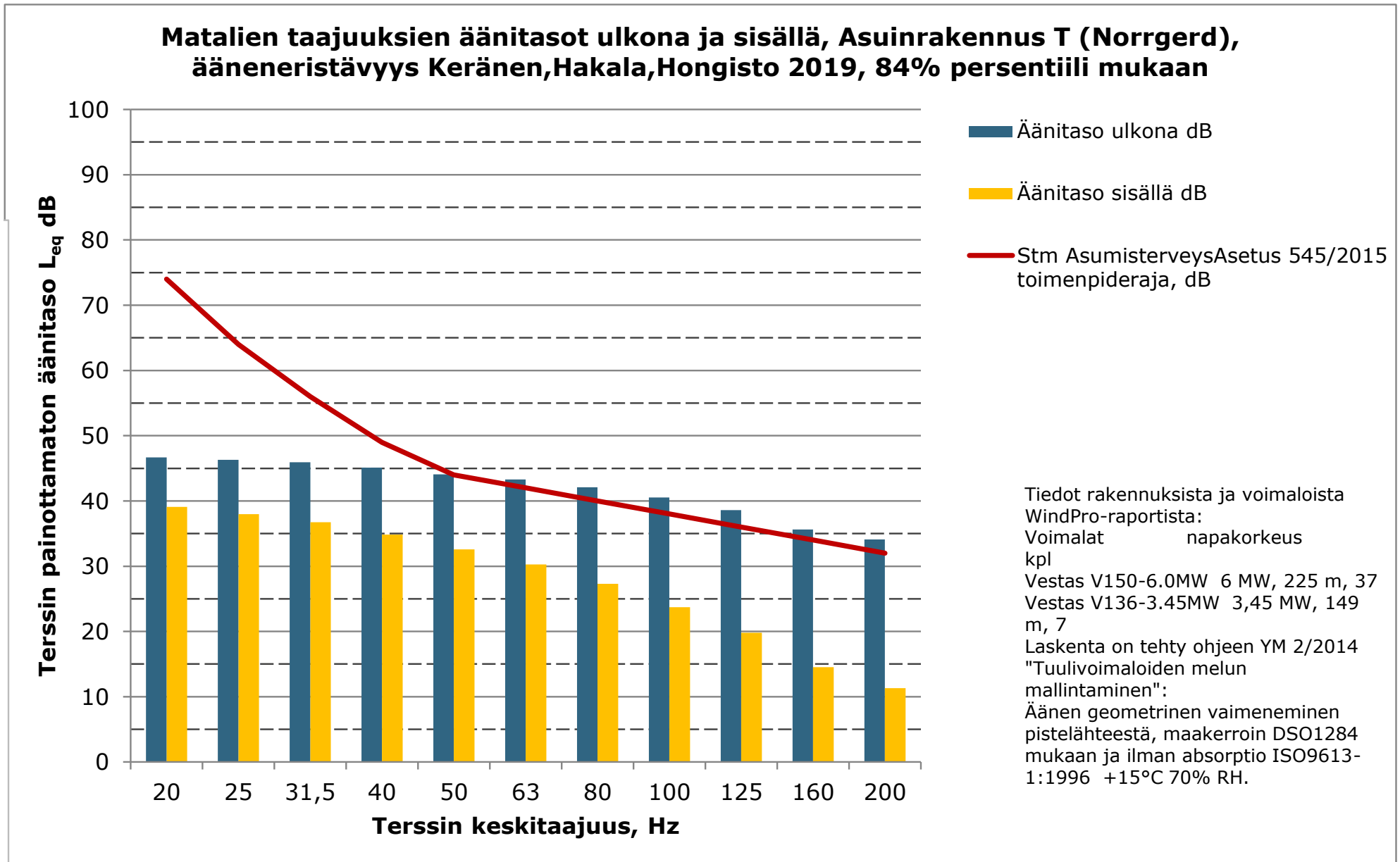


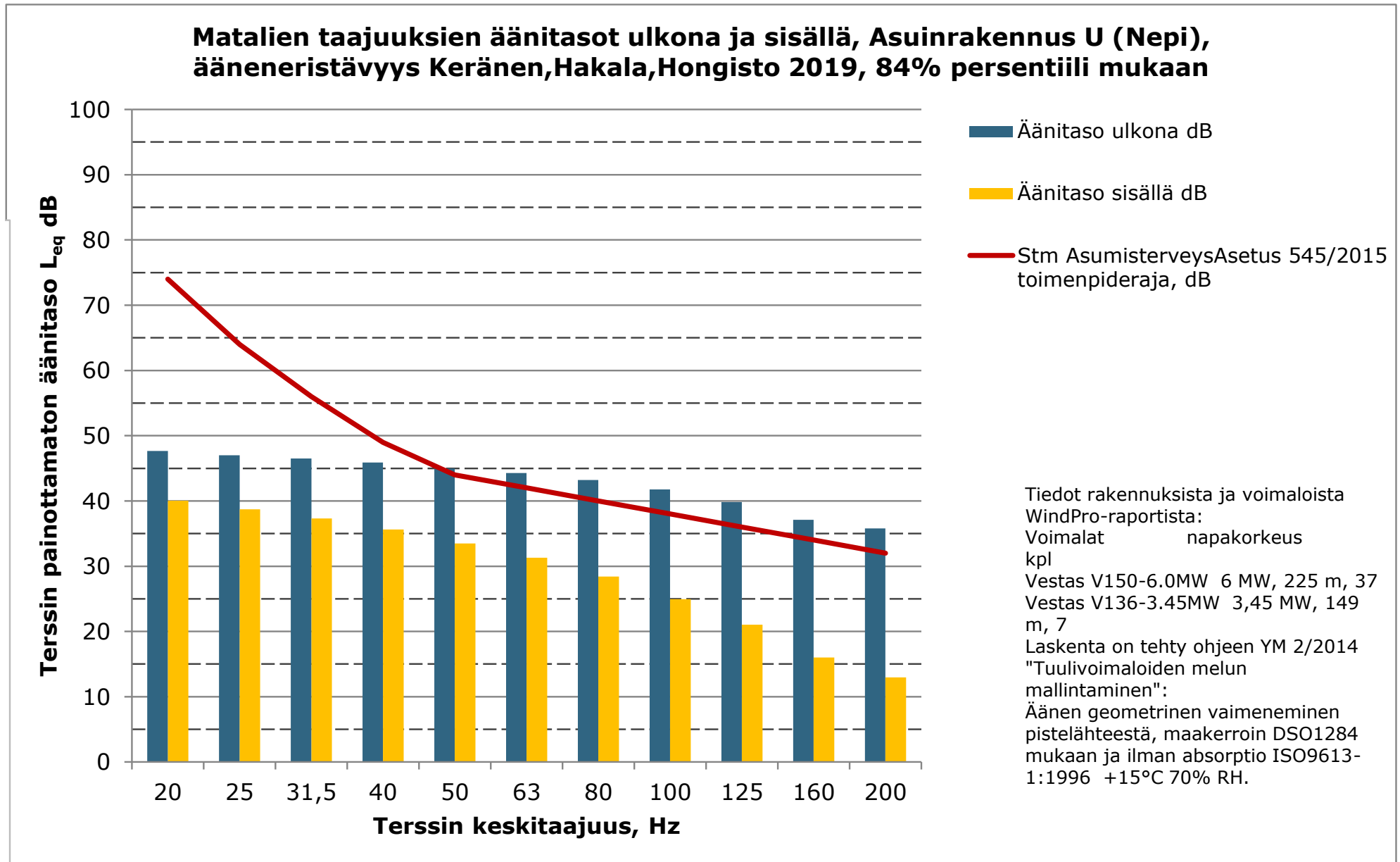
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q  
(Dalabacka), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persenttiili  
mukaan**



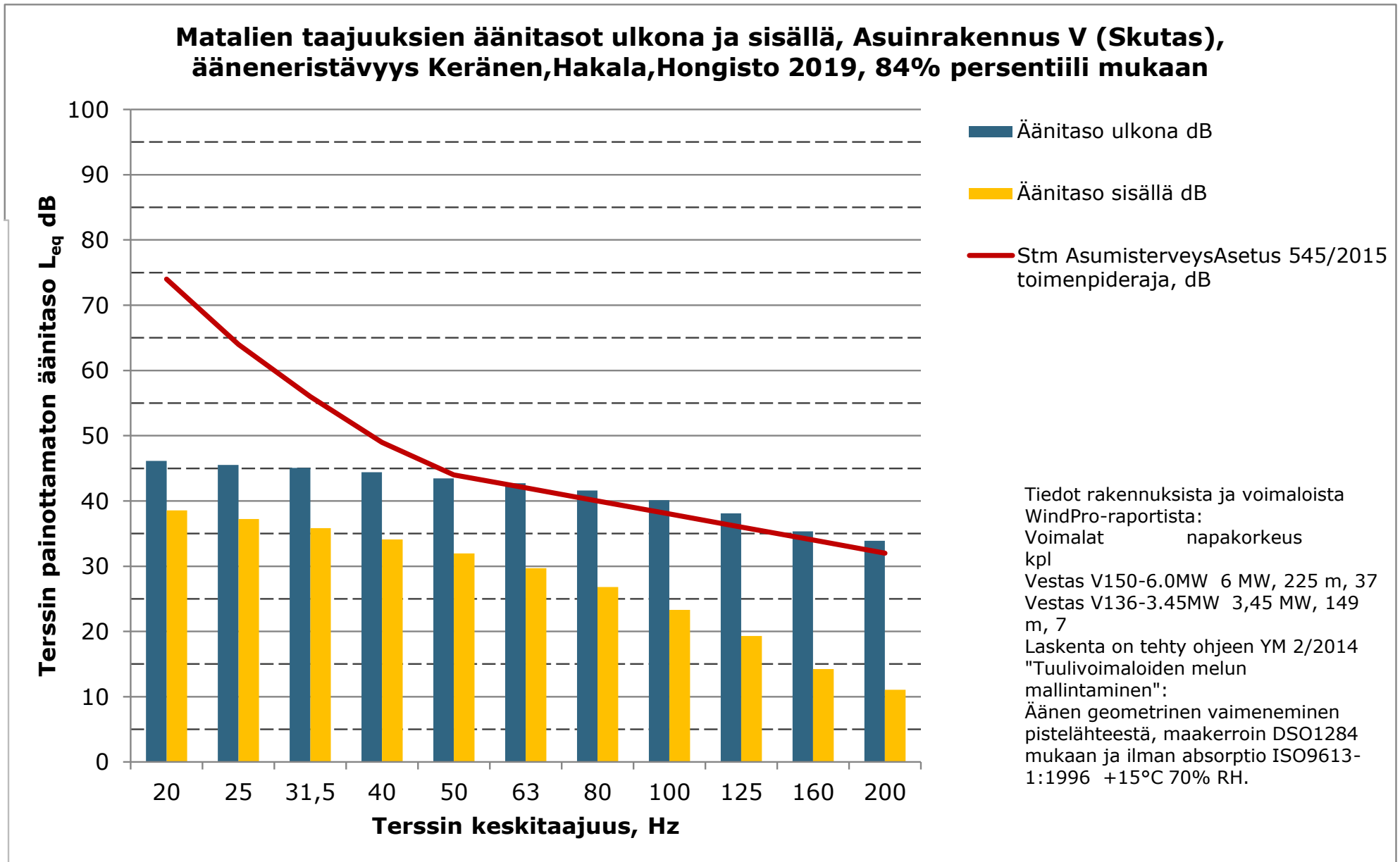


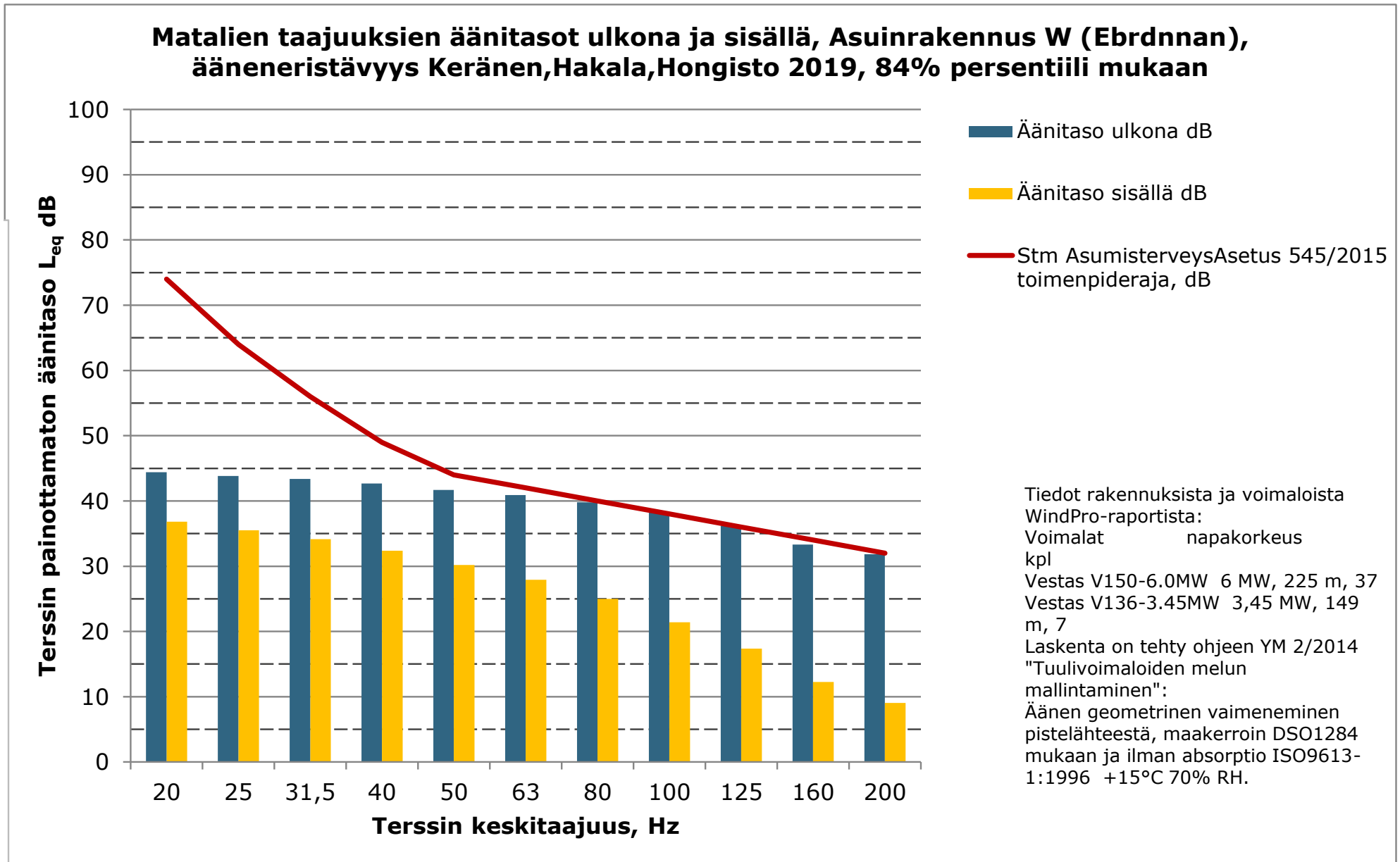


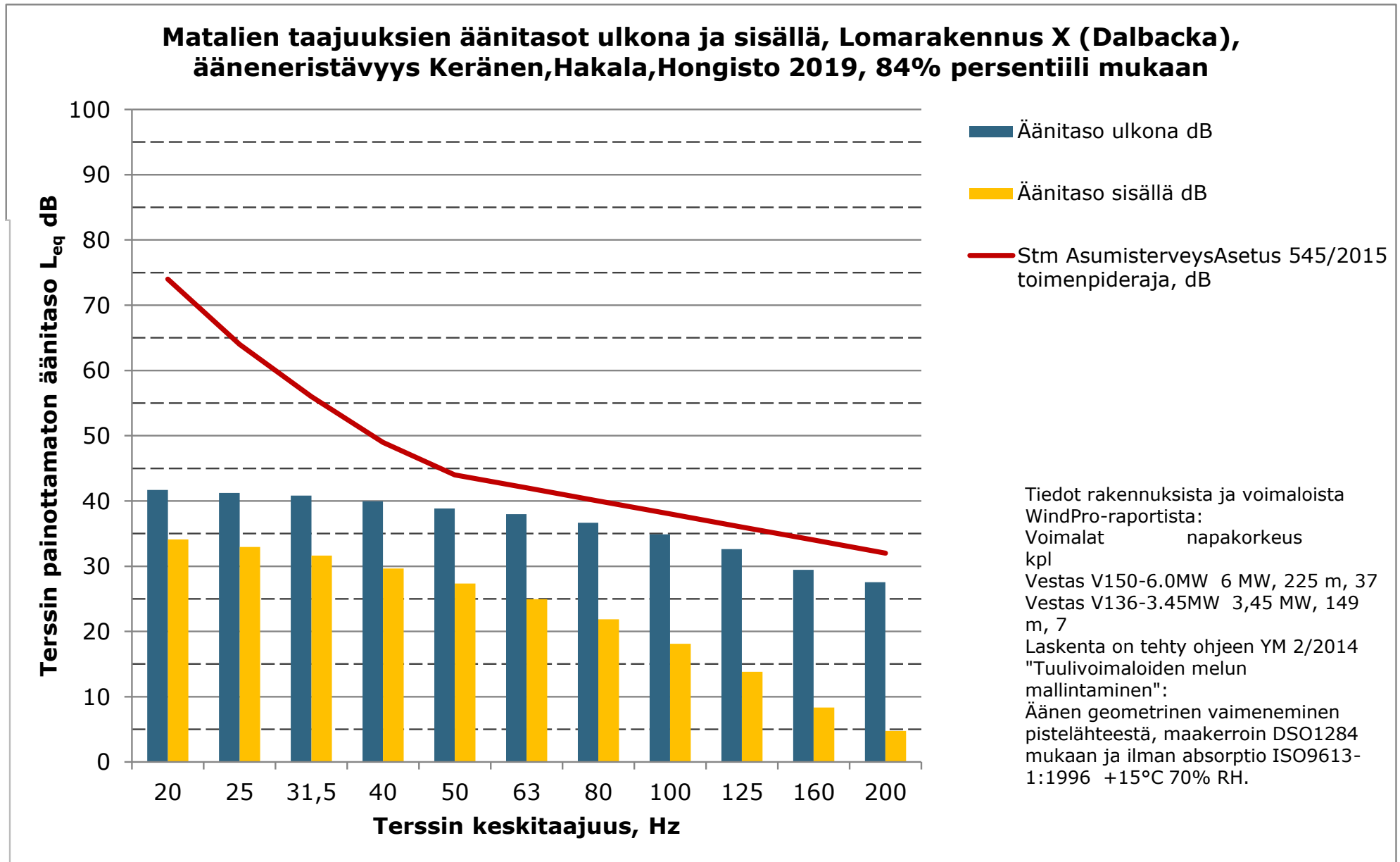


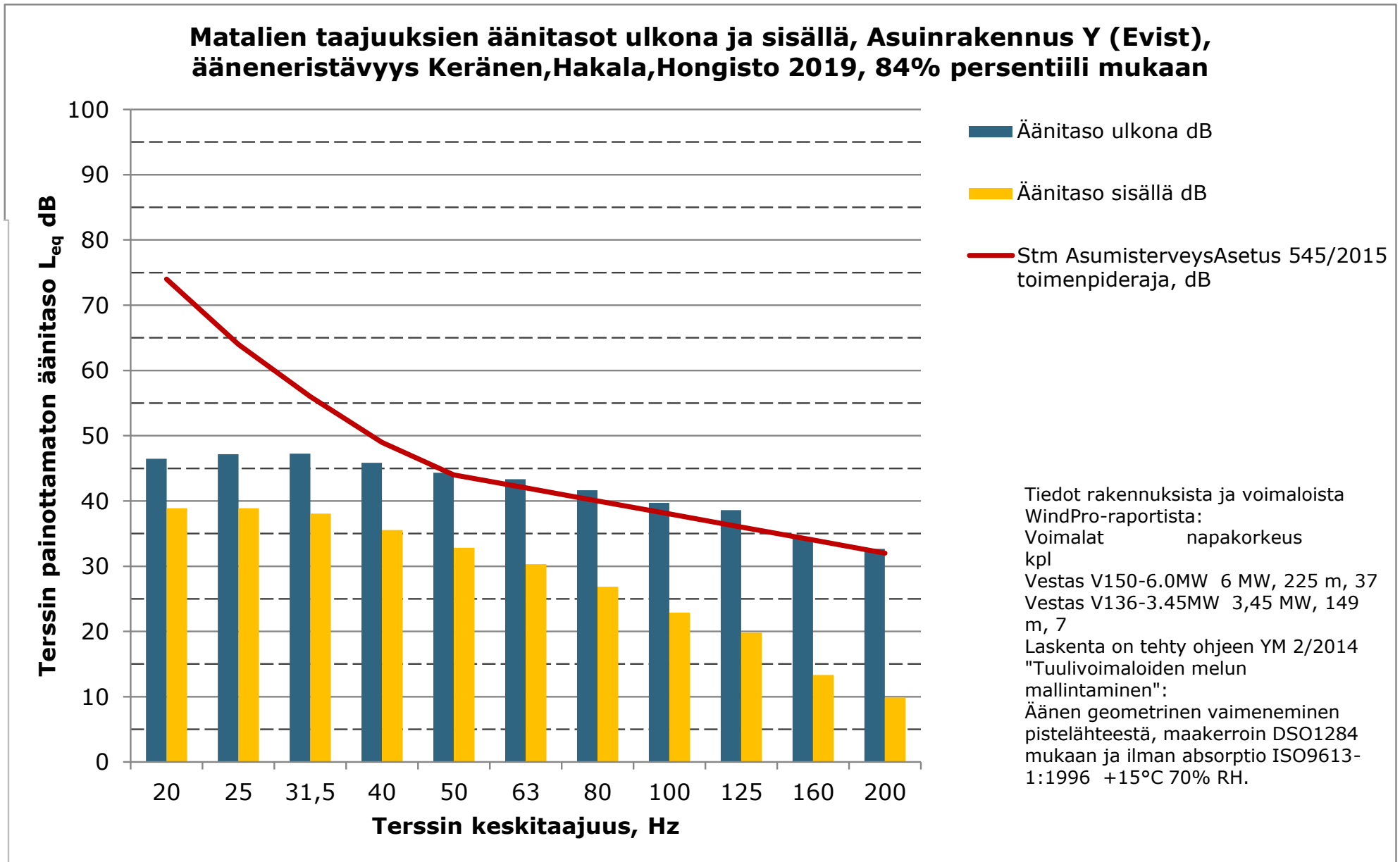


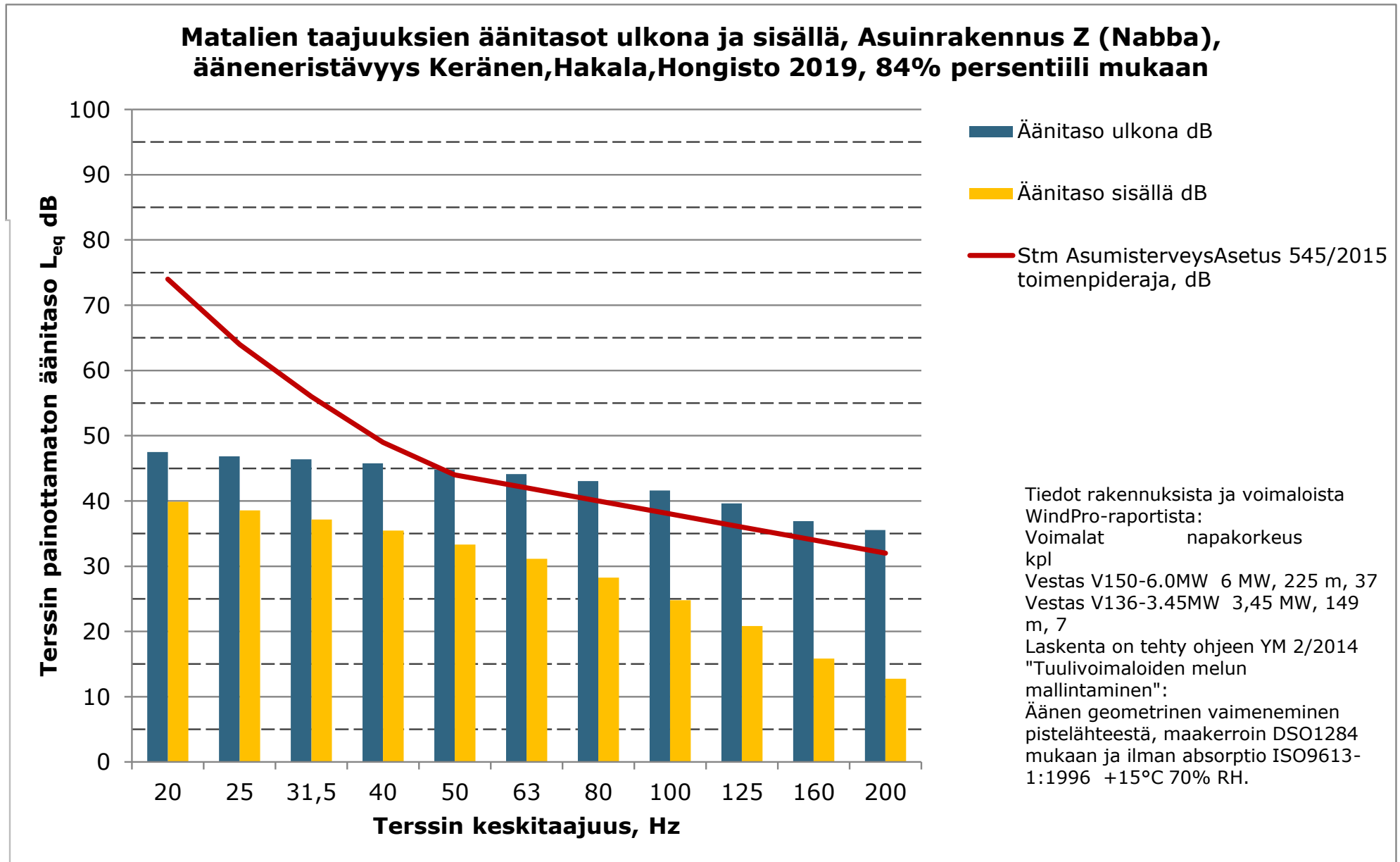








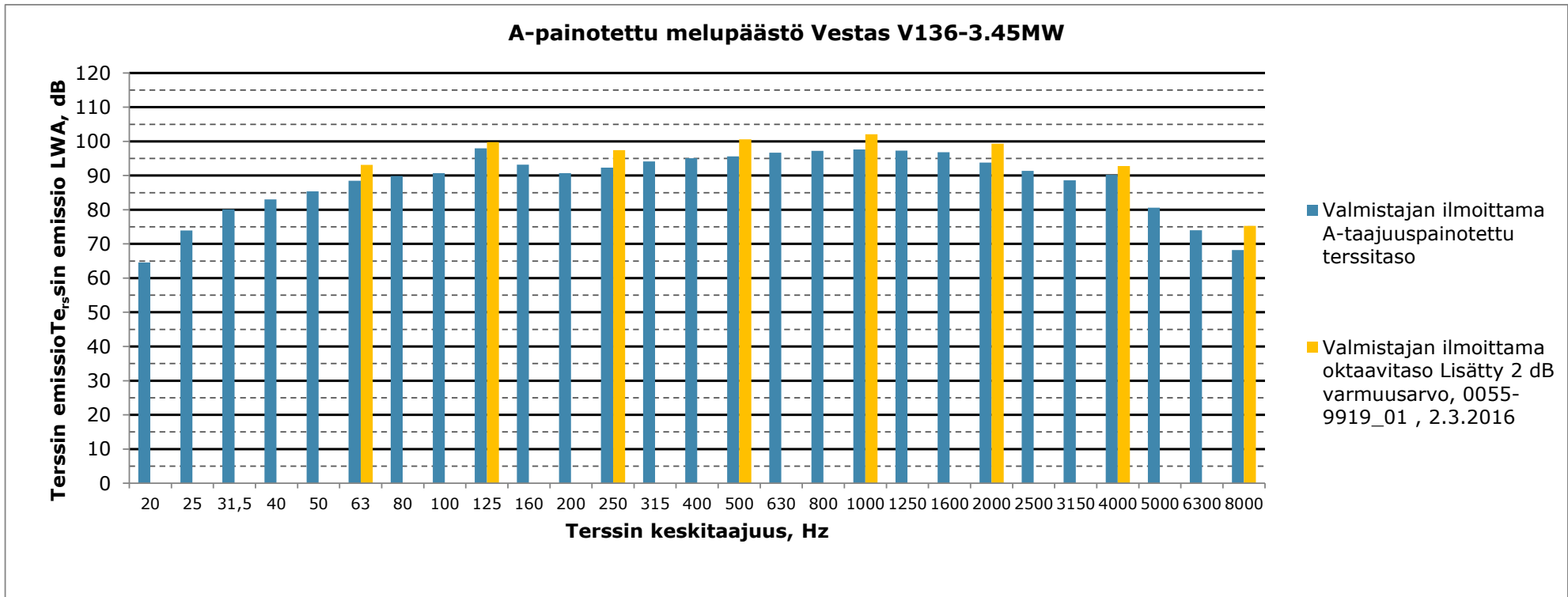


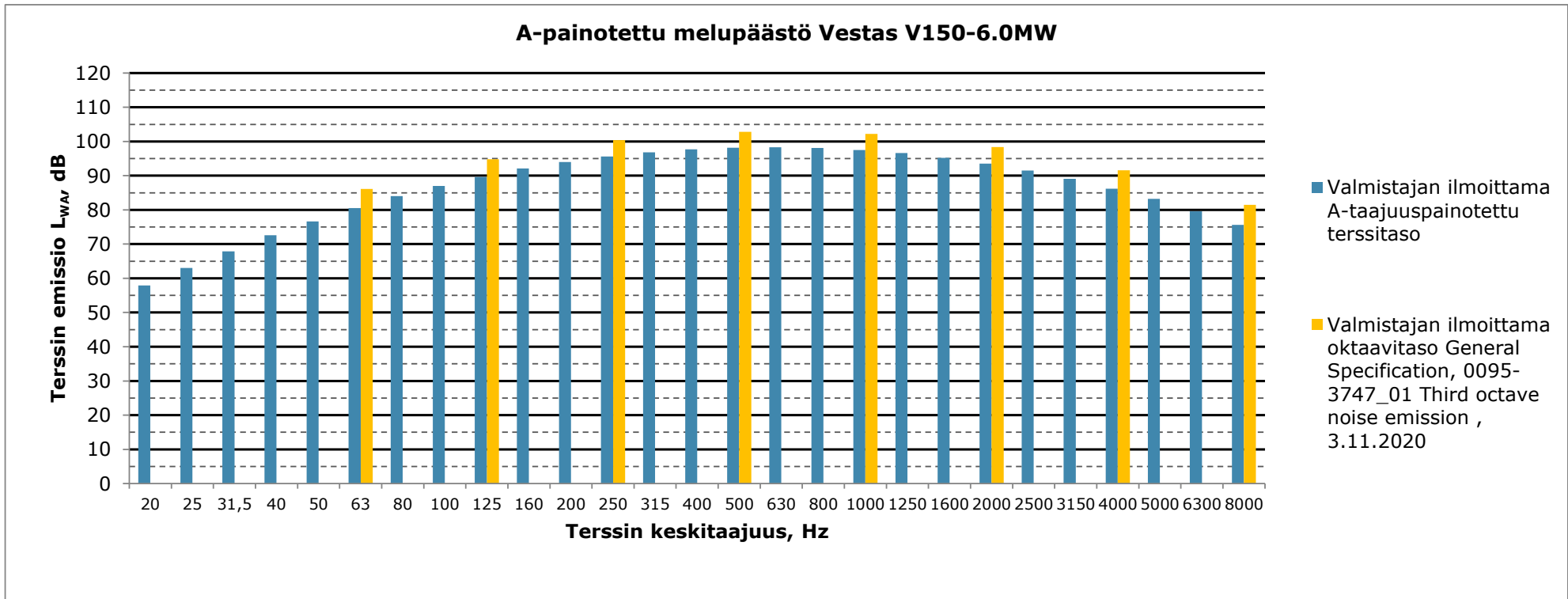


13.2.2023

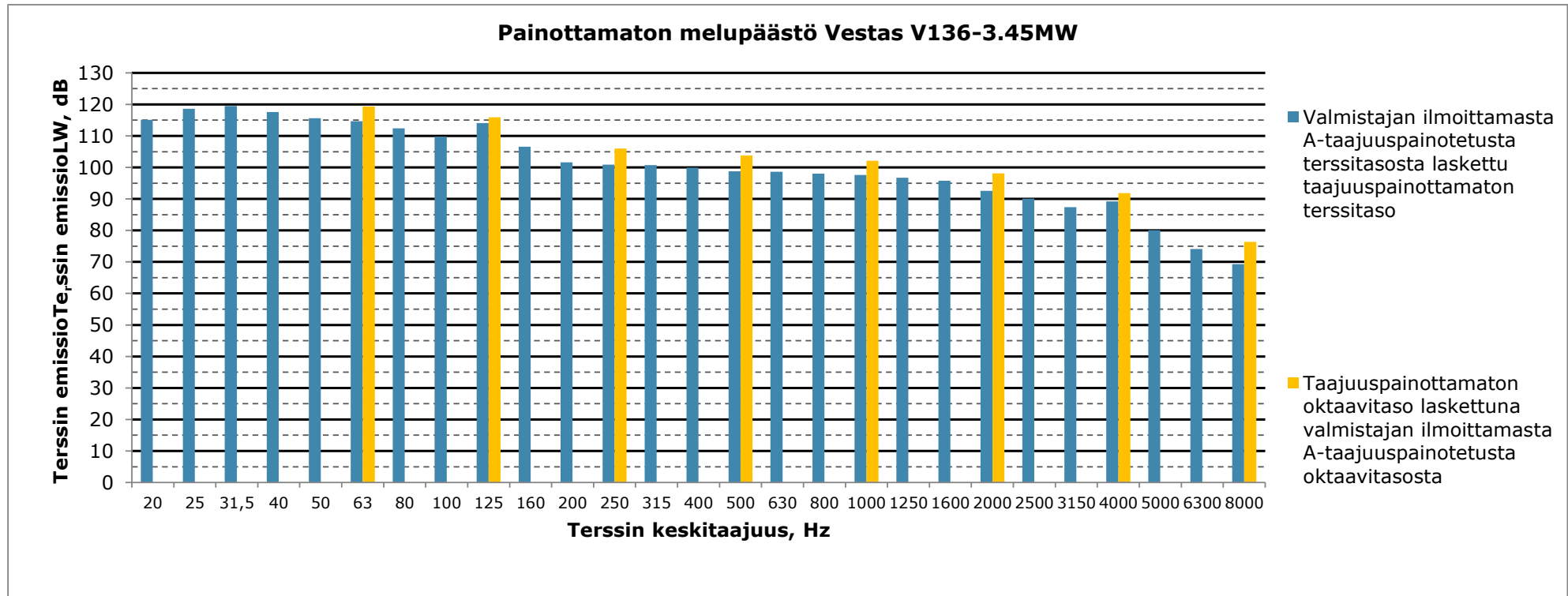
---

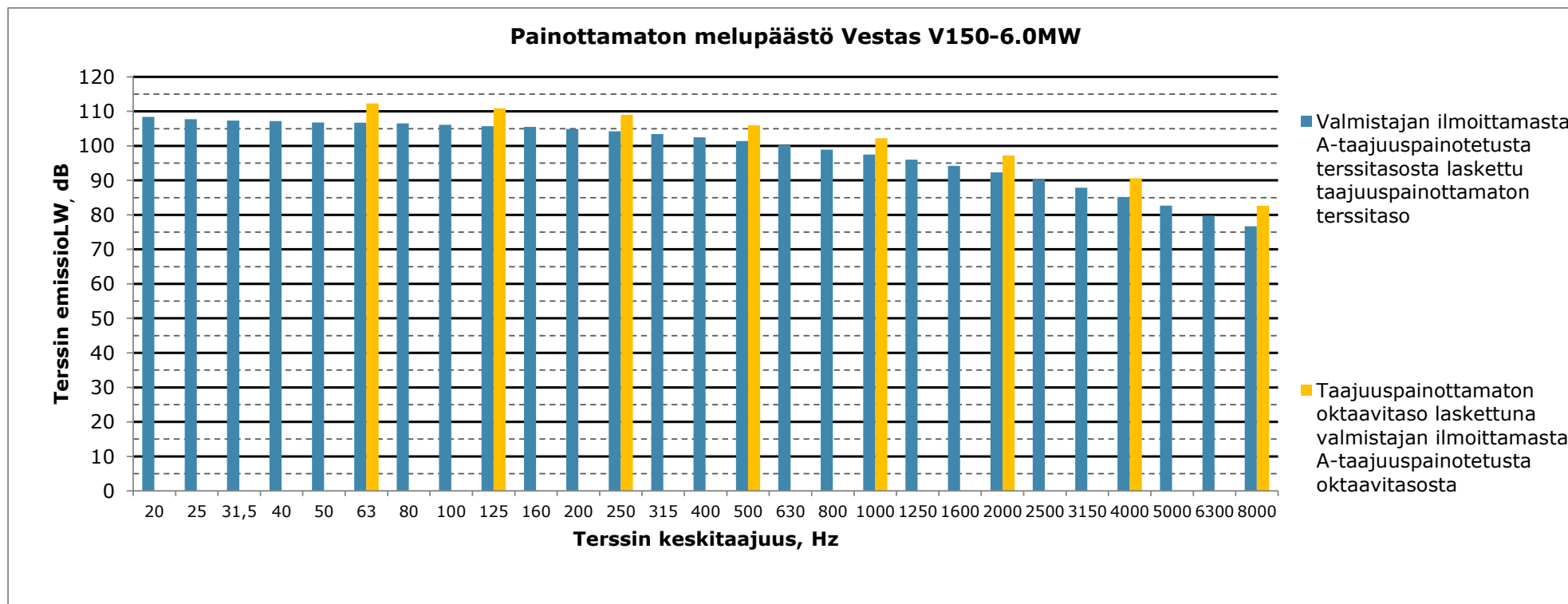
Liite 8. Purmon tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE3 V150 – 6.0 MW Salo-Ylikosken hankkeen kanssa.

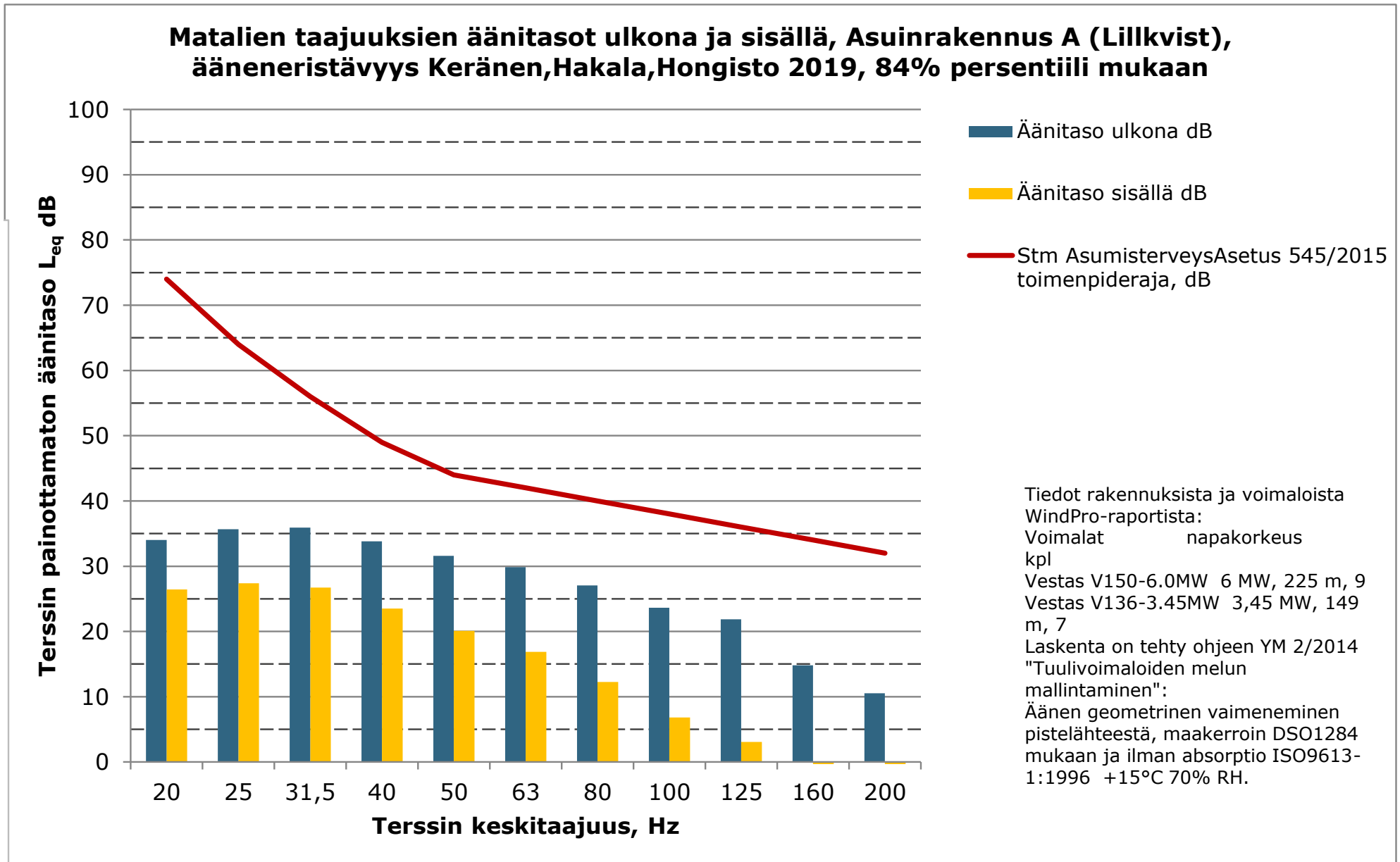




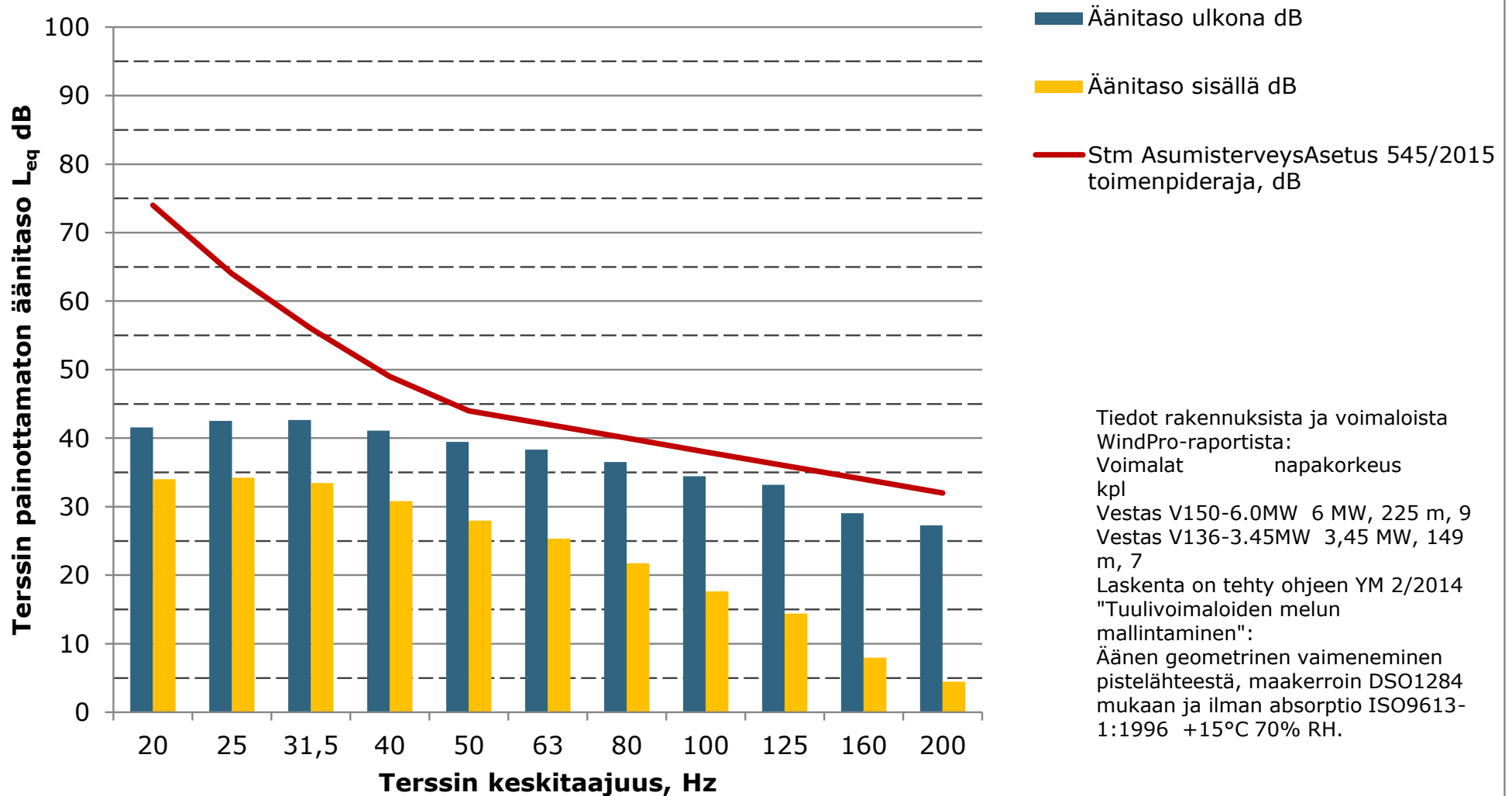


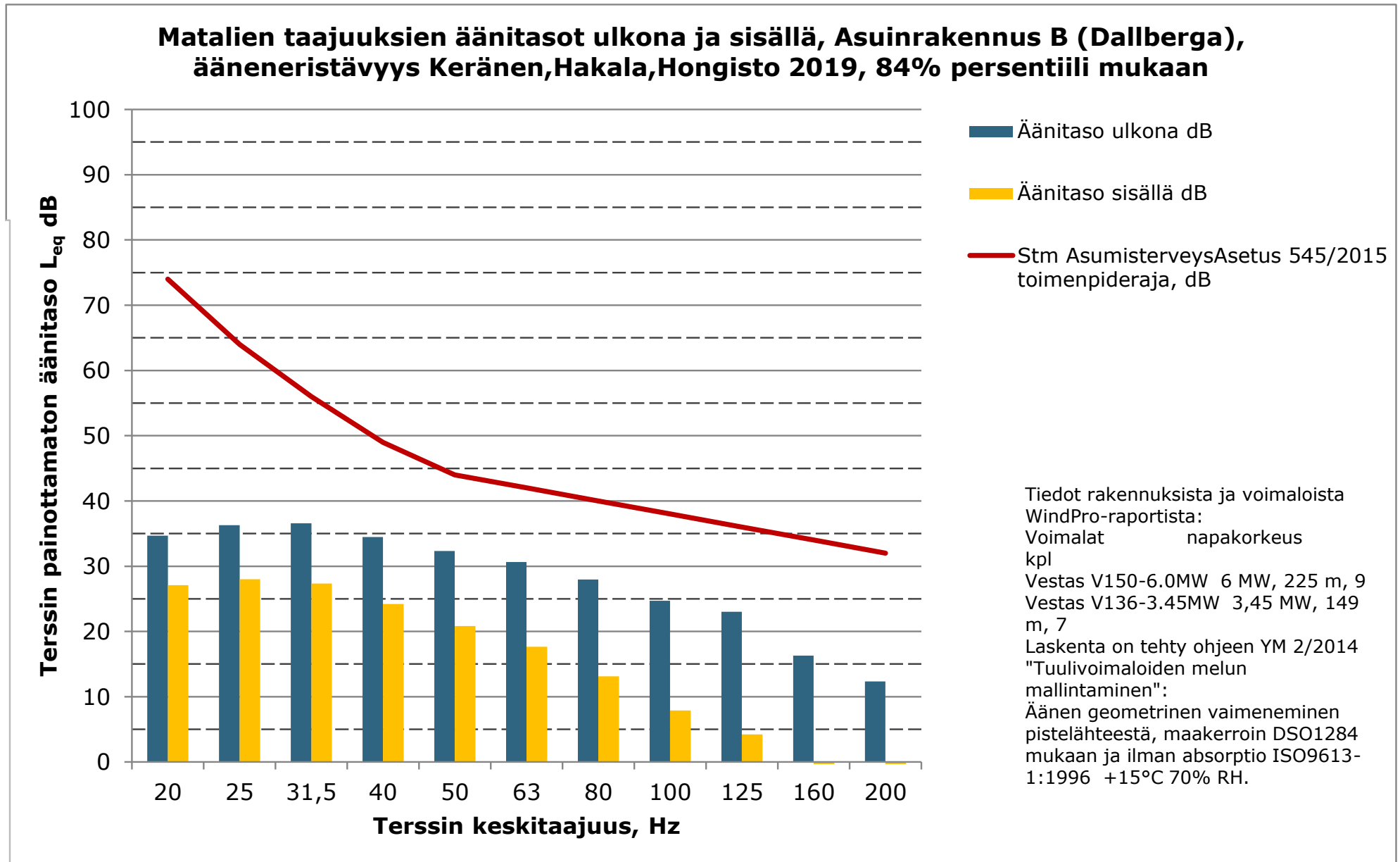




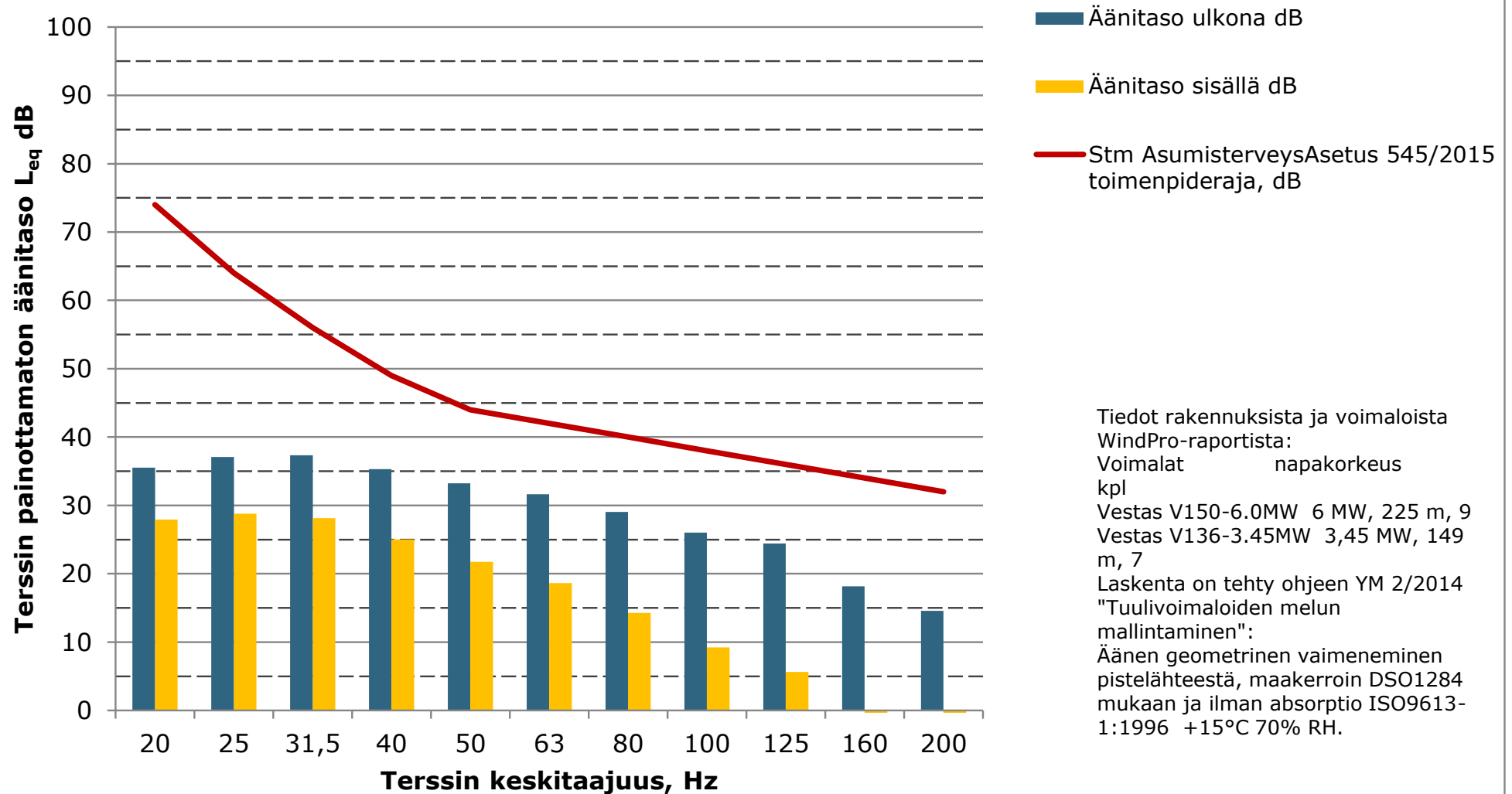


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus AA  
(Kronkvist), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

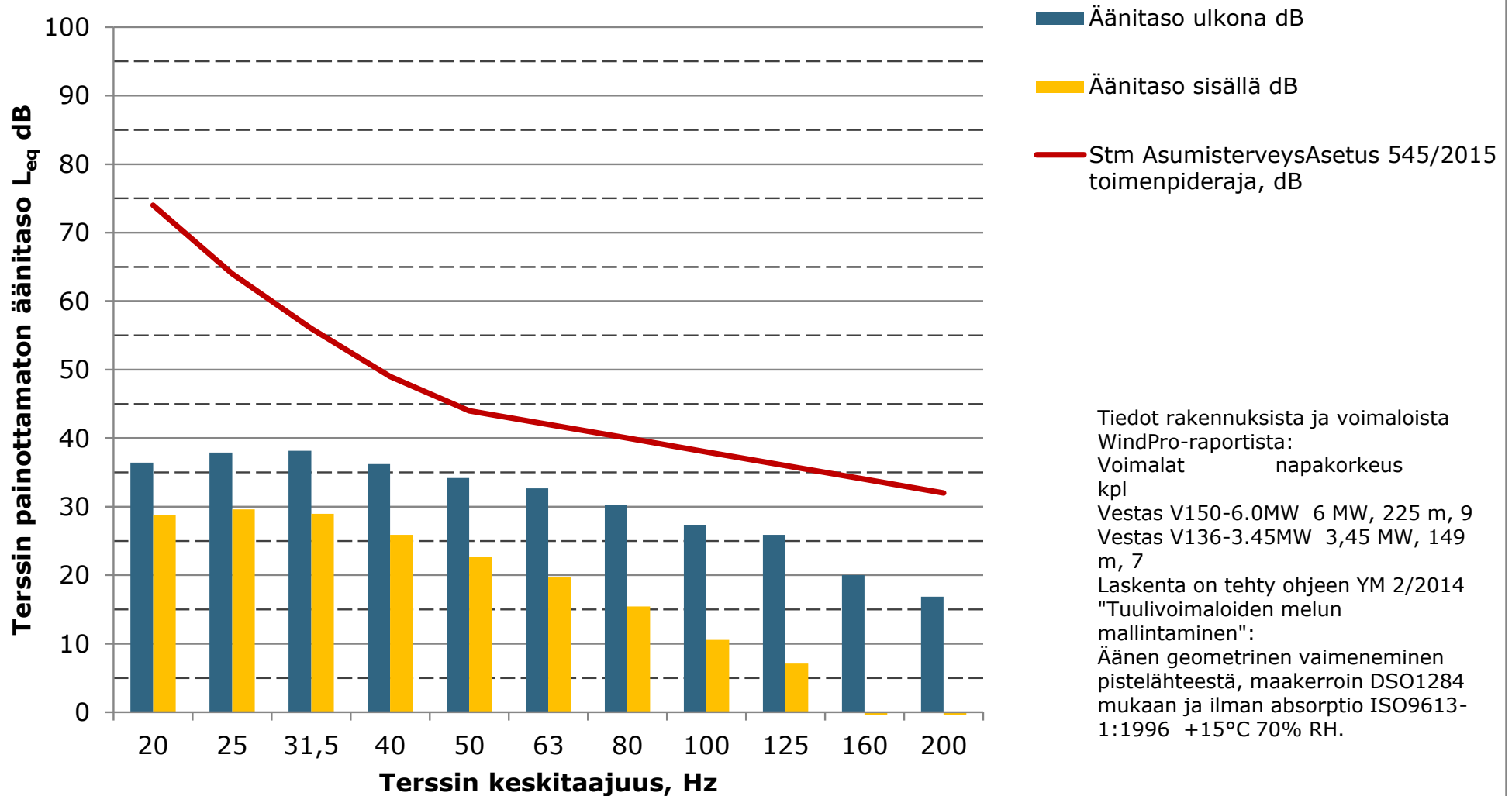




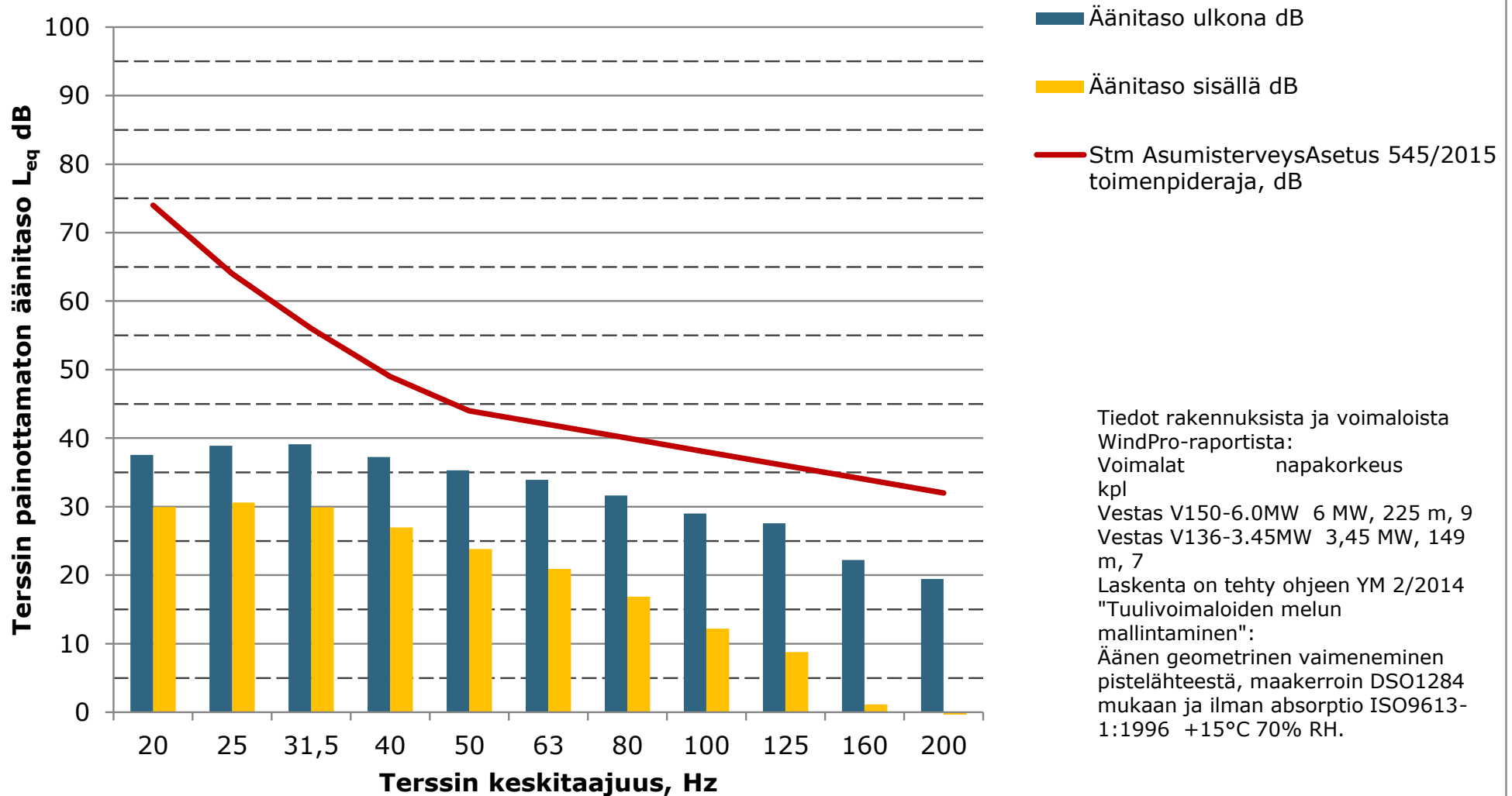
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Tormbacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D  
(Kalltrdskvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

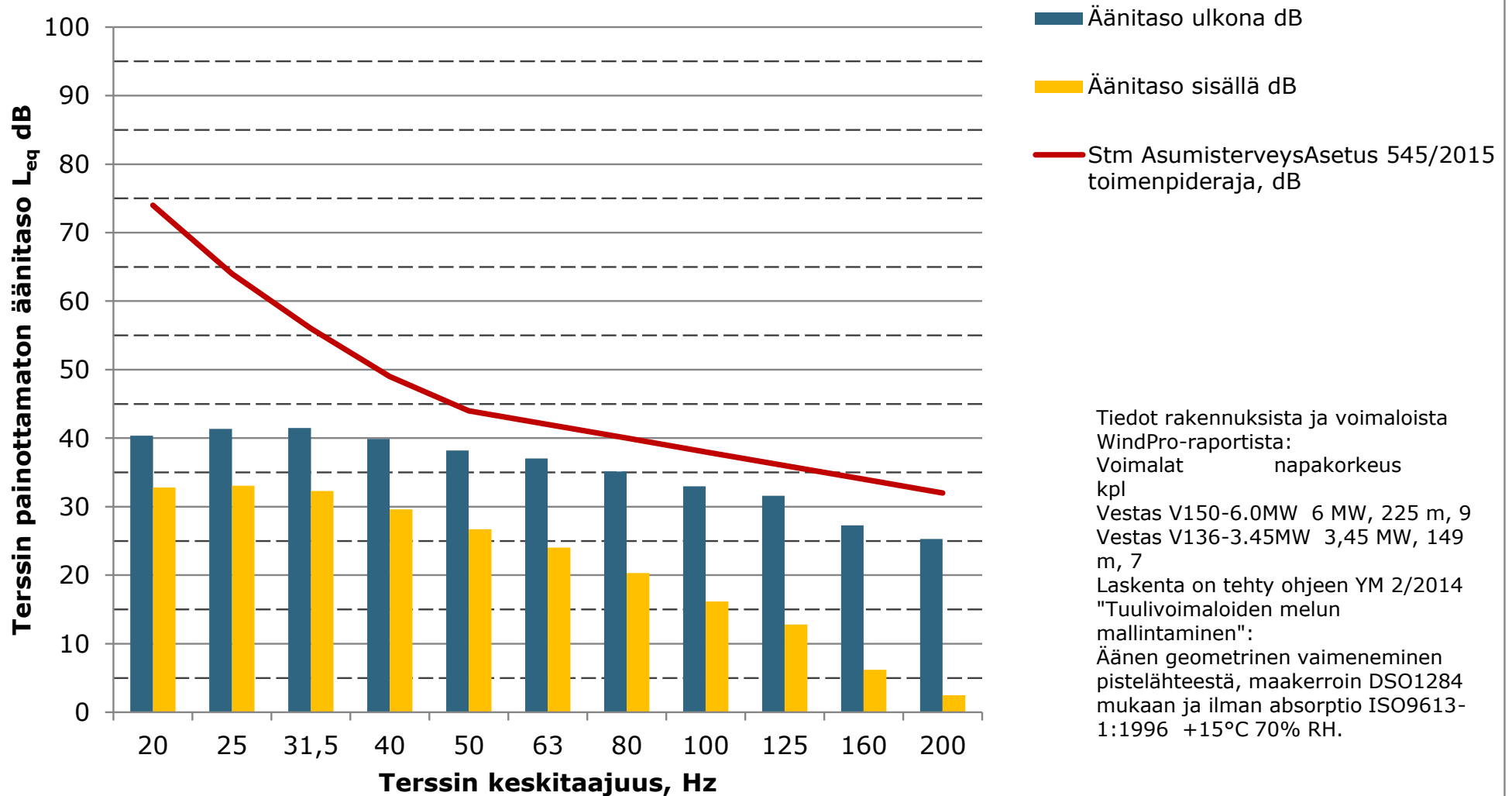


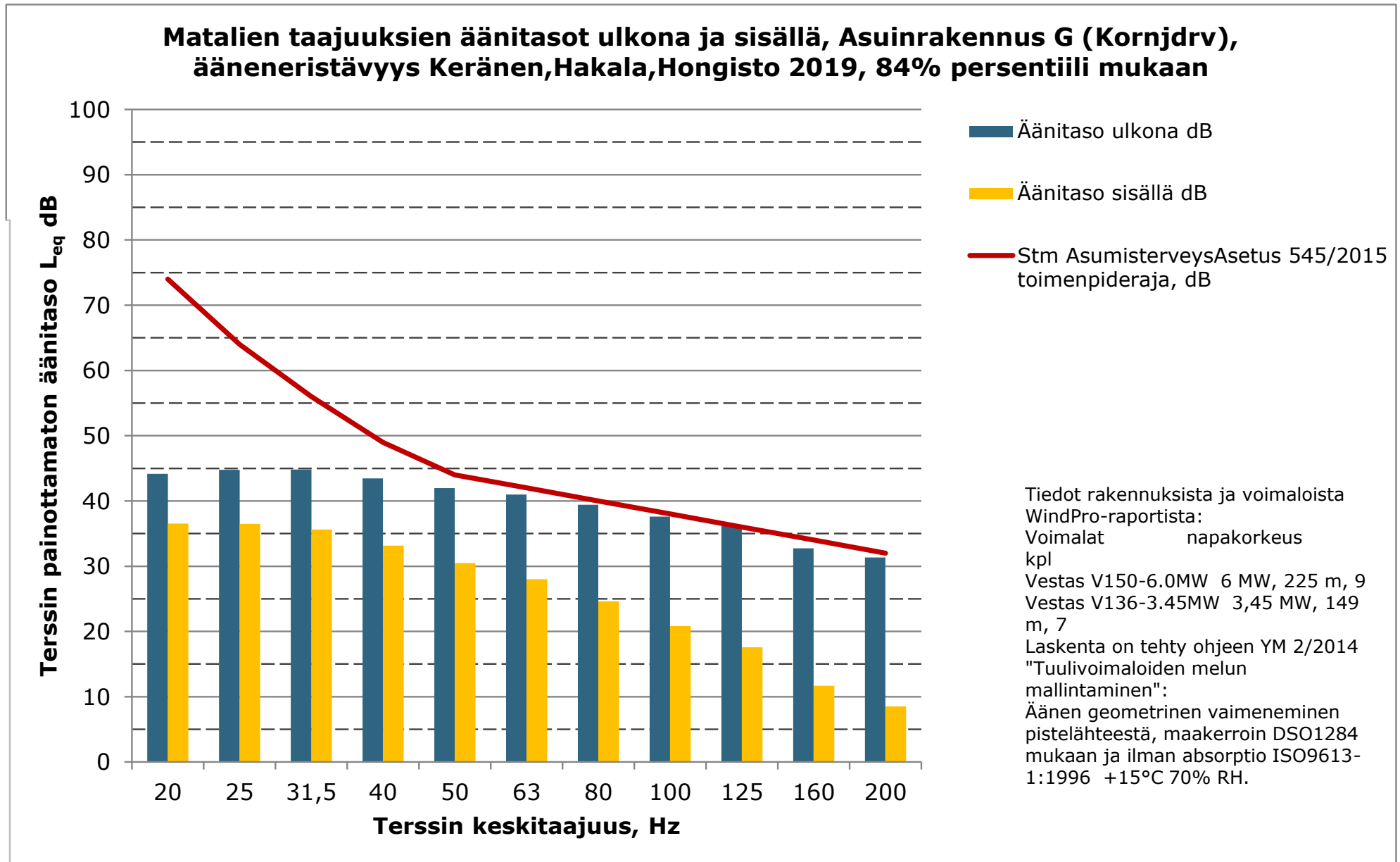
**Matalien taajuuksien äänitasot ulkona ja sisällä, Metsästysmaja E  
(Kejsarbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**



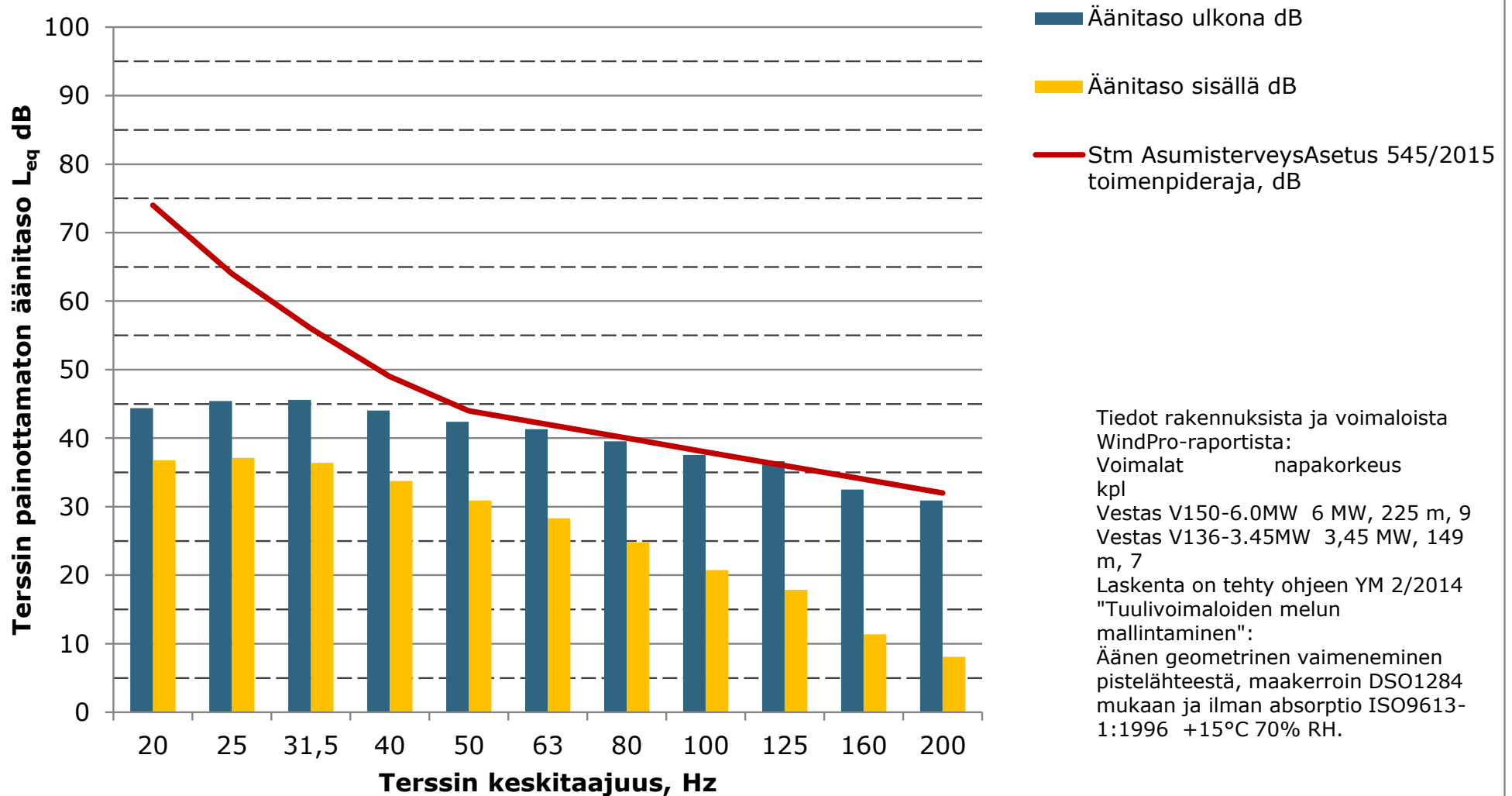


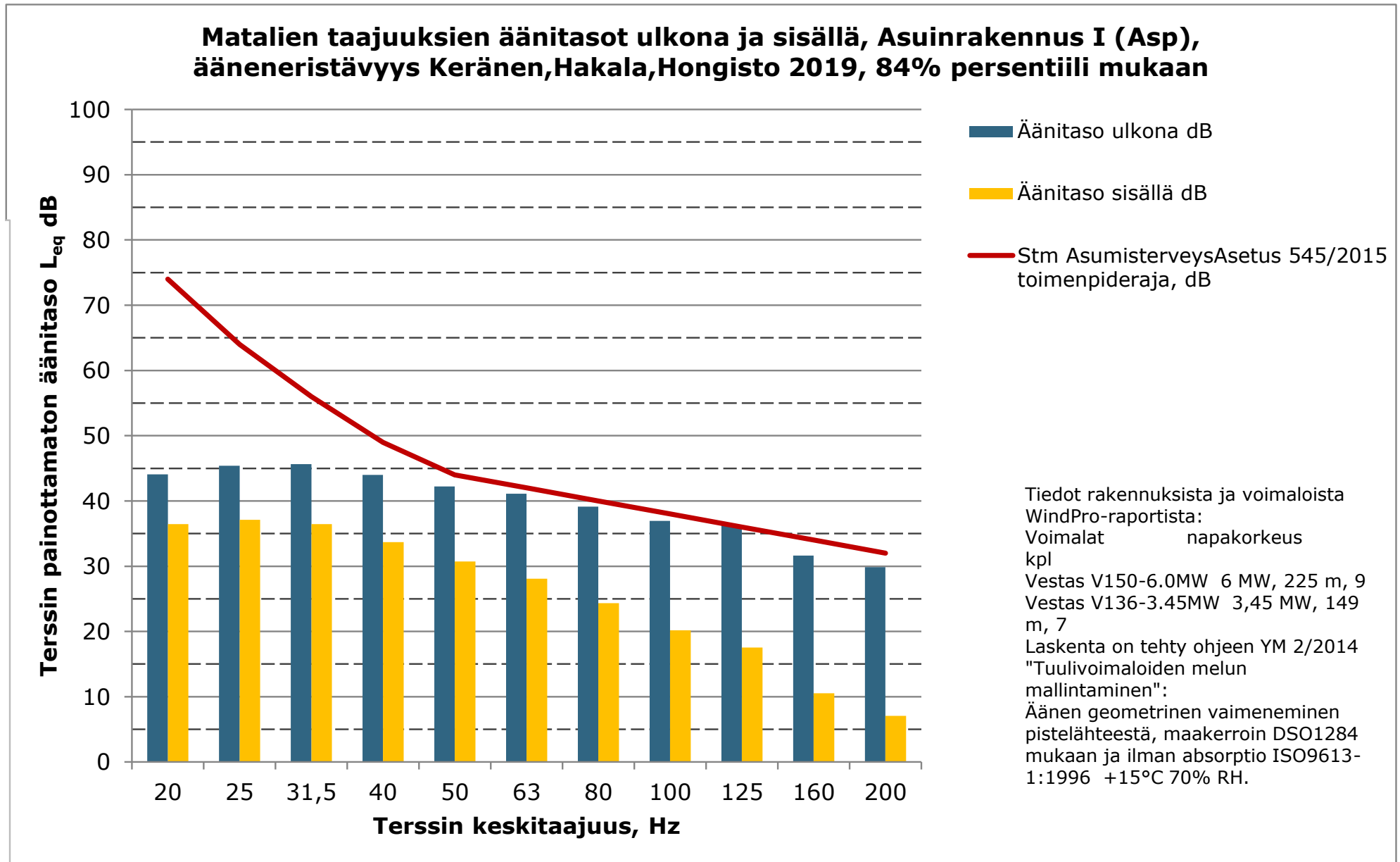
### Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus F (Kdillbacken), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan

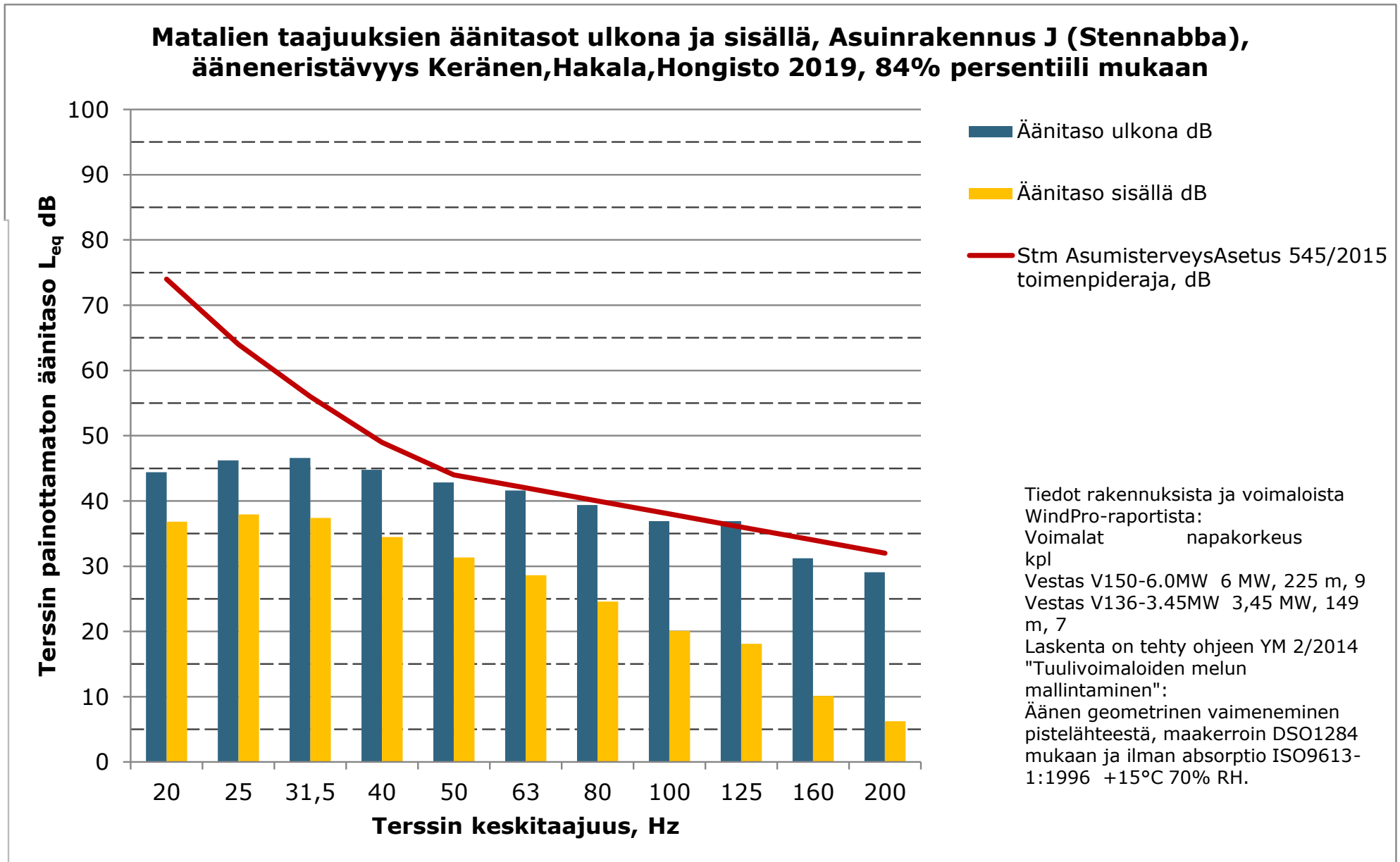




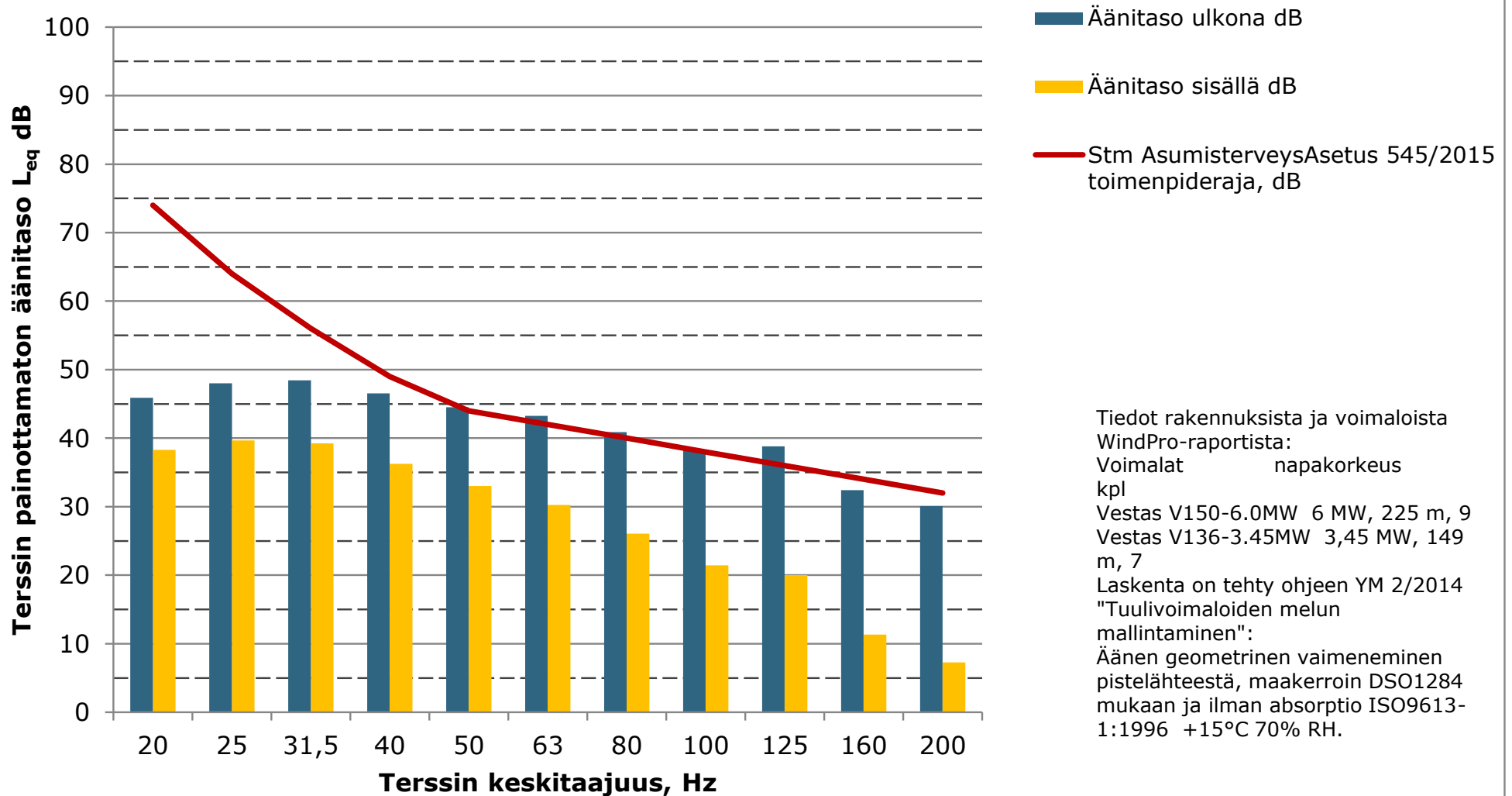
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Sandnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



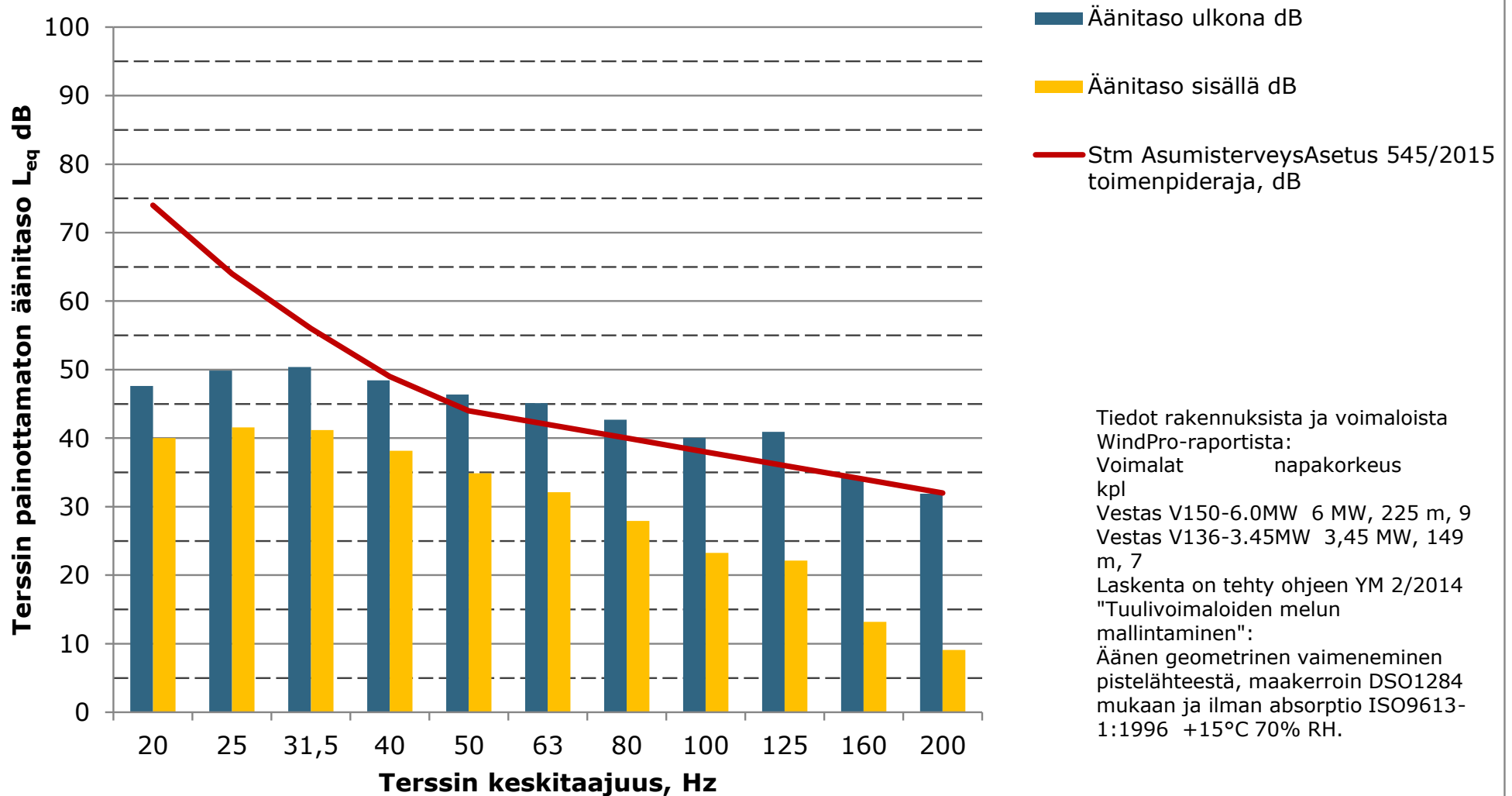




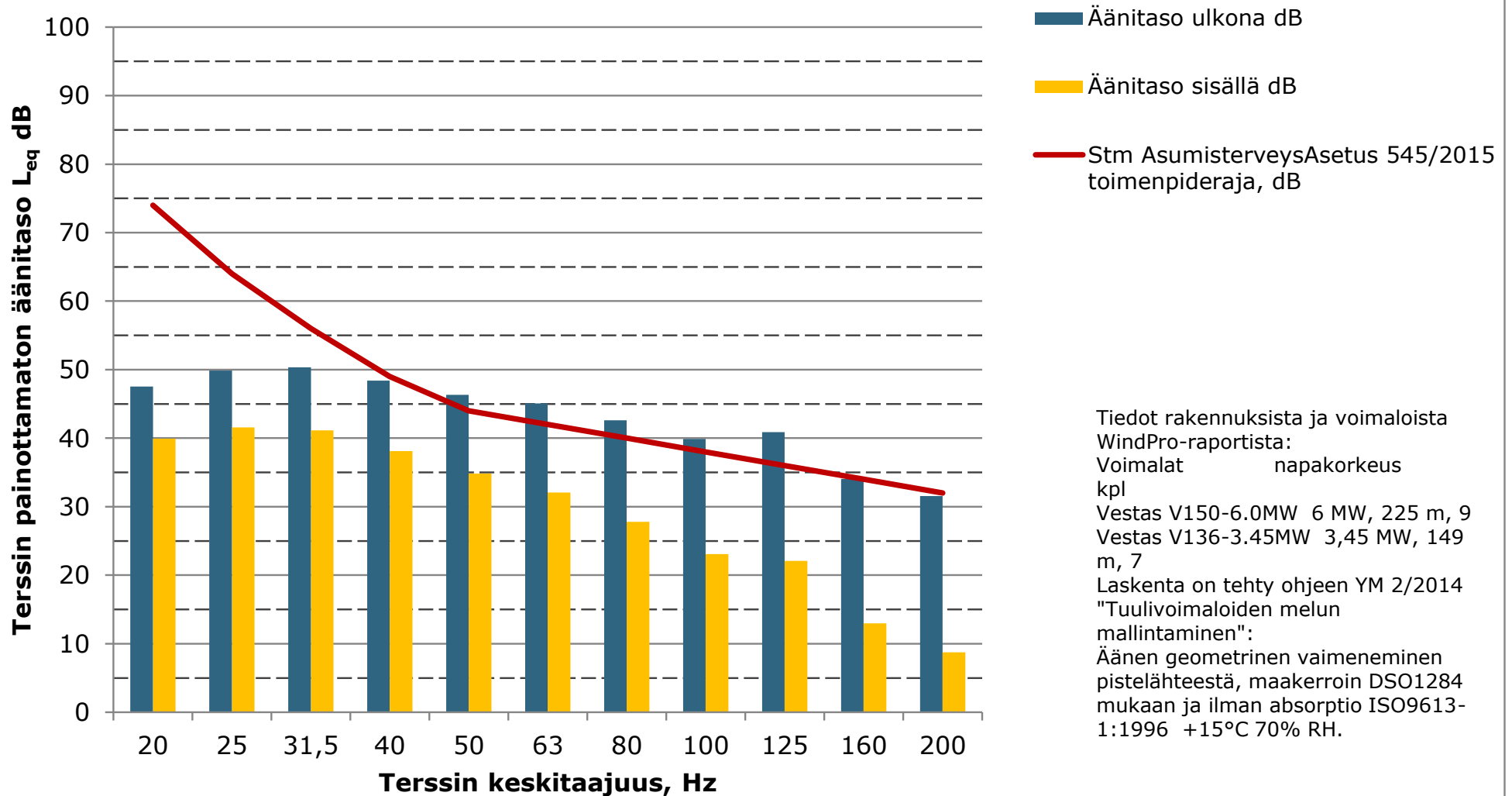
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Lengnabba), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili mukaan



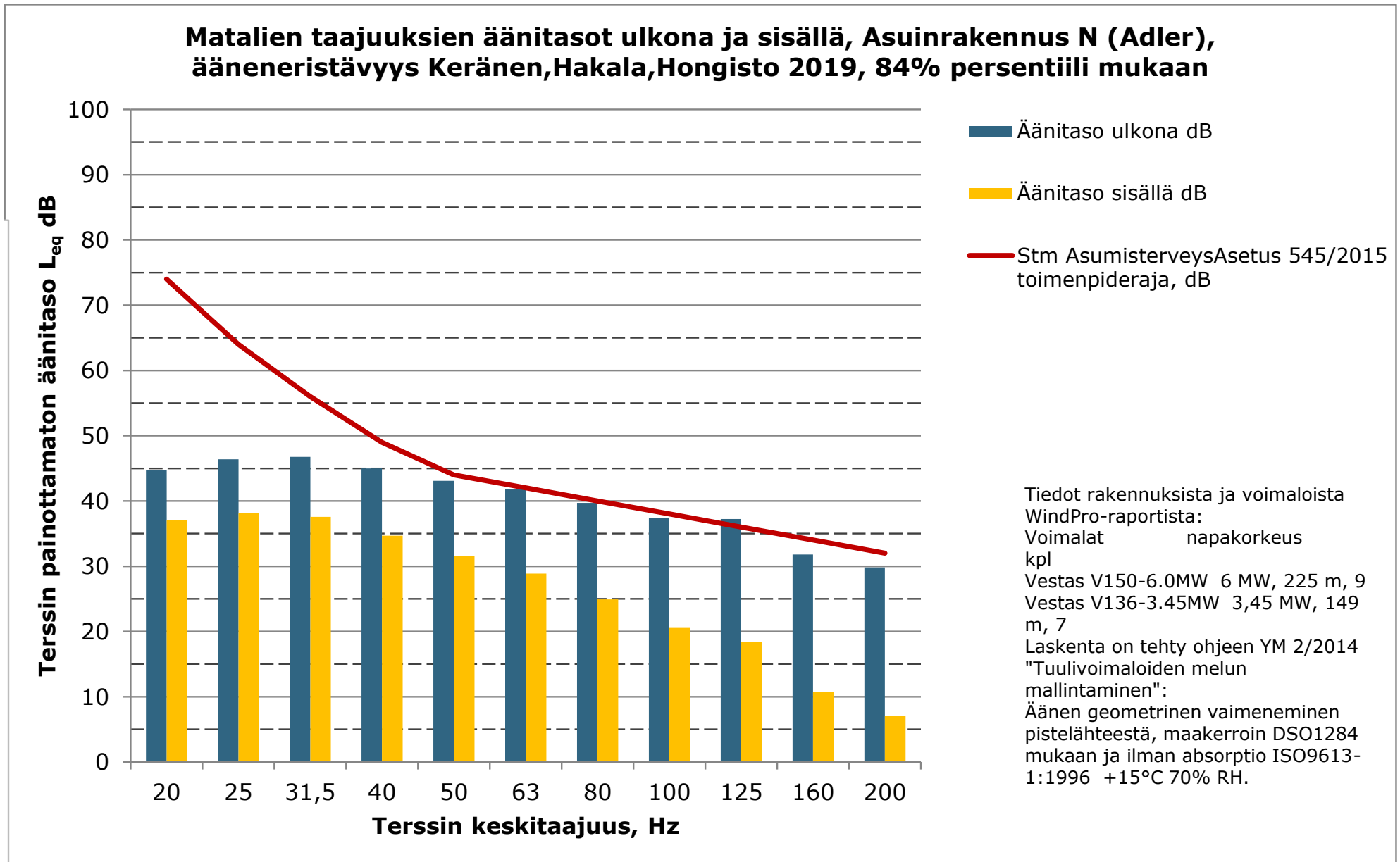
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus L  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**



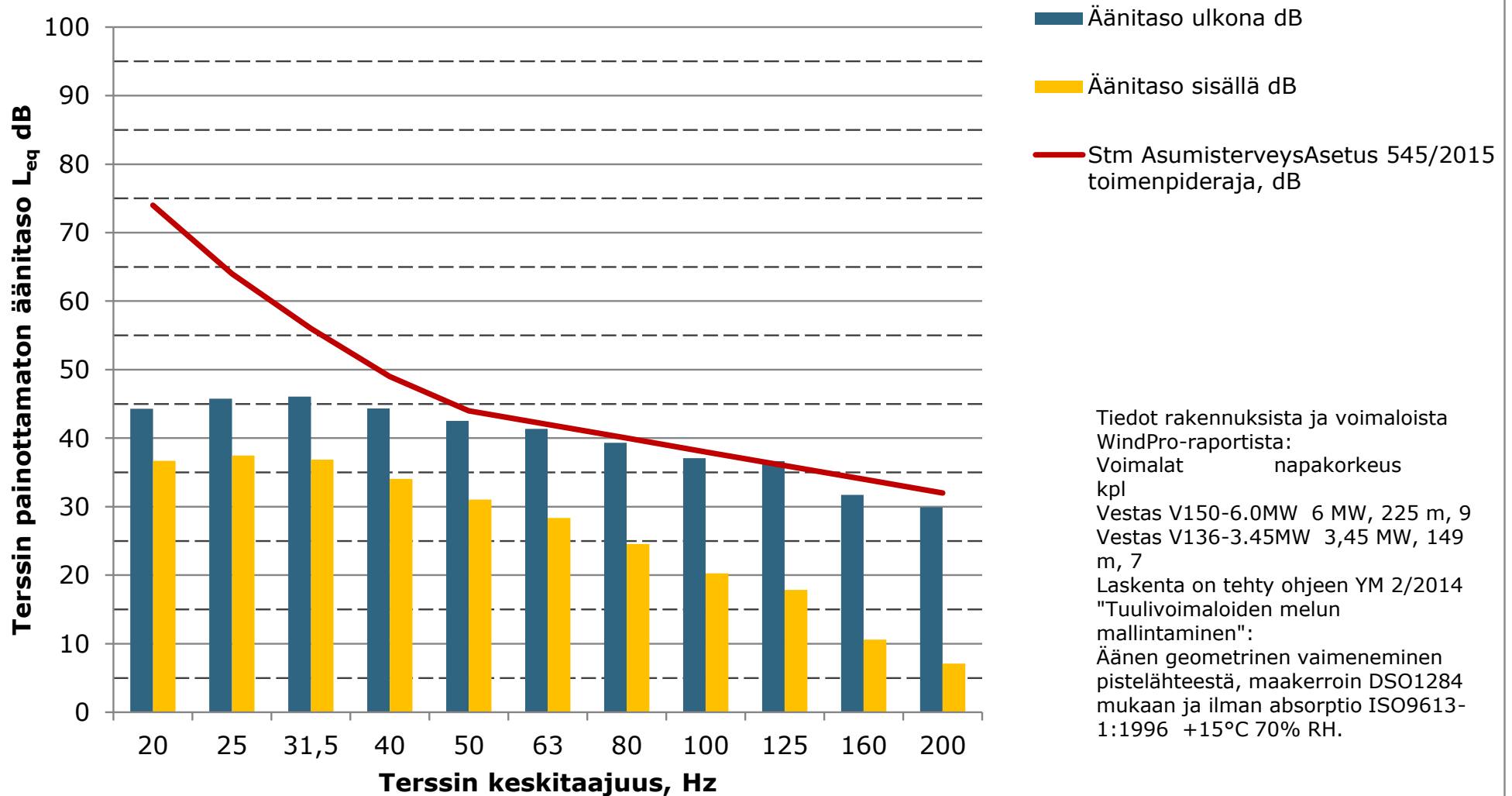
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M (Stenbacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili mukaan



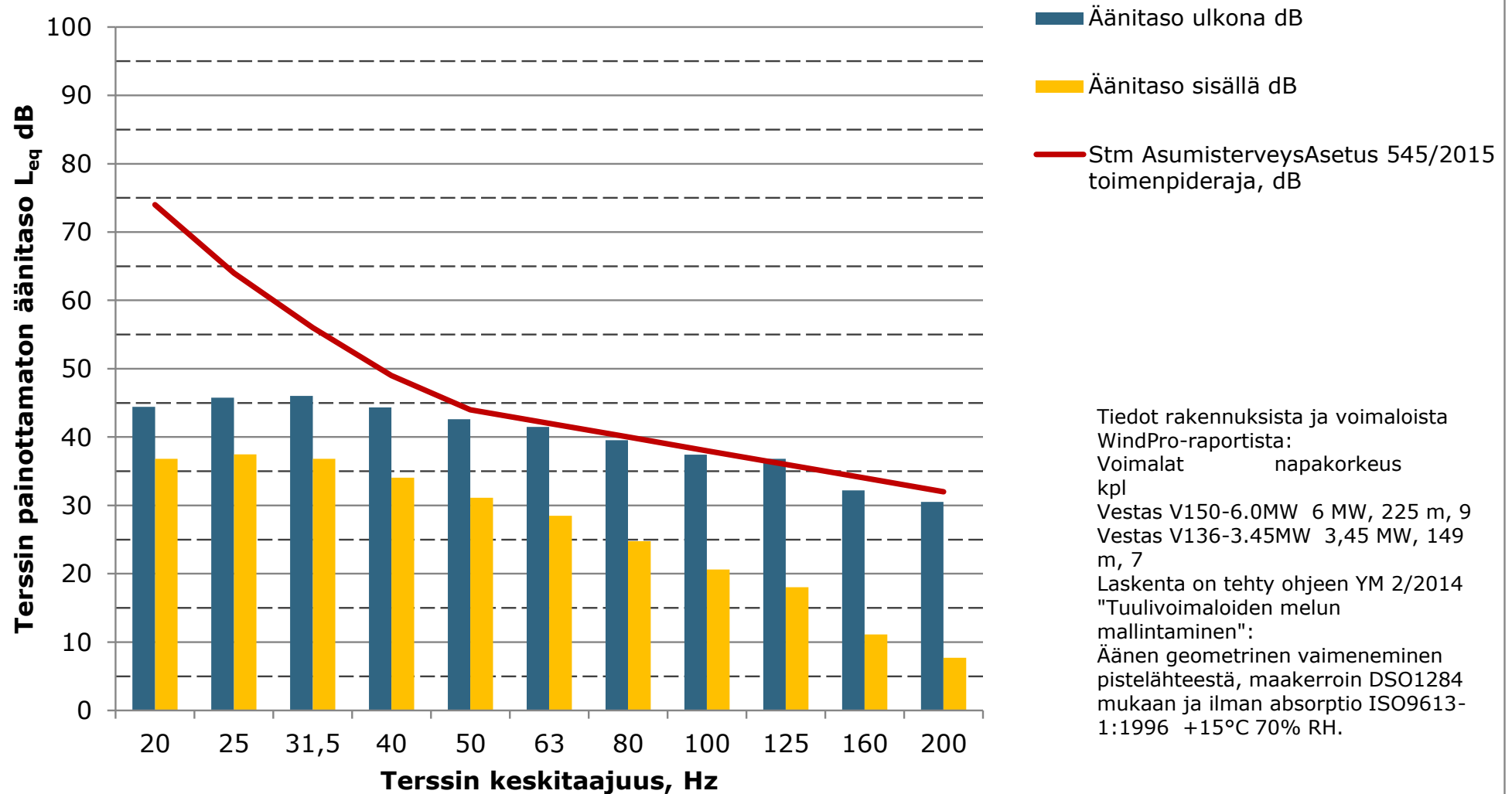




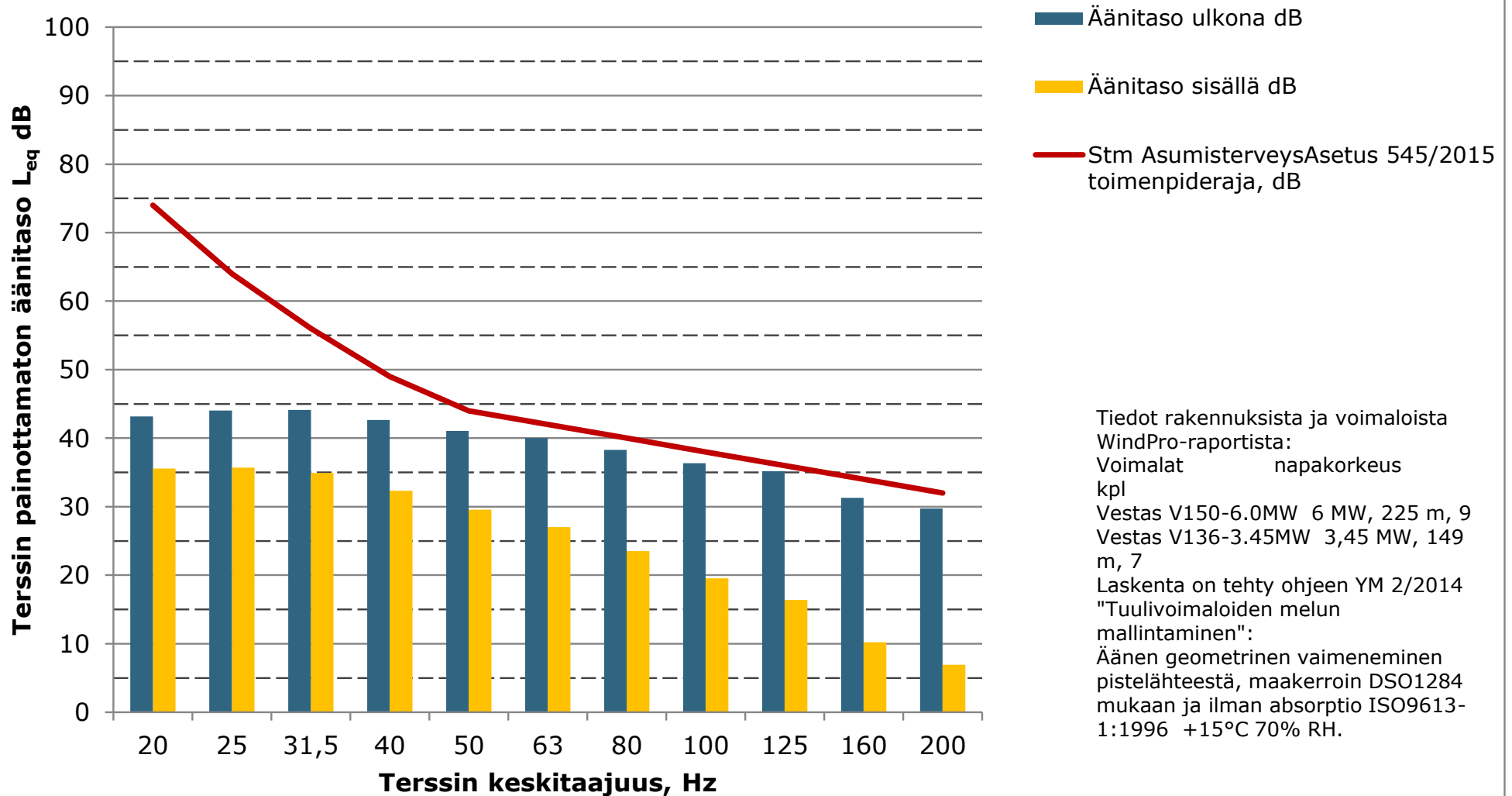
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O  
(Evistvdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

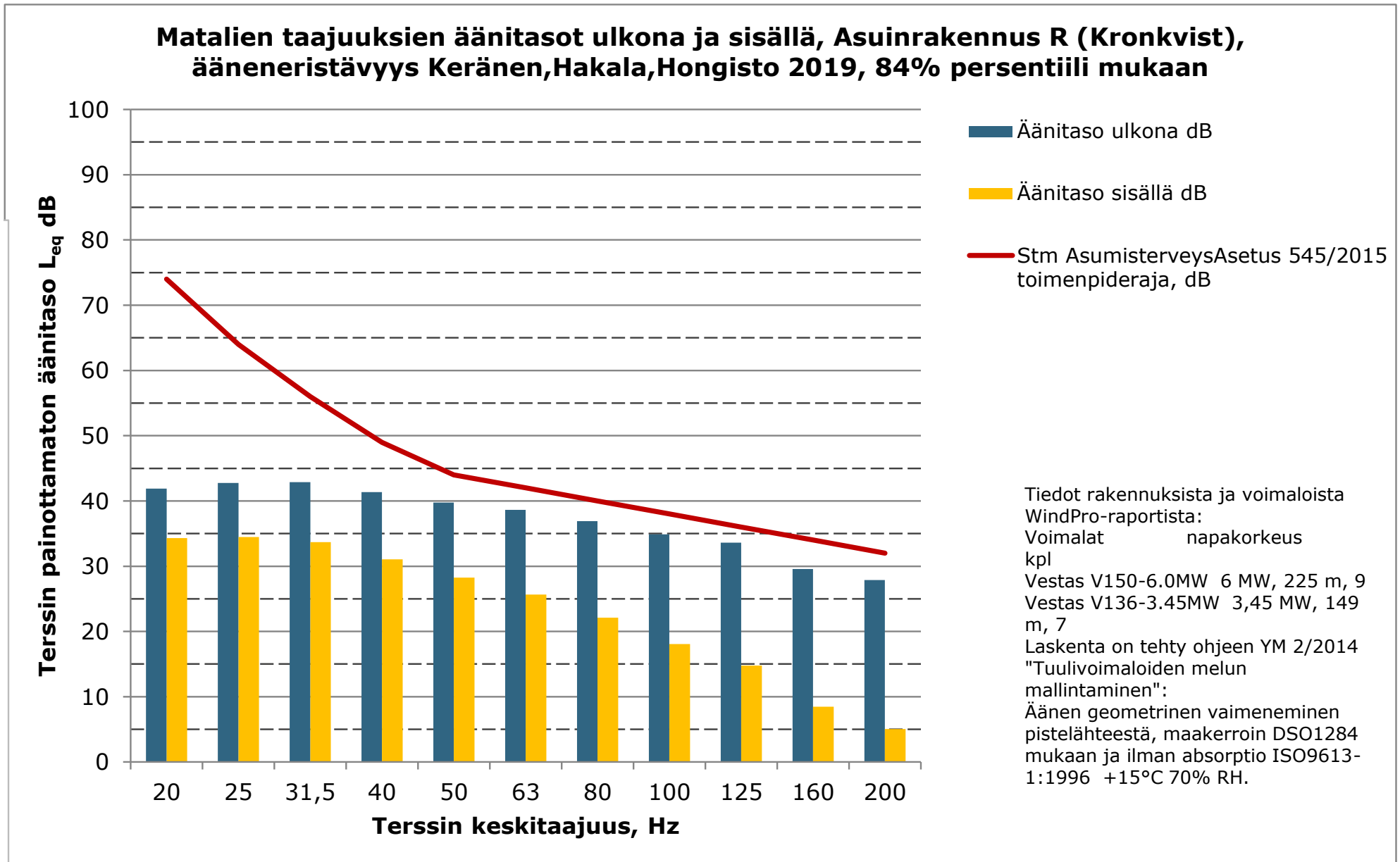


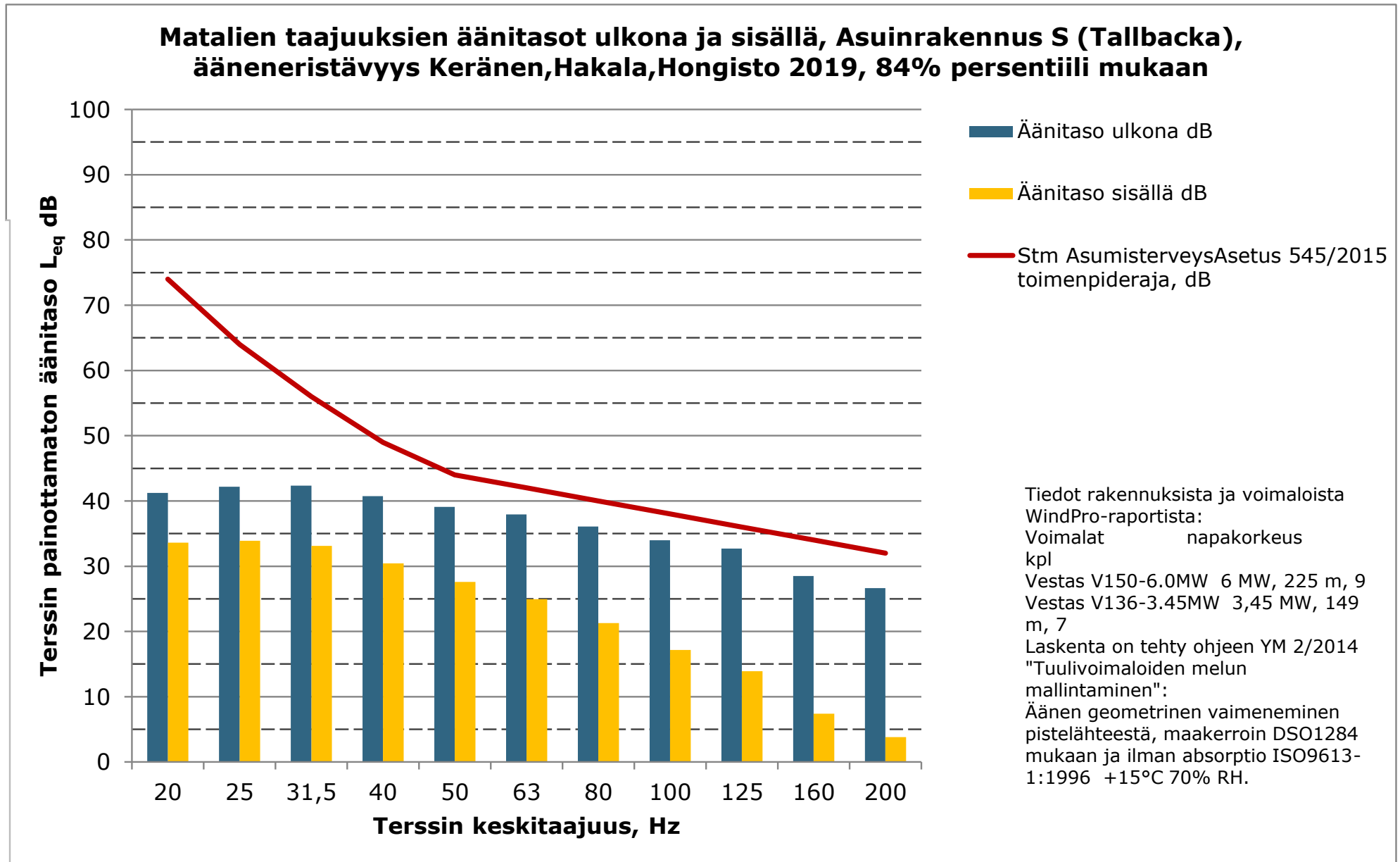
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Finnabbavdgen), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

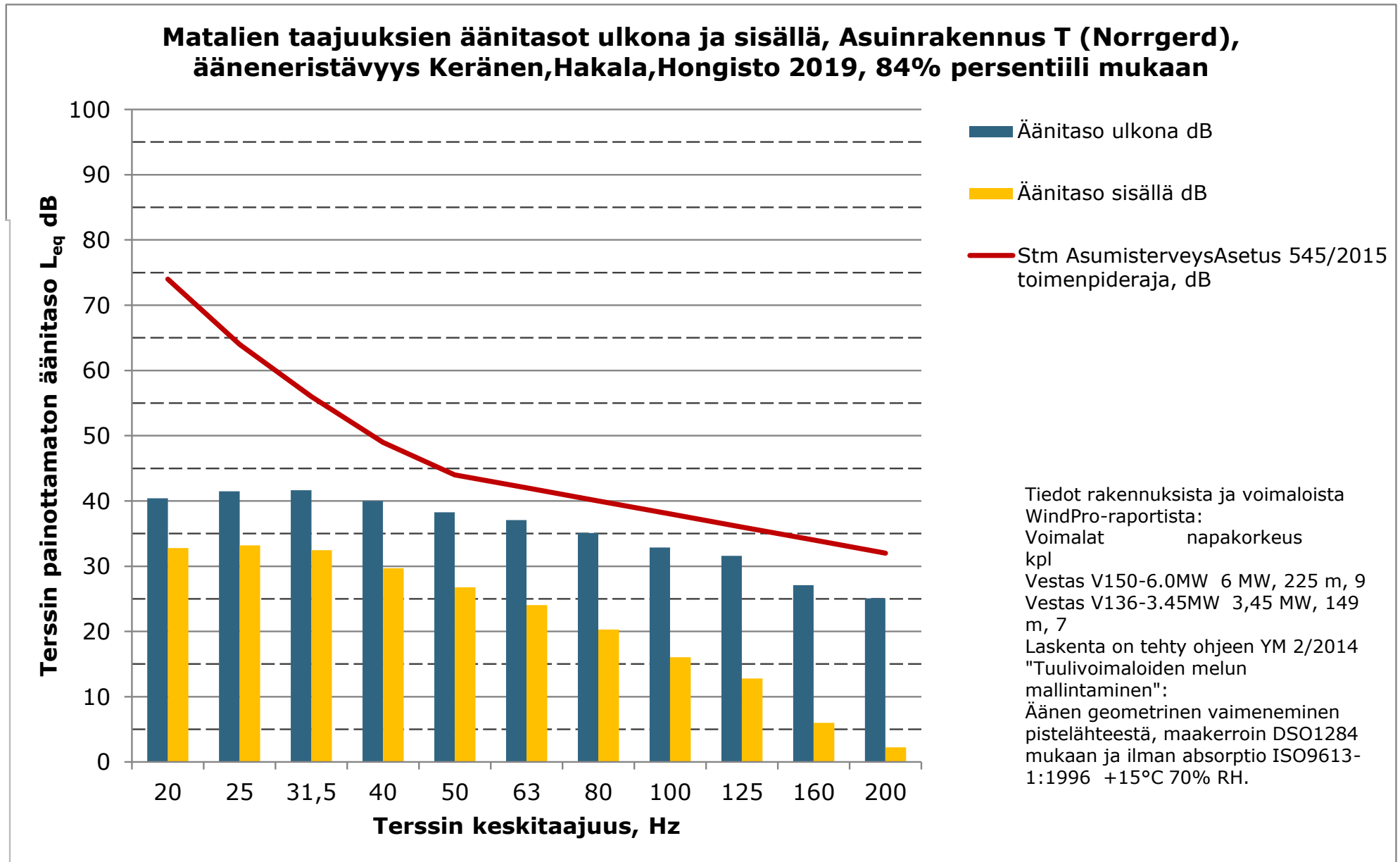


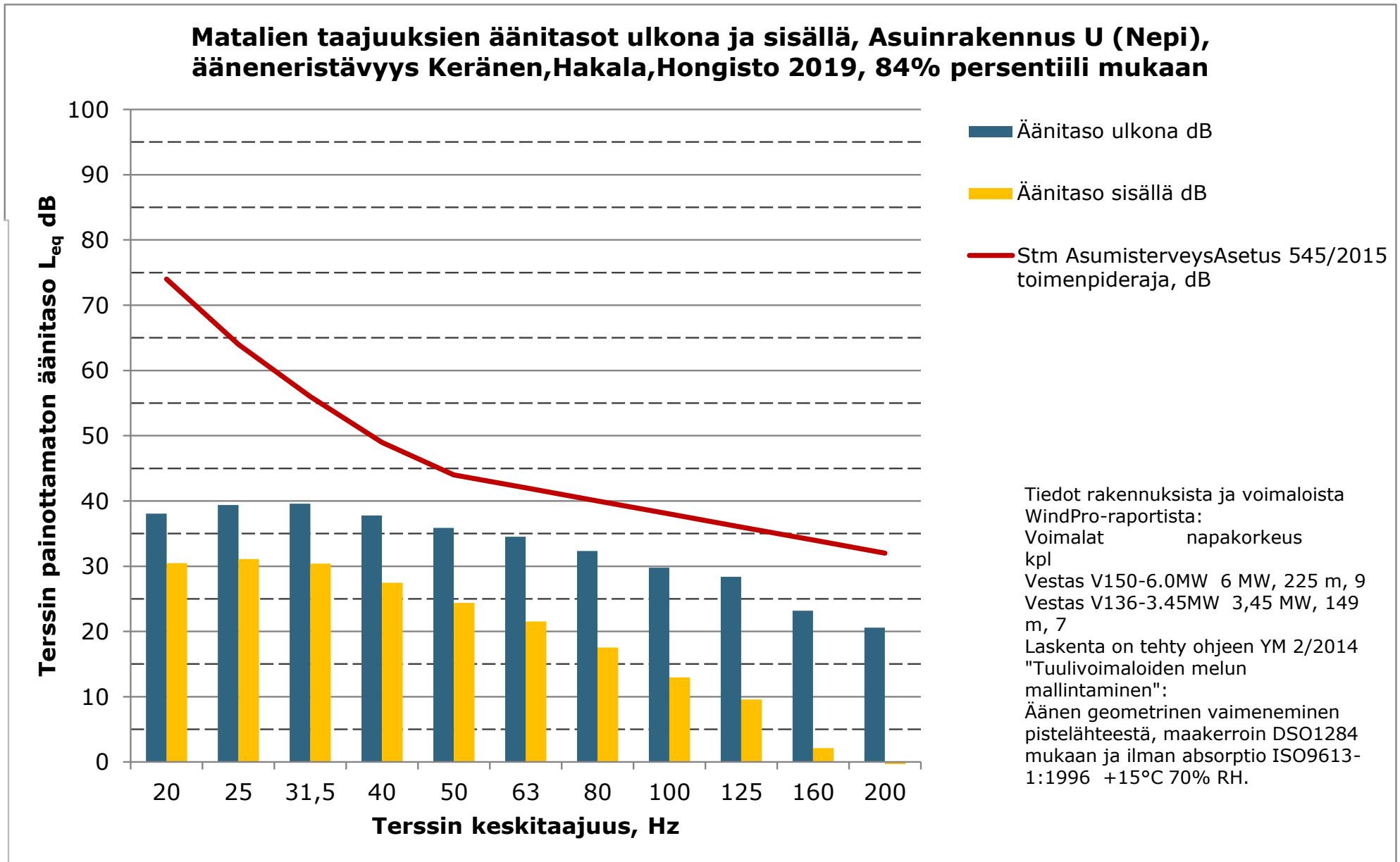
### Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q (Dalabacka), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persenttiili mukaan



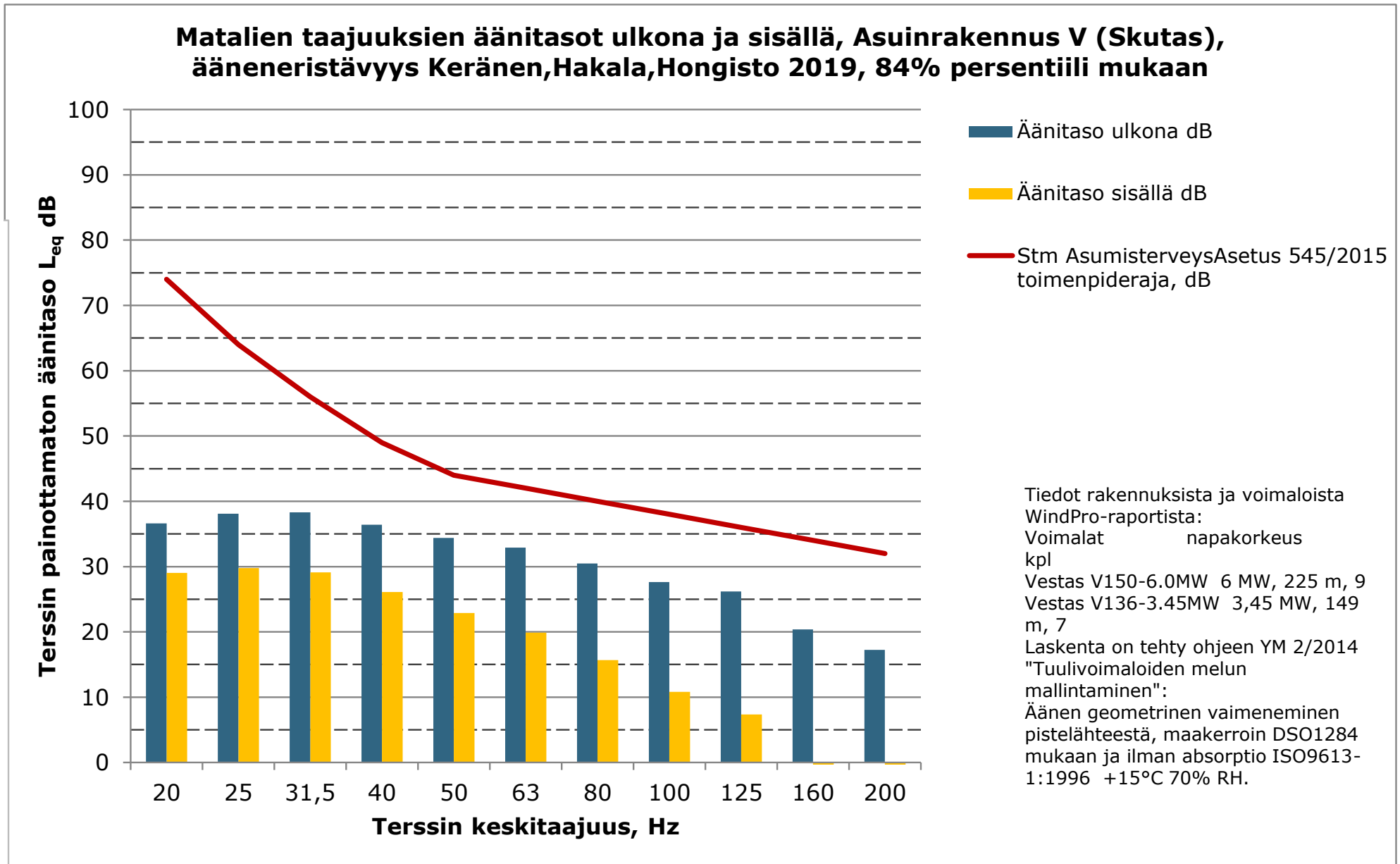


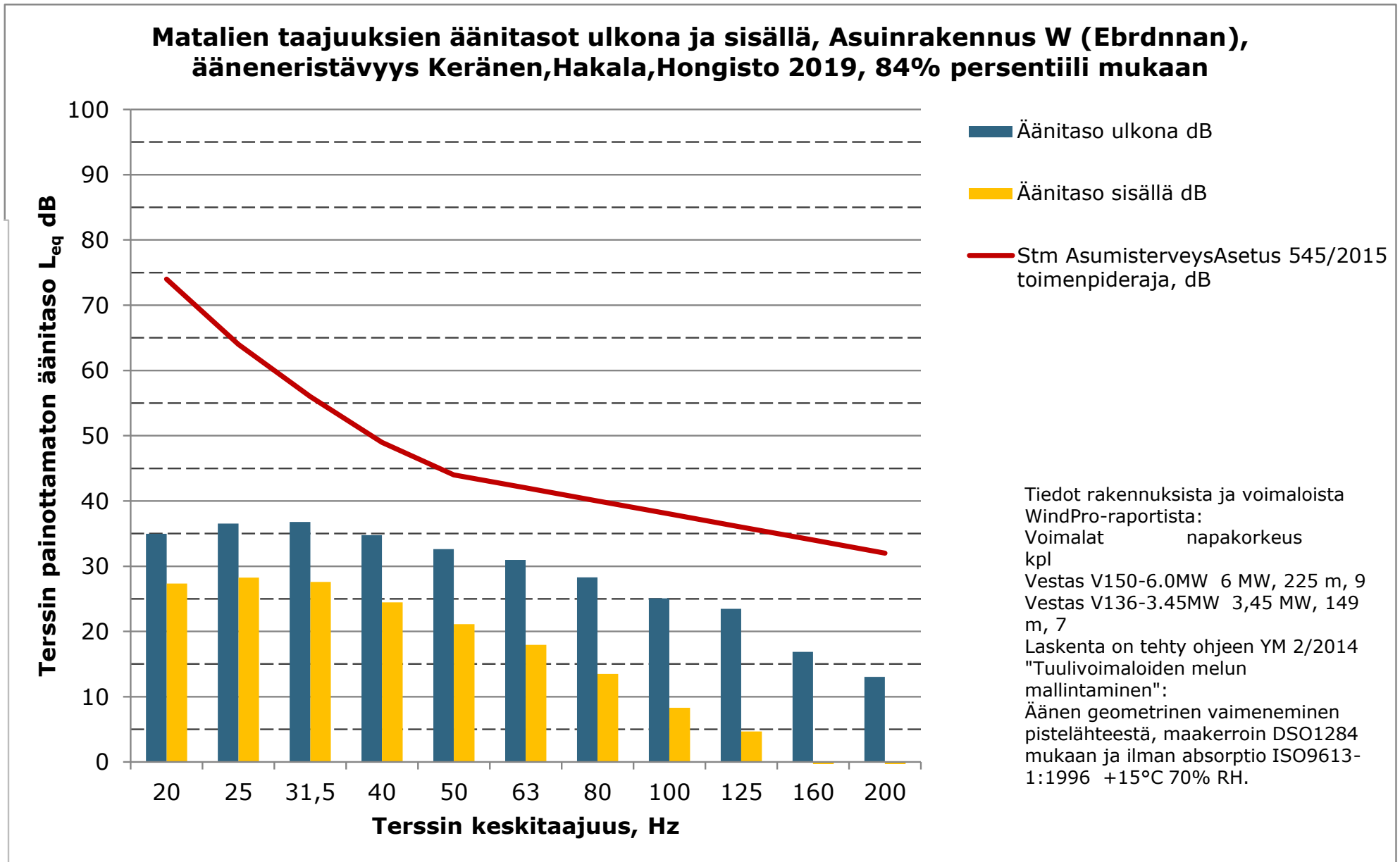


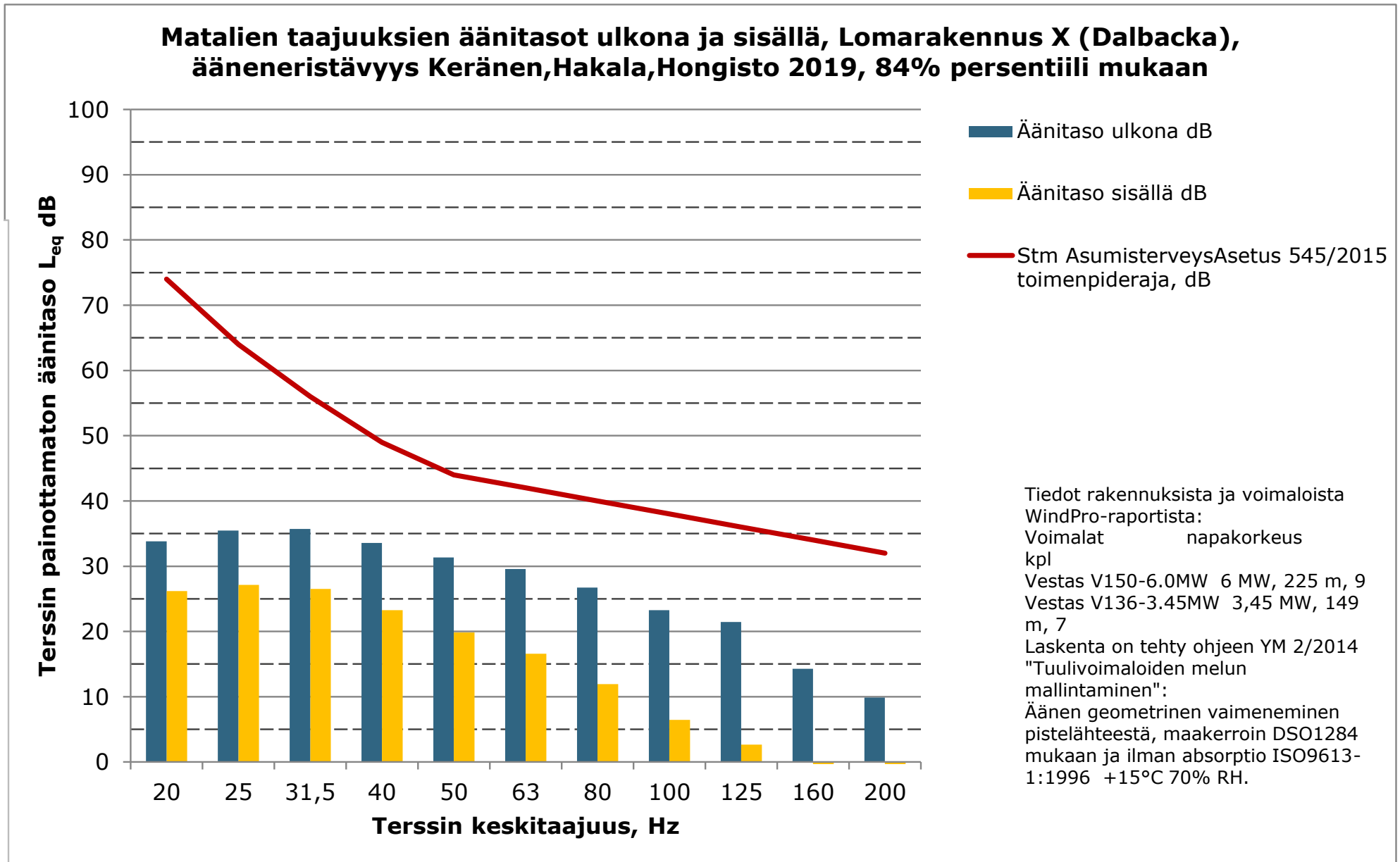


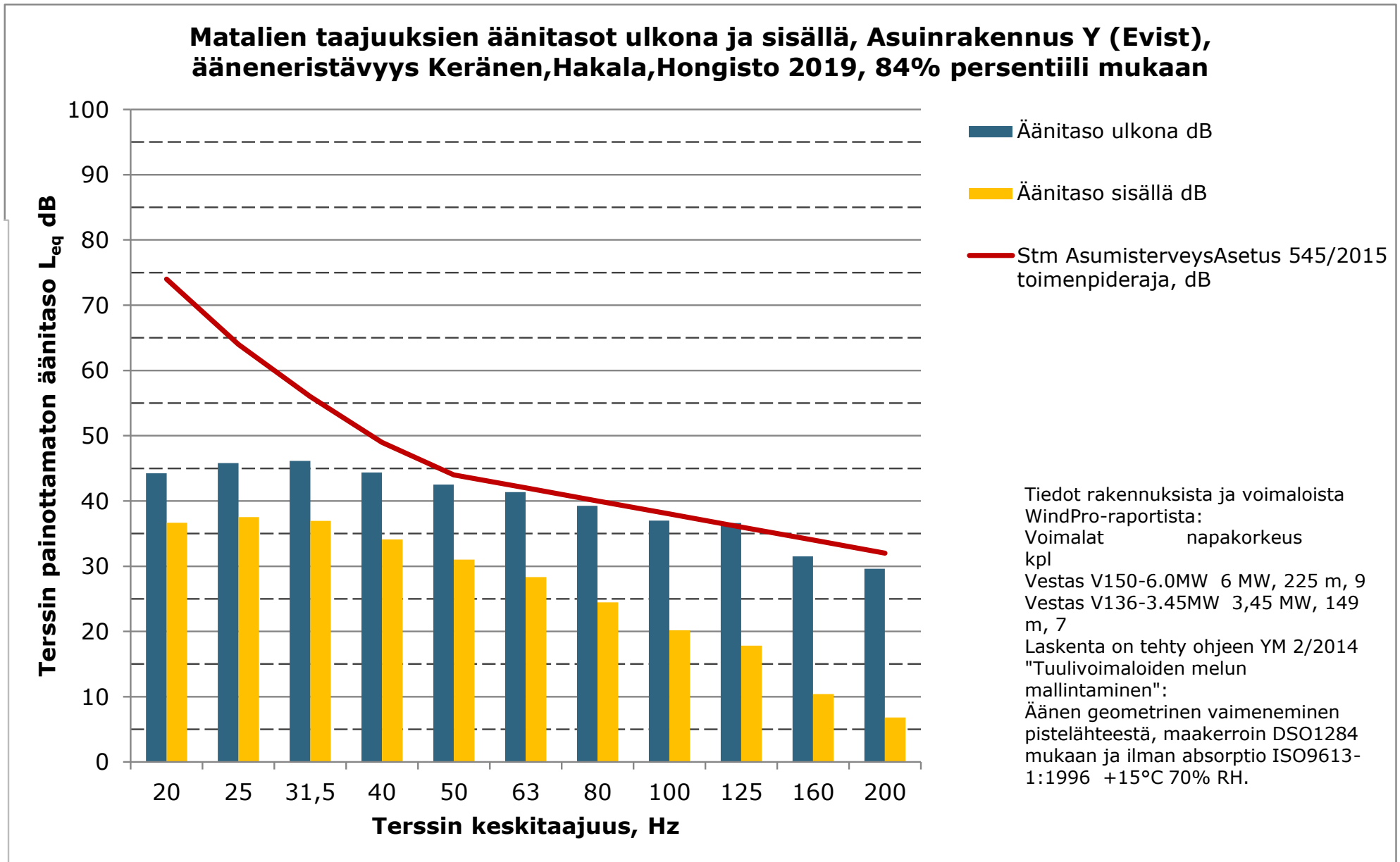


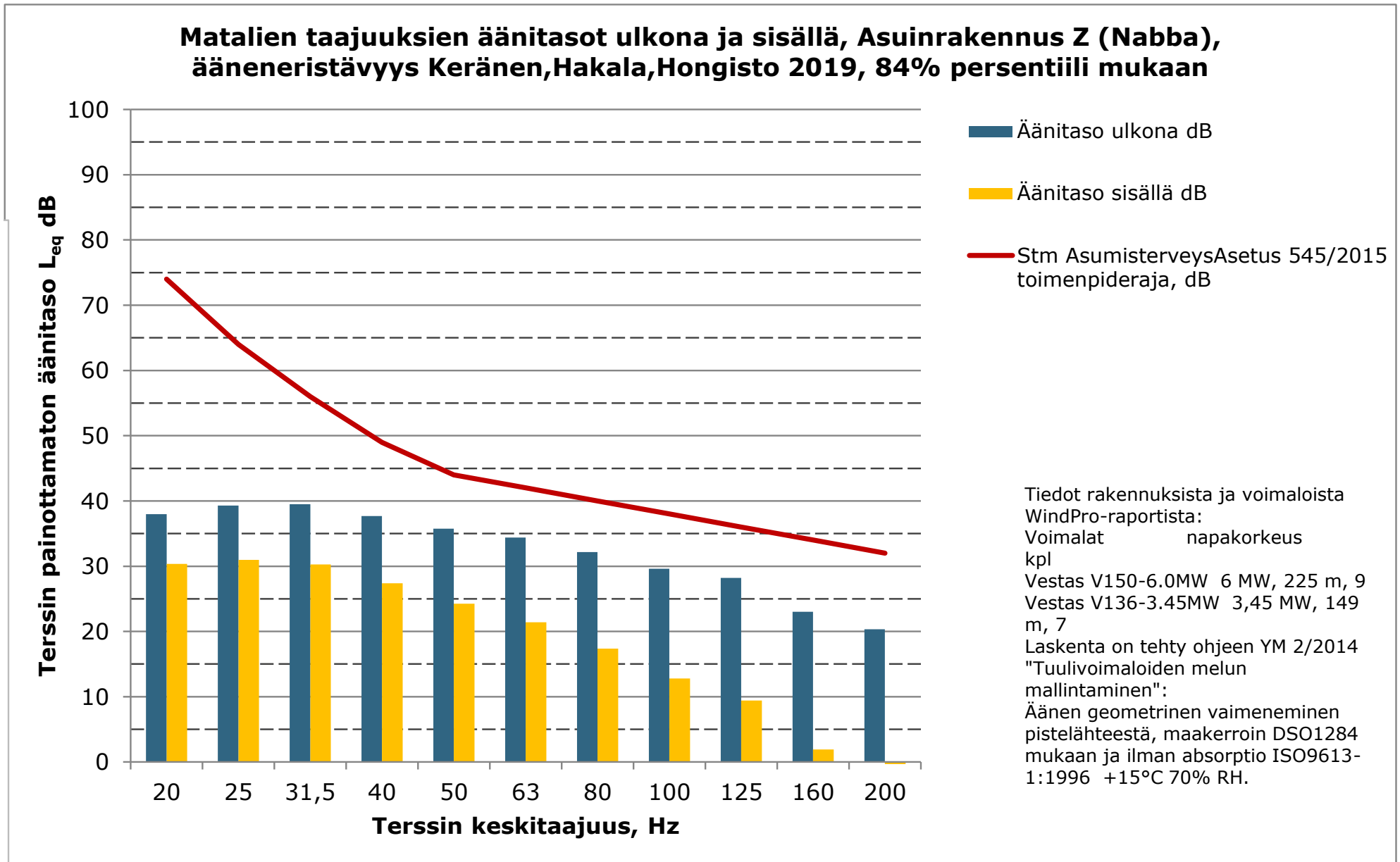












13.2.2023

---

Liite 9. Purmon tuulivoimahanke nykytilanne. Varjostusmallinnuksen tulokset "real case, no forest".

## SHADOW - Main Result

Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne

### 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) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

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\_Purmon tuulivoimaha

Obstacles used in calculation

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

### WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM
			[m]									
1	298 762	7 032 913	58,6	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
2	299 290	7 032 796	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
3	298 900	7 031 842	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
4	298 977	7 031 430	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
5	299 000	7 030 729	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
6	299 358	7 030 441	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
7	299 389	7 029 959	60,0	Generic RD180 HH150 7000 180...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4



New WTG

Scale 1:400 000  
Shadow receptor

### 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]
A	Asuinrakennus A (Lillkvist)	296 866	7 052 328	26,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Tormbacka)	298 274	7 049 757	28,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Kallträskvägen)	298 556	7 048 421	35,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Lomarakenus F (Källbacken)	299 710	7 044 165	37,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Kornjärvi)	301 071	7 040 772	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Långnabba)	300 689	7 036 583	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakenus L (Åvistvägen)	298 031	7 035 773	52,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Åvistvägen)	294 394	7 036 982	41,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Finnabbavägen)	294 415	7 037 260	40,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Asuinrakennus T (Norrgård)	293 326	7 042 304	30,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Asuinrakennus U (Näpi)	294 326	7 045 578	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
W	Asuinrakennus W (Åbrännan)	293 782	7 049 981	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne

...continued from previous page

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]
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Y	Asuinrakennus Y (Åvist)	294 403	7 036 830	41,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	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 (Lillkvist)	0:00
B	Asuinrakennus B (Dallberga)	0:00
C	Asuinrakennus C (Tormbacka)	0:00
D	Asuinrakennus D (Kallträskvägen)	0:00
E	Metsästysmaja E (Kejsarbacken)	0:00
F	Lomarakennus F (Källbacken)	0:00
G	Asuinrakennus G (Kornjärvi)	0:00
H	Asuinrakennus H (Sandnabba)	0:00
I	Asuinrakennus I (Asp)	0:00
J	Asuinrakennus J (Stennabba)	0:00
K	Asuinrakennus K (Långnabba)	0:00
L	Lomarakennus L (Åvistvägen)	0:00
M	Asuinrakennus M (Stenbacka)	0:00
N	Asuinrakennus N (Adler)	0:00
O	Asuinrakennus O (Åvistvägen)	0:00
P	Asuinrakennus P (Finnabbavägen)	0:00
Q	Asuinrakennus Q (Dalabacka)	0:00
R	Asuinrakennus R (Kronkvist)	0:00
S	Asuinrakennus S (Tällbacka)	0:00
T	Asuinrakennus T (Norrgård)	0:00
U	Asuinrakennus U (Näpi)	0:00
V	Asuinrakennus V (Skutas)	0:00
W	Asuinrakennus W (Åbrännan)	0:00
X	Lomarakennus X (Dalbacka)	0:00
Y	Asuinrakennus Y (Åvist)	0:00
Z	Asuinrakennus Z (Nabba)	0:00
AA	Asuinrakennus AA (Kronkvist)	0:00

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

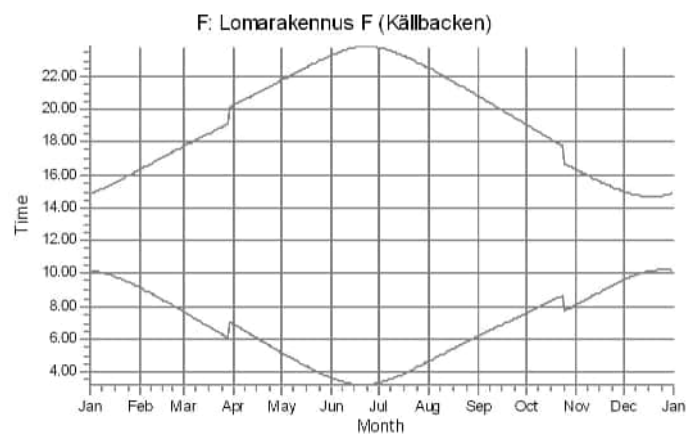
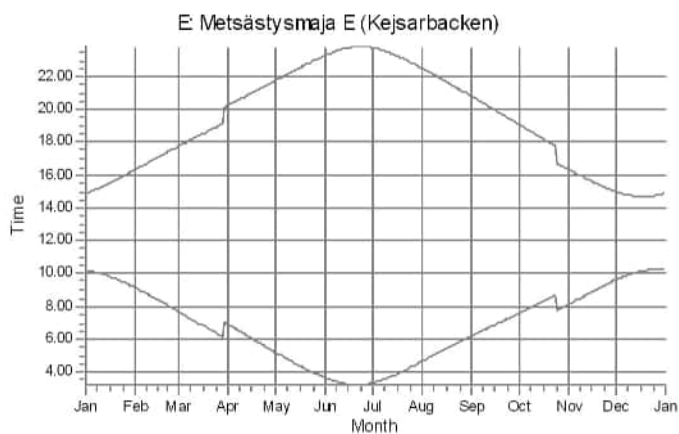
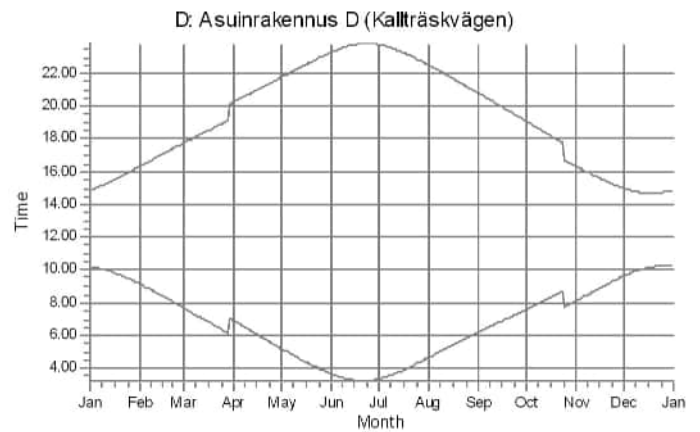
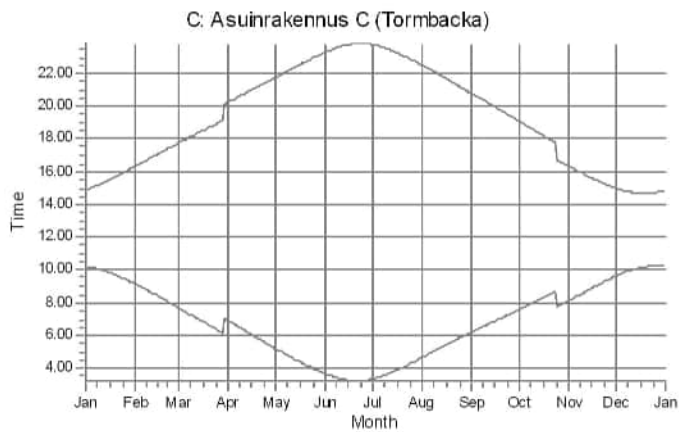
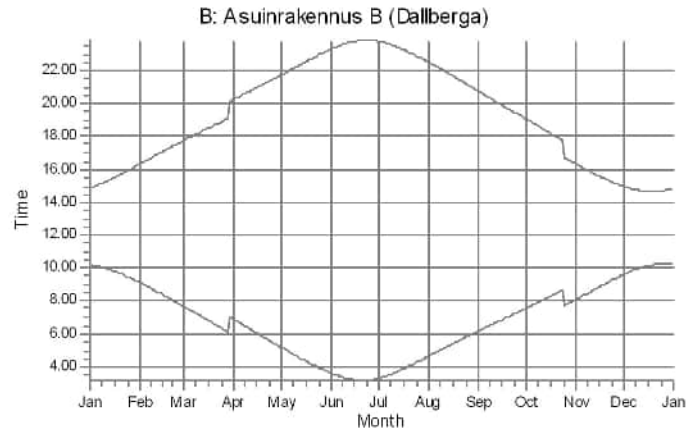
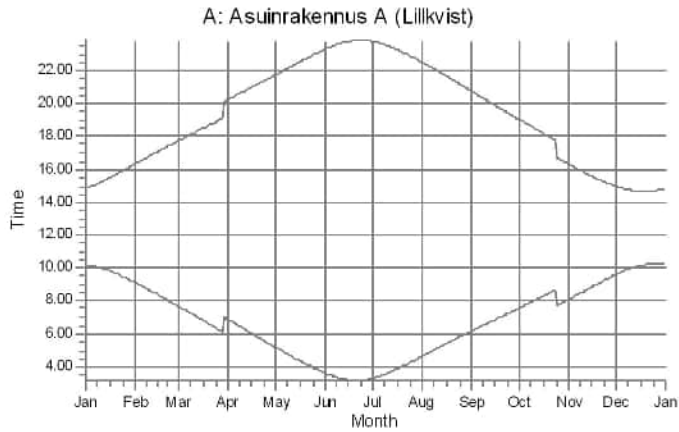
No.	Name	Expected [h/year]
1	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1454)	0:00
2	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1455)	0:00
3	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1456)	0:00
4	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1457)	0:00
5	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1458)	0:00
6	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1459)	0:00
7	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1460)	0:00

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.



## SHADOW - Calendar, graphical

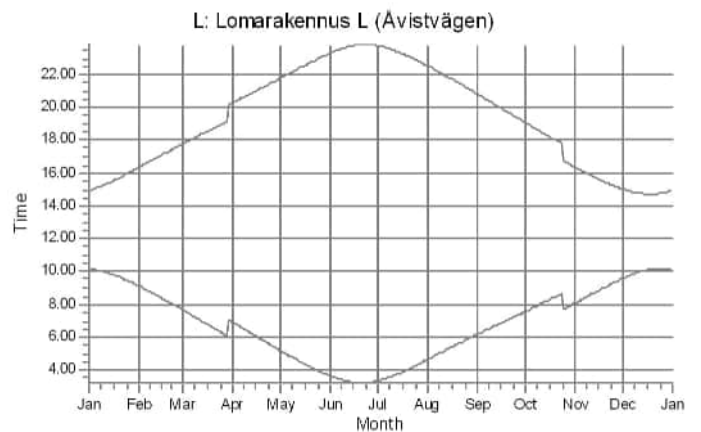
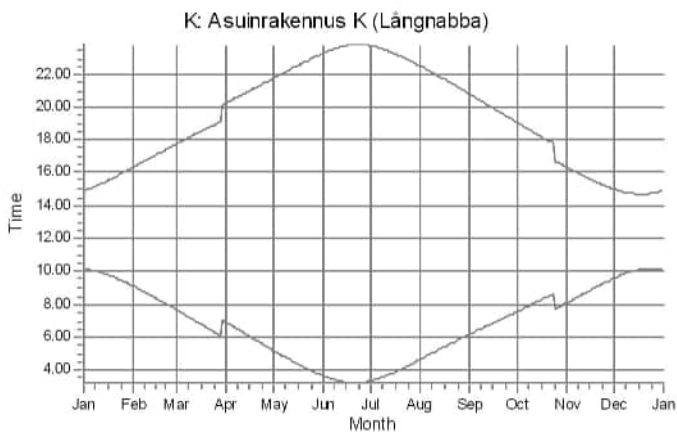
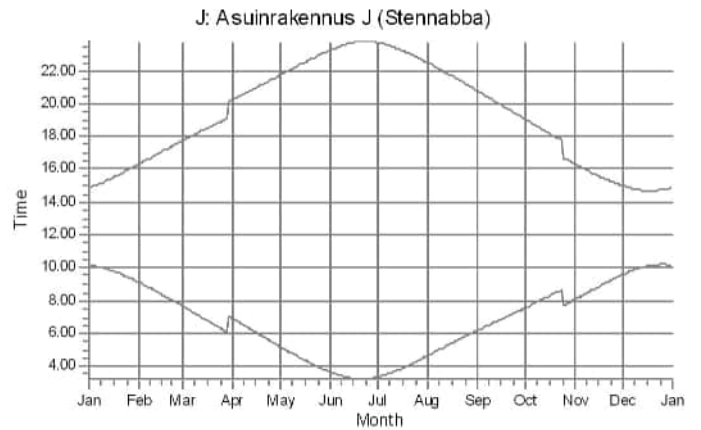
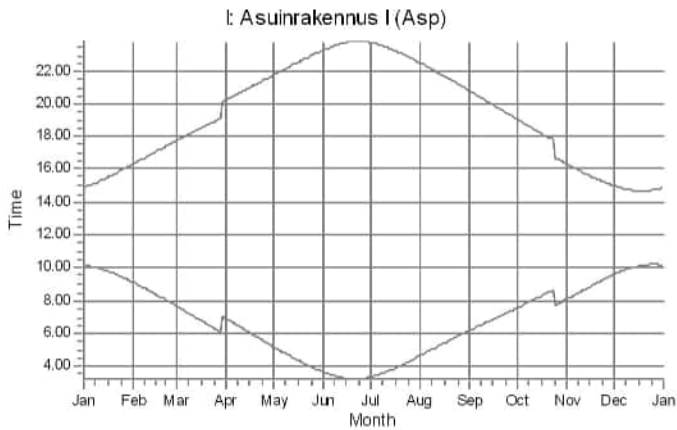
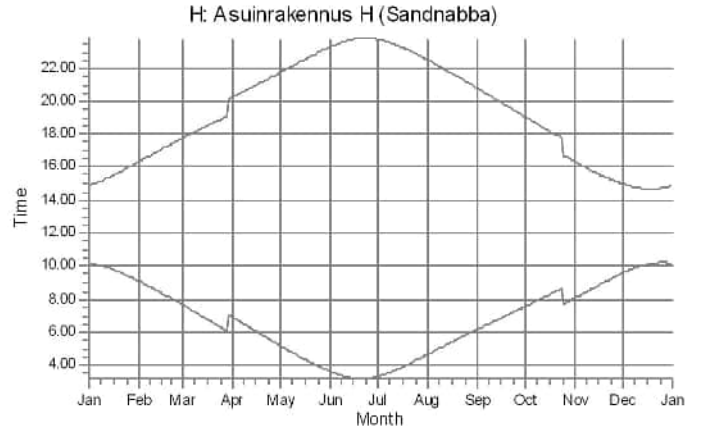
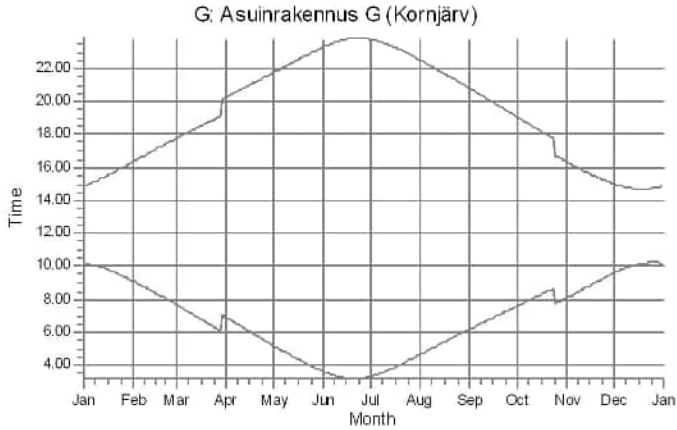
Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



WTGs

## SHADOW - Calendar, graphical

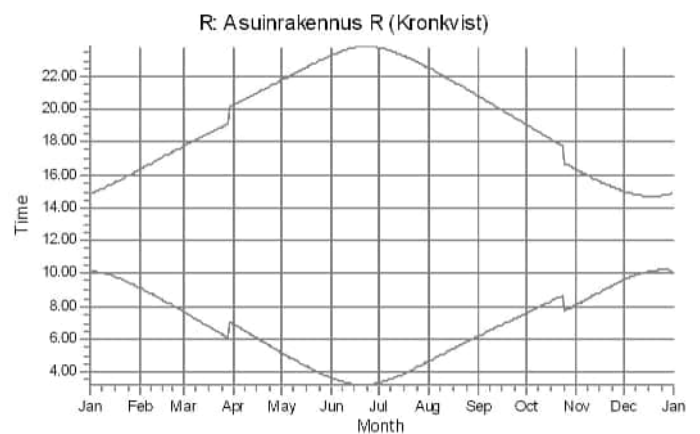
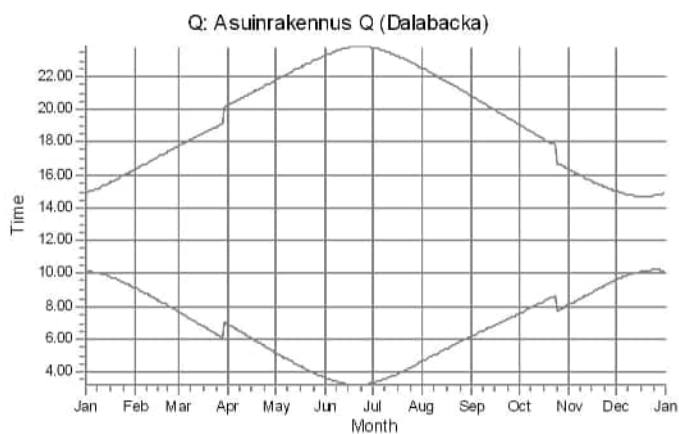
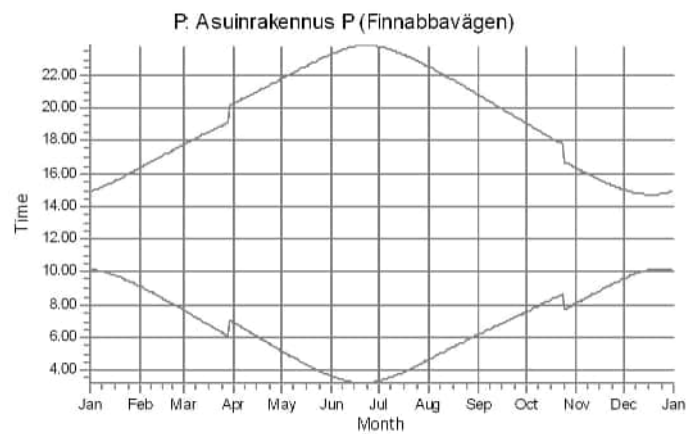
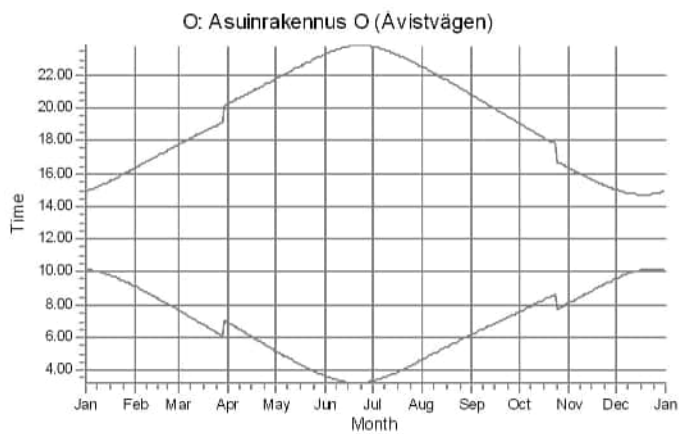
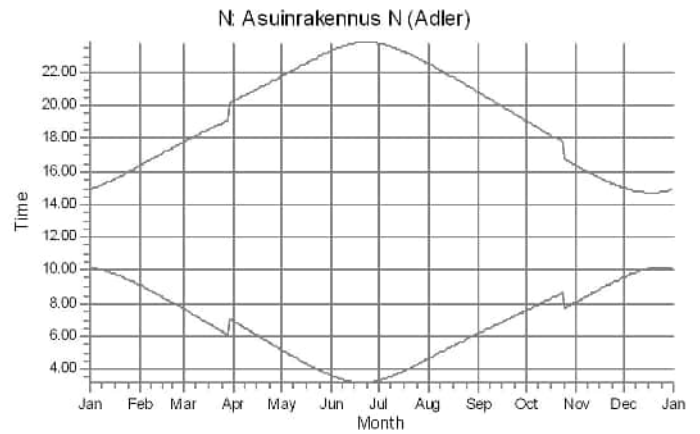
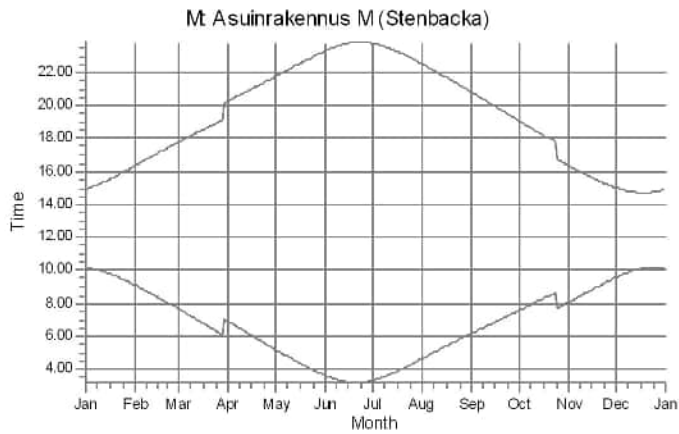
Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



WTGs

## SHADOW - Calendar, graphical

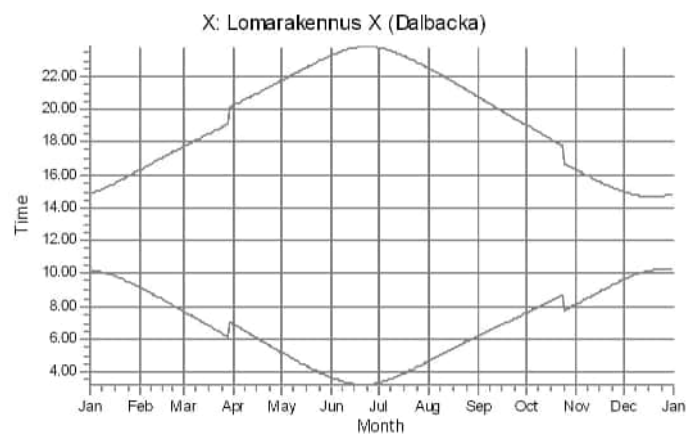
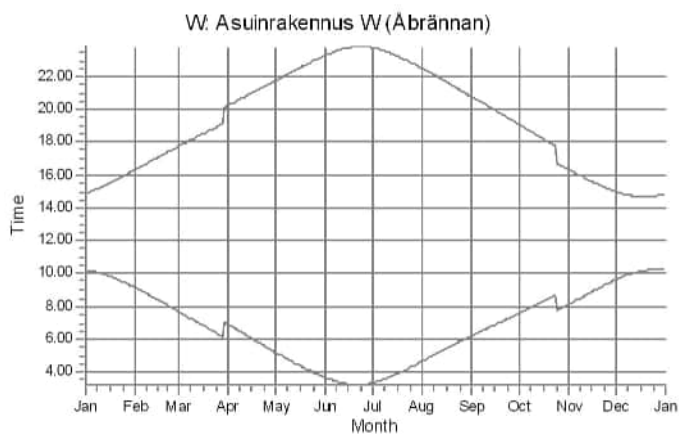
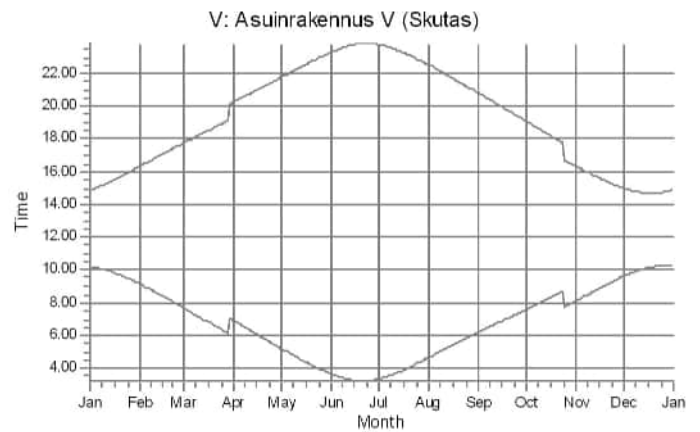
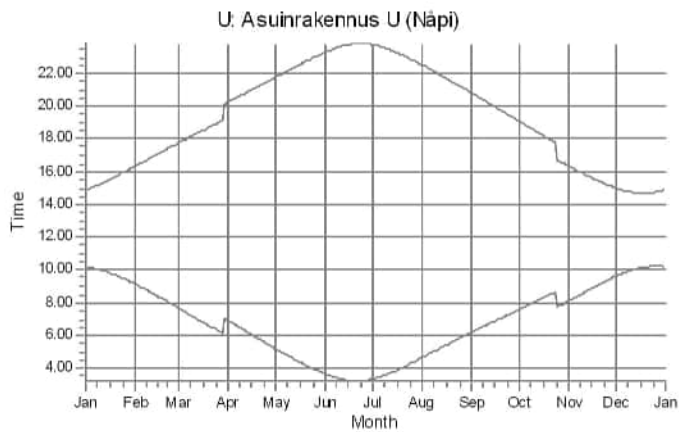
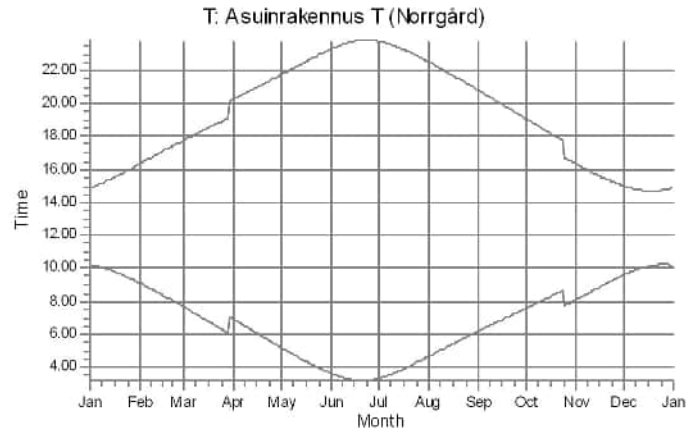
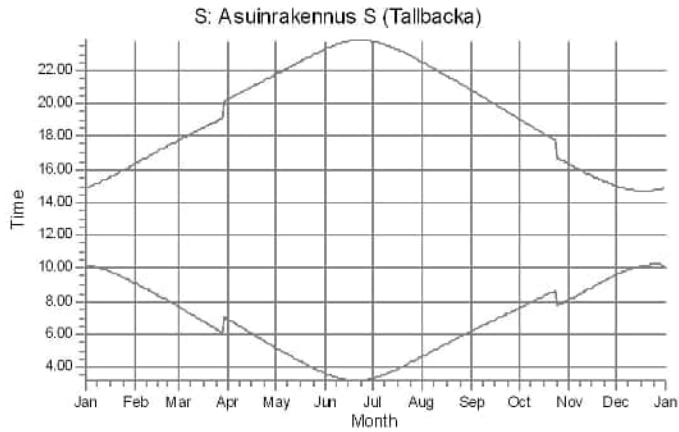
Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



WTGs

## SHADOW - Calendar, graphical

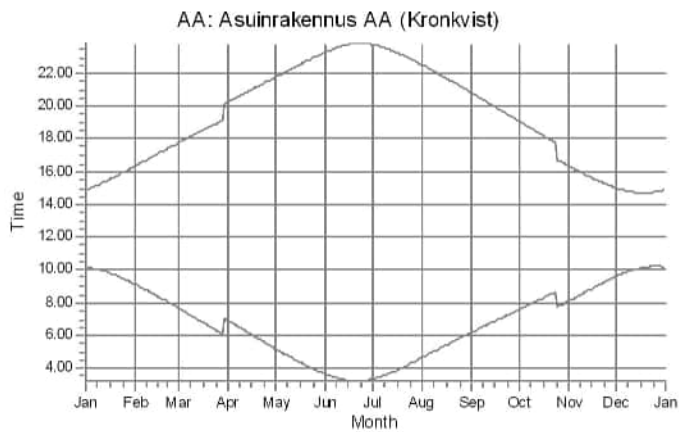
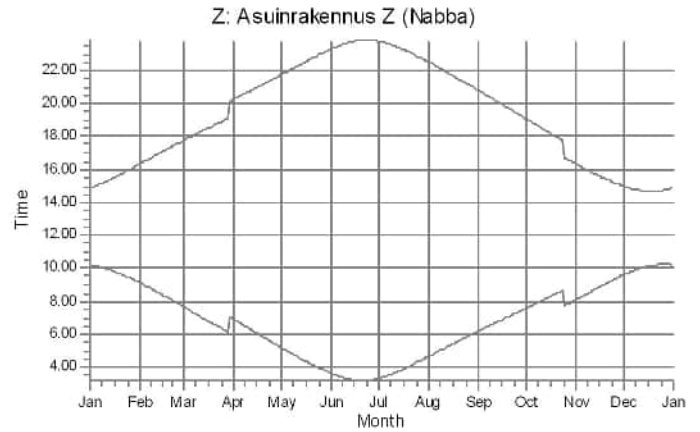
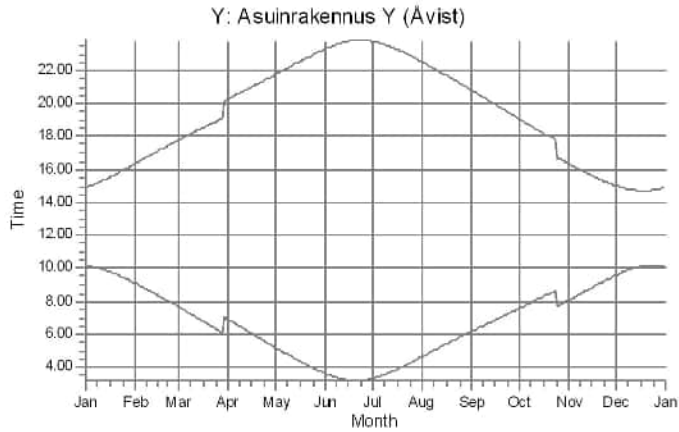
Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



WTGs

## SHADOW - Calendar, graphical

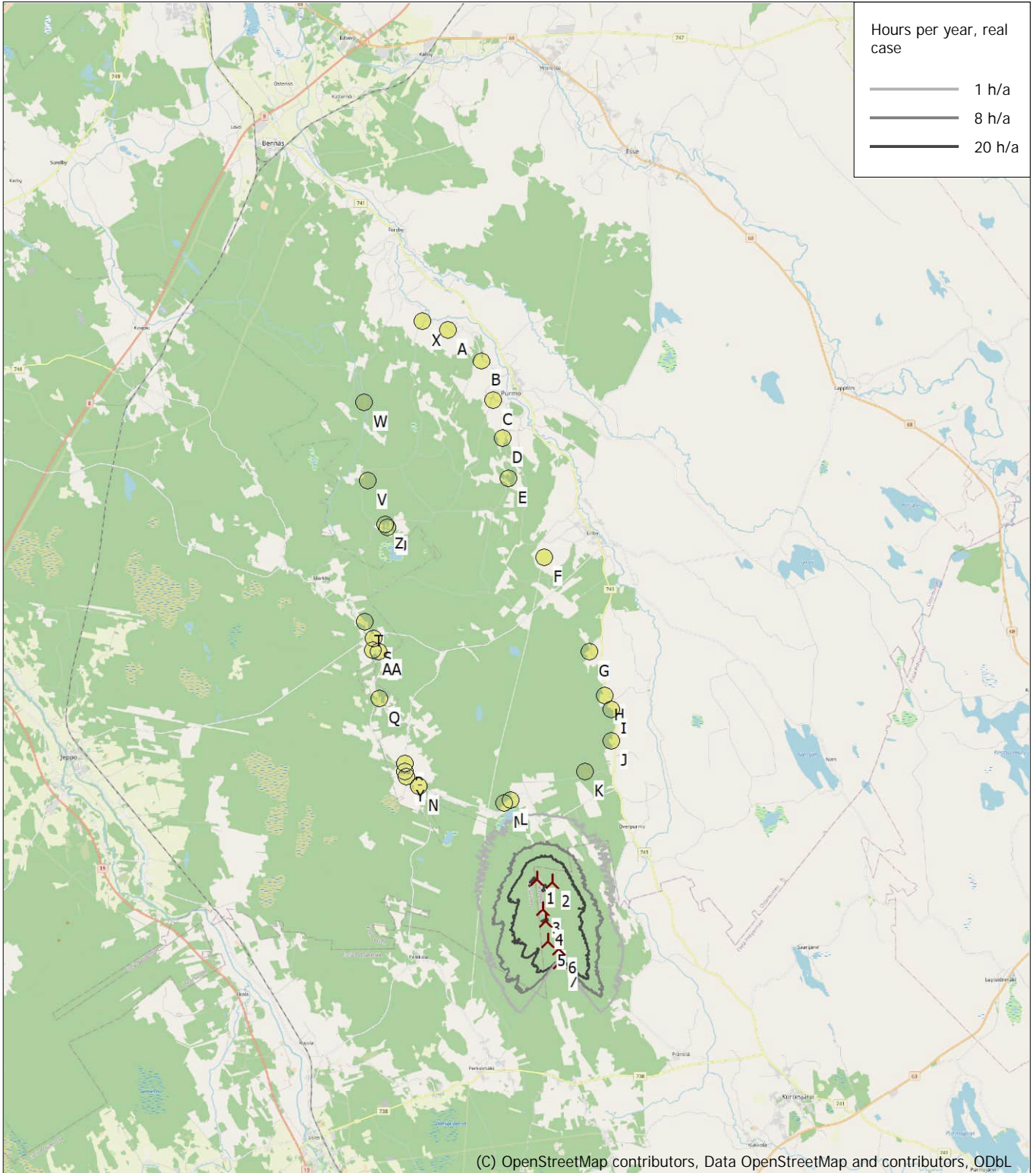
Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



WTGs

## SHADOW - Map

Calculation: Purmon hanke YV(Salo-Ylikoski)\_nykytilanne



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 298 050 North: 7 042 710

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_Purmon tuulivoimahanke\_0.wpo (4)

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

13.2.2023

---

Liite 10. Purmon tuulivoimahanke – varjostusmallinnuksen tulokset "real case, no forest" (VE1)  
Salo-Ylikosken hankkeen kanssa.

## SHADOW - Main Result

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

### 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

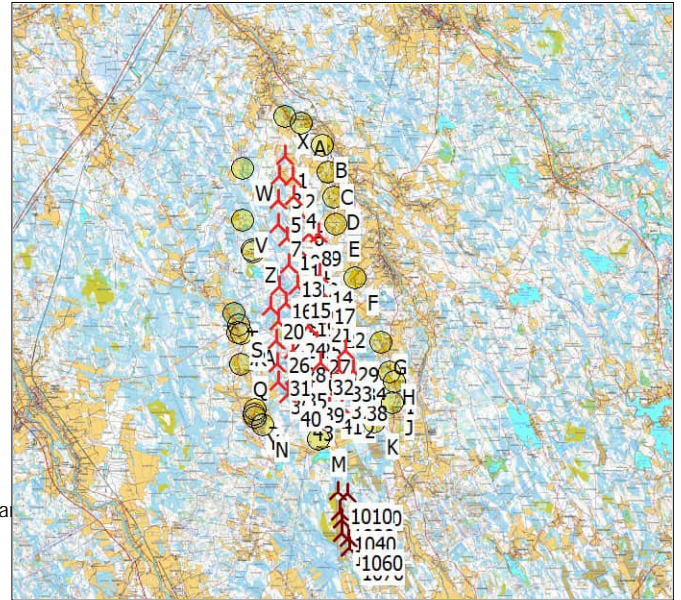
Sunshine probability S (Average daily sunshine hours) []  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

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\_Purmon tuulivoimahanke  
 Obstacles used in calculation  
 Receptor grid resolution: 1,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89

### WTGs



	East	North	Z	Row data/Description	WTG type			Shadow data					
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM	
			[m]										
1	296 015	7 050 633	25,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
2	296 402	7 049 512	28,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
3	295 688	7 049 533	26,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
4	296 468	7 048 488	31,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
5	295 661	7 048 308	32,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
6	296 860	7 047 573	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
7	295 626	7 047 011	32,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
8	297 281	7 046 511	32,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
9	297 768	7 046 509	35,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
10	296 092	7 046 333	36,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
11	296 633	7 045 796	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
12	297 035	7 044 833	36,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
13	296 211	7 044 887	37,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
14	297 806	7 044 390	40,6	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
15	296 659	7 043 785	40,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
16	295 680	7 043 726	37,7	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
17	297 935	7 043 485	36,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
18	297 013	7 042 799	42,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
19	296 033	7 042 892	40,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
20	295 245	7 042 663	37,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
21	298 459	7 042 222	42,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
22	297 759	7 042 500	40,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
23	295 640	7 041 888	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
24	297 207	7 041 637	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
25	296 420	7 041 637	37,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
26	297 642	7 040 813	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
27	295 536	7 040 877	38,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
28	299 185	7 040 392	48,4	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
29	296 377	7 040 414	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
30	297 071	7 039 884	45,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
31	295 591	7 039 696	41,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
32	298 849	7 039 361	49,7	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
33	299 581	7 039 334	53,6	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
34	296 466	7 039 042	47,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
35	297 841	7 039 740	47,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
36	295 637	7 038 744	41,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	
37	299 616	7 038 389	54,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4	

To be continued on next page...



## SHADOW - Main Result

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
38	298 820	7 038 484	53,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
39	296 154	7 038 055	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
40	297 367	7 038 248	47,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
41	298 305	7 037 659	50,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
42	298 984	7 037 431	54,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
43	296 802	7 037 326	47,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
44	298 762	7 032 913	58,6	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
45	299 290	7 032 796	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
46	298 900	7 031 842	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
47	298 977	7 031 430	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
48	299 000	7 030 729	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
49	299 358	7 030 441	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
50	299 389	7 029 959	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	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 (Lillkvist)	296 866	7 052 328	26,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Tornbacka)	298 274	7 049 757	28,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Kallträskvägen)	298 556	7 048 421	35,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Lomarakennus F (Källbacken)	299 710	7 044 165	37,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Kornjärvi)	301 071	7 040 772	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Långnabba)	300 689	7 036 583	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Åvistvägen)	298 031	7 035 773	52,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Åvistvägen)	294 394	7 036 982	41,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Finnabavägen)	294 415	7 037 260	40,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Asuinrakennus T (Norrgård)	293 326	7 042 304	30,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Asuinrakennus U (Näpi)	294 326	7 045 578	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
W	Asuinrakennus W (Åbrännan)	293 782	7 049 981	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
X	Lomarakennus X (Dalabacka)	296 008	7 052 686	21,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Y	Asuinrakennus Y (Åvist)	294 403	7 036 830	41,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	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 (Lillkvist)	2:17
B	Asuinrakennus B (Dallberga)	1:34
C	Asuinrakennus C (Tornbacka)	1:42
D	Asuinrakennus D (Kallträskvägen)	4:01
E	Metsästysmaja E (Kejsarbacken)	11:36
F	Lomarakennus F (Källbacken)	3:53
G	Asuinrakennus G (Kornjärvi)	3:27
H	Asuinrakennus H (Sandnabba)	3:25
I	Asuinrakennus I (Asp)	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

...continued from previous page

No.	Name	Shadow, expected values	
		Shadow hours	per year [h/year]
J	Asuinrakennus J (Stennabba)	0:00	
K	Asuinrakennus K (Långnabba)	2:49	
L	Lomarakennus L (Åvistvägen)	3:34	
M	Asuinrakennus M (Stenbacka)	0:00	
N	Asuinrakennus N (Adler)	0:00	
O	Asuinrakennus O (Åvistvägen)	4:30	
P	Asuinrakennus P (Finnabbavägen)	3:43	
Q	Asuinrakennus Q (Dalabacka)	1:58	
R	Asuinrakennus R (Kronkvist)	8:35	
S	Asuinrakennus S (Tallbacka)	6:39	
T	Asuinrakennus T (Norrgård)	2:05	
U	Asuinrakennus U (Näpi)	5:56	
V	Asuinrakennus V (Skutas)	1:49	
W	Asuinrakennus W (Åbrännan)	1:36	
X	Lomarakennus X (Dalbacka)	2:49	
Y	Asuinrakennus Y (Åvist)	0:00	
Z	Asuinrakennus Z (Nabba)	6:28	
AA	Asuinrakennus AA (Kronkvist)	1:28	

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1279)	6:40
2	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1280)	1:42
3	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1281)	1:36
4	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1282)	0:00
5	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1283)	0:00
6	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1284)	4:13
7	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1285)	6:15
8	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1286)	3:02
9	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1287)	8:18
10	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1288)	5:06
11	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1289)	0:00
12	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1290)	0:00
13	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1291)	1:29
14	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1292)	2:01
15	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1293)	0:00
16	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1294)	0:00
17	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1295)	1:51
18	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1296)	0:00
19	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1297)	0:00
20	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1298)	11:21
21	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1299)	0:00
22	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1300)	0:00
23	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1301)	4:10
24	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1302)	0:00
25	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1303)	0:00
26	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1304)	0:00
27	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1305)	1:59
28	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1306)	1:37
29	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1307)	0:00
30	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1308)	0:00
31	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1309)	1:58
32	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1310)	0:00
33	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1311)	3:41
34	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1312)	0:00
35	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1313)	0:00
36	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1314)	0:00
37	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1315)	1:34
38	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1316)	0:00
39	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1317)	8:14
40	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1318)	0:00

To be continued on next page...

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 16.18/3.5.584

## SHADOW - Main Result

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

...continued from previous page

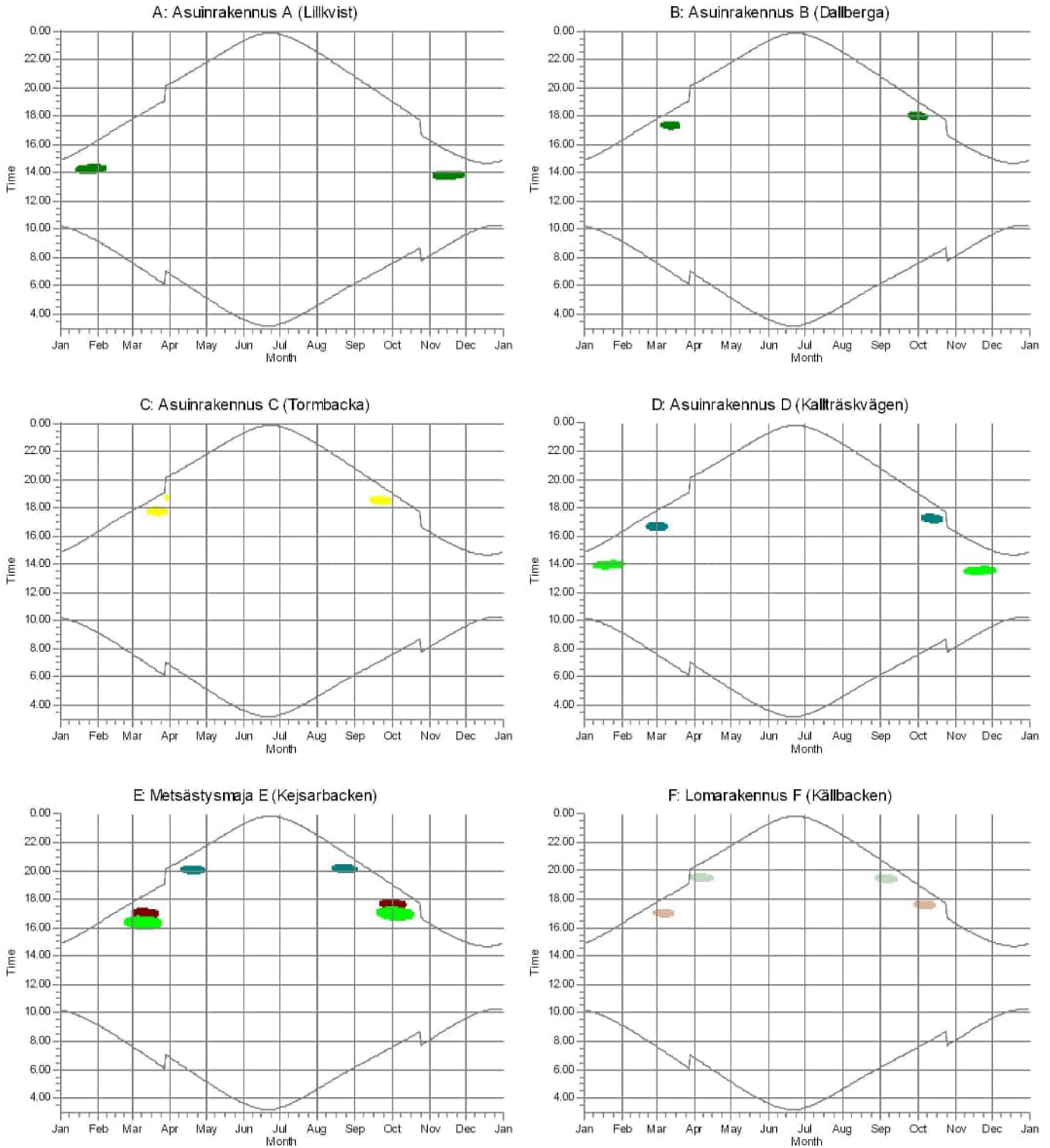
No.	Name	Expected [h/year]
41	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1319)	0:00
42	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1320)	2:49
43	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1321)	3:34
44	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1454)	0:00
45	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1455)	0:00
46	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1456)	0:00
47	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1457)	0:00
48	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1458)	0:00
49	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1459)	0:00
50	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1460)	0:00

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.

## SHADOW - Calendar, graphical

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

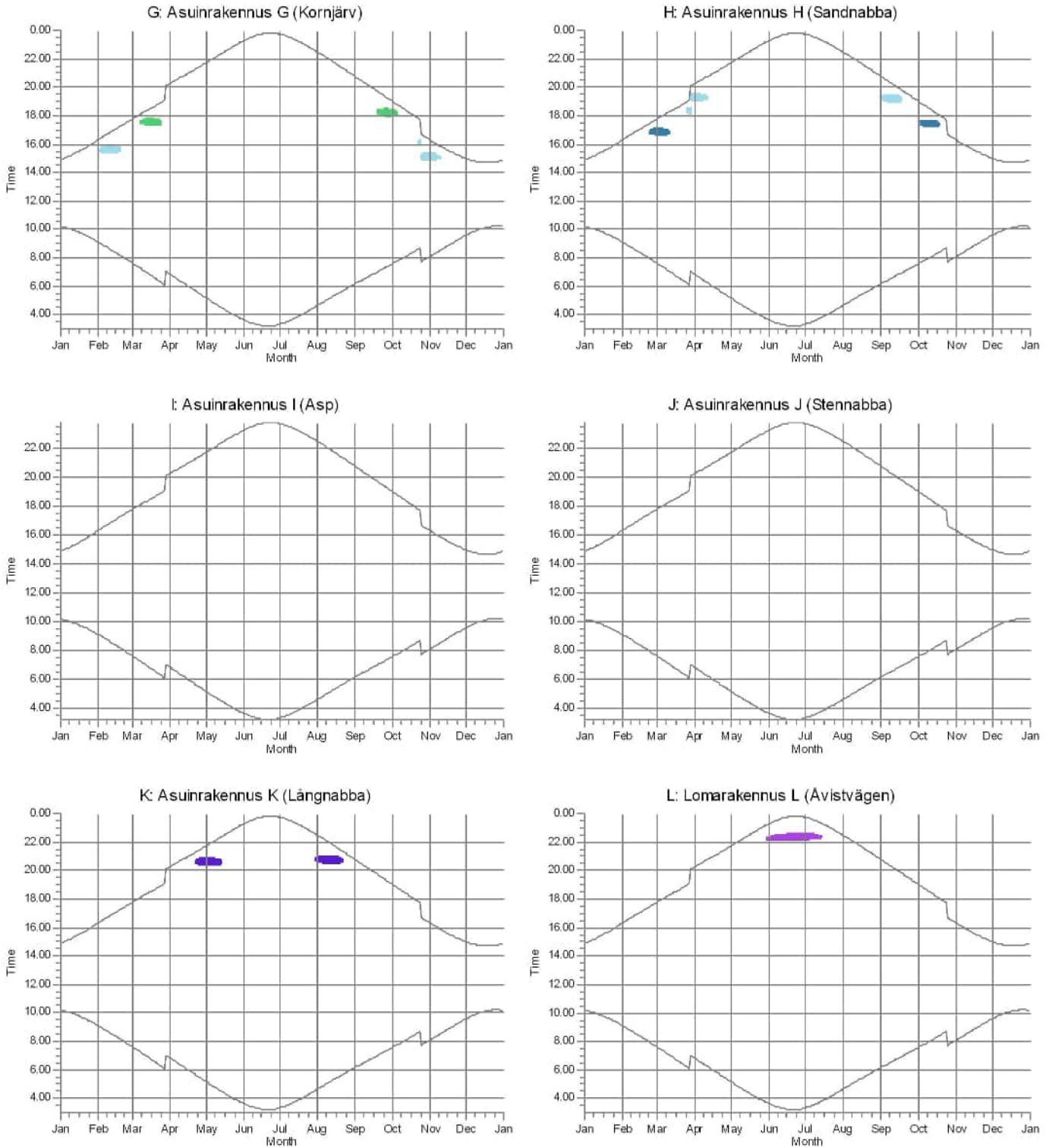


WTGs

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>1: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1279)</li> <li>2: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1280)</li> <li>6: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1284)</li> </ul> | <ul style="list-style-type: none"> <li>8: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1286)</li> <li>9: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1287)</li> <li>14: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1292)</li> </ul> | <ul style="list-style-type: none"> <li>17: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1295)</li> </ul> |
|---|--|--|

## SHADOW - Calendar, graphical

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

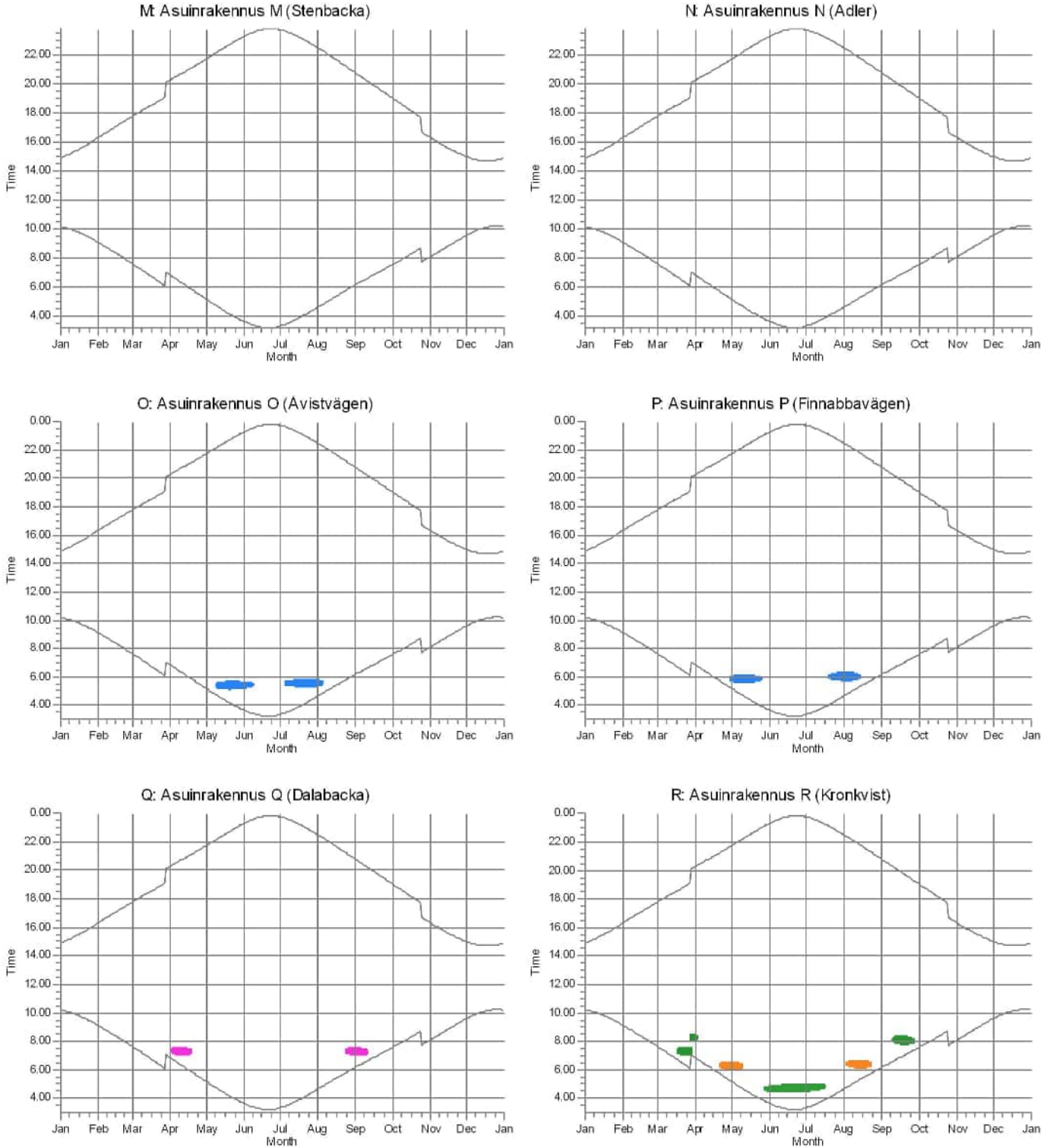


WTGs

- 28: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1306)
- 37: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1315)
- 43: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1321)
- 33: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1311)
- 42: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1320)

## SHADOW - Calendar, graphical

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

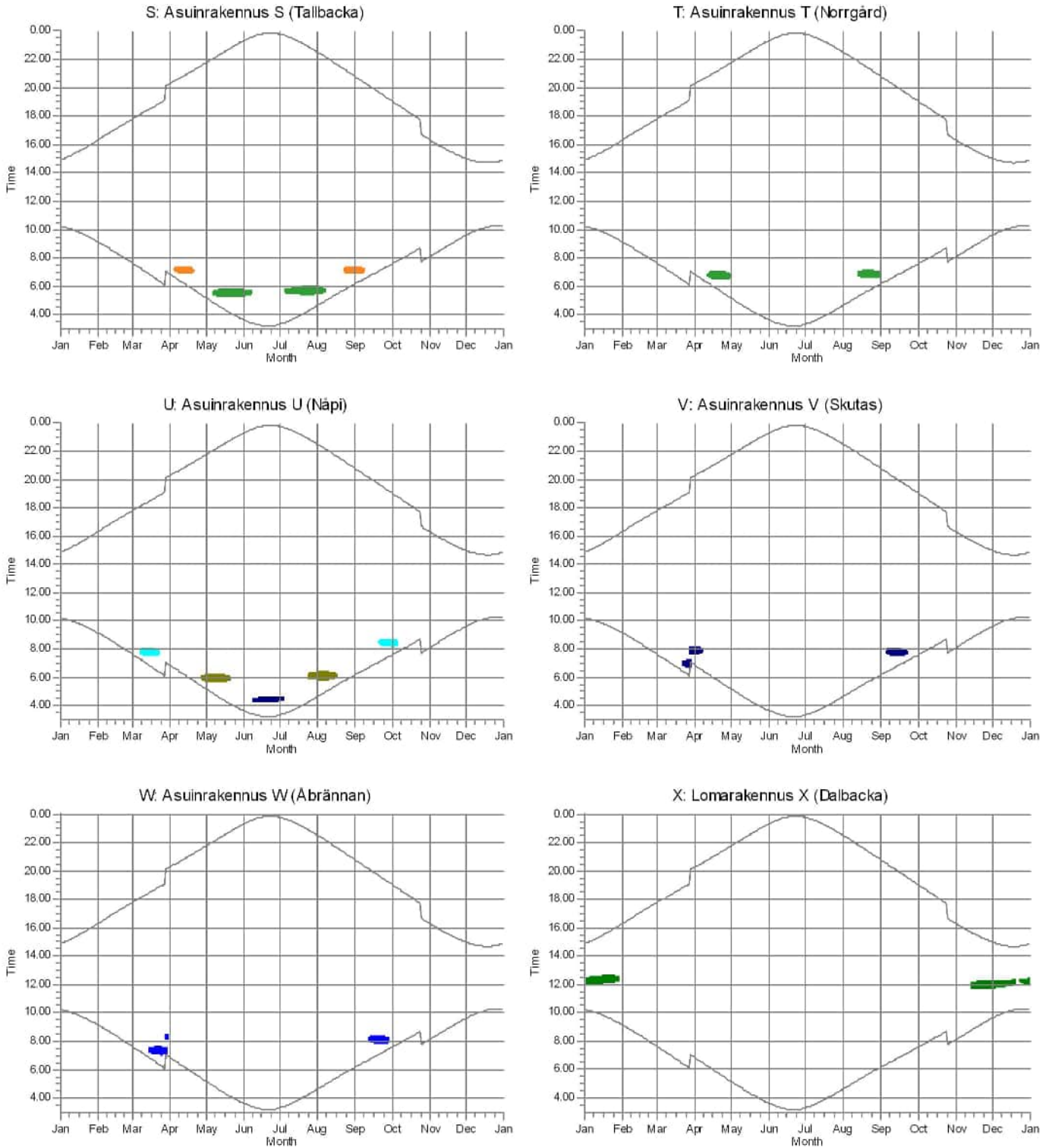


WTGs

- 20: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1298)
- 23: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1301)
- 27: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1305)
- 31: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1309)
- 39: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1317)

## SHADOW - Calendar, graphical

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)

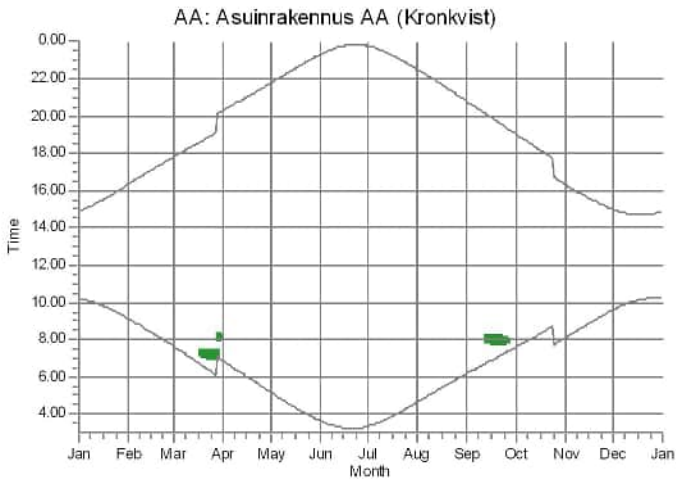
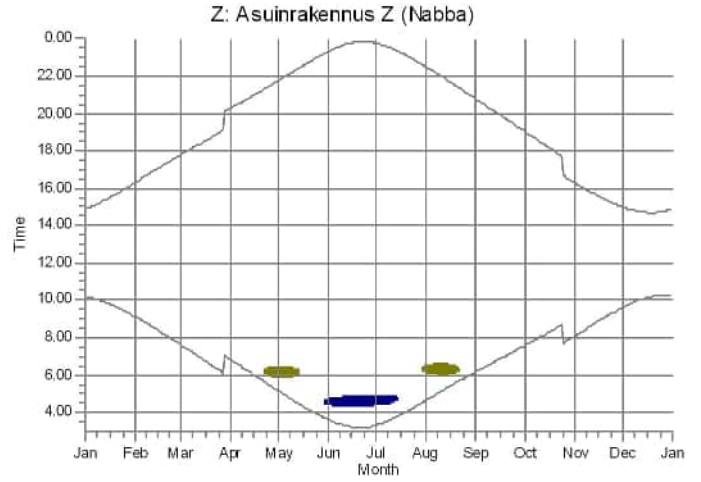
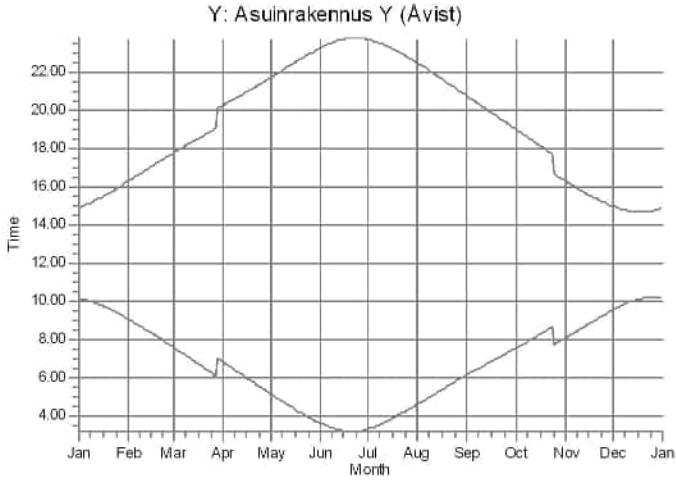


WTGs

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>1: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1279)</li> <li>3: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1281)</li> <li>7: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1285)</li> </ul> | <ul style="list-style-type: none"> <li>10: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1288)</li> <li>13: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1291)</li> <li>20: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1298)</li> </ul> | <ul style="list-style-type: none"> <li>23: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1301)</li> </ul> |
|---|--|--|

## SHADOW - Calendar, graphical

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)



WTGs

7: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1285)

10: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1288)

27: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1305)



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 1 - Generic RD200 HH200 ABO Wind 5600 200.0 IQ! hub: 200,0 m (TOT: 300,0 m) (1279)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to June) and rows for days (1 to 31). Each cell contains a matrix of values representing shadow calculations for that day. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 1 - Generic RD200 HH200 ABO Wind 5600 200.0 IQ! hub: 200,0 m (TOT: 300,0 m) (1279)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

	July	August	September	October	November	December
1	03.18 23.46	04.39 22.30	06.11 20.46	07.34 19.02	17.47-18.11/24 08.06	08.06 14.58
2	03.20 23.44	04.42 22.27	06.13 20.42	07.37 18.58	17.47-18.11/24 16.15	08.09 14.56
3	03.22 23.43	04.45 22.23	06.16 20.39	07.40 18.55	17.47-18.10/23 16.12	08.12 14.54
4	03.23 23.41	04.48 22.20	06.19 20.36	07.43 18.51	17.48-18.09/21 16.09	08.15 14.53
5	03.25 23.40	04.51 22.17	06.22 20.32	07.46 18.48	17.48-18.08/20 16.06	08.18 14.51
6	03.27 23.38	04.54 22.14	06.25 20.29	07.49 18.45	17.49-18.06/17 16.03	08.21 14.50
7	03.29 23.36	04.57 22.10	06.27 20.25	07.51 18.41	17.50-18.03/13 16.00	08.24 14.48
8	03.32 23.34	05.00 22.07	06.30 20.22	07.54 18.38	17.52-17.59/7 15.57	08.27 14.47
9	03.34 23.32	05.03 22.04	06.33 20.18	07.57 18.34	13.38-14.00/22 15.54	08.31 14.46
10	03.36 23.30	05.06 22.01	06.36 20.15	08.00 18.31	13.37-14.01/24 15.51	08.34 14.45
11	03.39 23.28	05.09 21.57	06.39 20.11	08.03 18.28	13.37-14.01/24 15.48	08.37 14.43
12	03.41 23.26	05.12 21.54	06.41 20.08	08.06 18.24	13.36-14.01/25 15.45	08.40 14.43
13	03.44 23.23	05.15 21.51	06.44 20.04	08.09 18.21	13.36-14.01/25 15.42	08.43 14.42
14	03.46 23.21	05.18 21.47	06.47 20.01	08.12 18.17	11.51-12.00/9 15.39	08.46 14.41
15	03.49 23.19	05.21 21.44	06.50 19.57	08.14 18.14	11.49-12.03/14 15.37	08.49 14.41
16	03.52 23.16	05.24 21.41	06.53 19.54	08.17 18.11	11.48-12.04/16 15.34	08.52 14.40
17	03.54 23.13	05.27 21.37	06.55 19.50	08.20 18.07	11.48-12.06/18 15.31	08.56 14.40
18	03.57 23.11	05.30 21.34	06.58 19.47	08.23 18.04	11.47-12.07/20 15.28	08.59 14.40
19	04.00 23.08	05.33 21.31	07.01 19.43	08.26 18.01	11.47-12.08/21 15.26	09.02 14.40
20	04.03 23.05	05.36 21.27	07.04 19.40	08.29 17.57	11.46-12.09/23 15.23	09.05 14.40
21	04.06 23.03	05.39 21.24	07.07 19.36	08.32 17.54	11.46-12.09/23 15.21	09.08 14.40
22	04.09 23.00	05.42 21.20	07.09 19.33	08.35 17.51	11.46-12.09/23 15.18	09.11 14.41
23	04.12 22.57	05.45 21.17	07.12 19.30	08.38 17.47	11.46-12.10/24 15.16	09.14 14.41
24	04.15 22.54	05.47 21.13	07.15 19.26	08.41 17.44	11.47-12.11/24 15.13	09.17 14.42
25	04.17 22.51	05.50 21.10	07.18 19.23	08.44 17.41	11.47-12.11/24 15.11	09.20 14.43
26	04.20 22.48	05.53 21.07	07.20 19.19	08.47 17.38	11.46-12.11/25 15.09	09.23 14.44
27	04.23 22.45	05.56 21.03	07.23 19.16	08.50 17.34	11.47-12.11/24 15.06	09.26 14.45
28	04.26 22.42	05.59 21.00	07.26 19.12	08.53 17.31	11.48-12.12/24 15.04	09.28 14.46
29	04.30 22.39	06.02 20.56	07.29 19.09	08.56 17.28	11.48-12.12/24 15.02	09.31 14.47
30	04.33 22.36	06.05 20.53	07.32 19.05	08.59 17.25	11.49-12.12/23 15.00	09.34 14.49
31	04.36 22.33	06.08 20.49		09.03 17.22		10.13 14.50
Potential sun hours	599	505	392	307	203	146
Sum of minutes with flicker	0	0	123	149	861	392

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 2 - Generic RD200 HH200 ABO Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1280)
Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). It contains numerical data for sun hours and minutes with flicker. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 3 - Generic RD200 HH200 ABO Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1281)
Assumptions for shadow calculations

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

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains sun rise and set times (hh:mm) and operational time (hh:mm). Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 4 - Generic RD200 HH200 ABO Wind 5600 200.0 IQI hub: 200.0 m (TOT: 300.0 m) (1282)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Table with 12 columns (Jan-Dec) and 1 row of values: 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 time

Table with 13 columns (N to Sum) and 1 row of values: 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Main data table with columns for months (January-December) and rows for days (1-31). Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Matrix with 2 rows and 3 columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm); First time (hh:mm) with flicker, Last time (hh:mm) with flicker, Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 5 - Generic RD200 HH200 ABO Wind 5600 200.0 IQI hub: 200.0 m (TOT: 300.0 m) (1283)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains two values representing sun rise and sun set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 6 - Generic RD200 HH200 ABO Wind 5600 200.0 IQ! hub: 200,0 m (TOT: 300,0 m) (1284)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

	January	February	March	April	May	June
1	10.12 14.53	09.07 16.19	07.38 16.28-16.53/25 17.46	06.52 20.16	05.09 21.45	03.37 23.18
2	10.11 14.55	09.04 16.22	07.35 16.29-16.54/25 17.49	06.48 20.19	05.06 21.48	03.35 23.21
3	10.10 14.57	09.01 16.25	07.31 16.28-16.53/25 17.52	06.45 20.22	05.02 21.52	03.33 23.23
4	10.09 14.59	08.58 16.28	07.28 16.29-16.52/23 17.55	06.41 20.25	04.59 21.55	03.30 23.25
5	10.08 15.01	08.55 16.31	07.25 16.29-16.51/22 17.58	06.38 20.28	04.56 21.58	03.28 23.28
6	10.06 15.03	08.52 16.35	07.21 16.31-16.51/20 18.01	06.34 20.31	04.53 22.01	03.26 23.30
7	10.05 15.05	08.49 16.38	07.18 16.31-16.48/17 18.04	06.31 20.34	04.49 22.04	03.25 23.32
8	10.04 15.08	08.46 16.41	07.14 16.34-16.47/13 18.07	06.27 20.37	04.46 22.07	03.23 23.34
9	10.02 15.10	08.43 16.44	07.11 16.38-16.42/4 18.10	06.24 20.39	04.43 22.10	03.21 23.36
10	10.00 15.13	08.40 16.47	07.08 18.13	06.20 20.42	04.40 22.13	03.20 23.38
11	09.58 15.15	08.37 16.50	07.04 18.16	06.17 20.04-20.09/5 20.45	04.37 22.16	03.18 23.40
12	09.57 15.18	08.34 16.54	07.01 18.19	06.14 20.01-20.12/11 20.48	04.33 22.19	03.17 23.41
13	09.55 15.21	08.31 16.57	06.57 18.21	06.10 19.58-20.14/16 20.51	04.30 22.22	03.16 23.43
14	09.53 15.23	08.27 17.00	06.54 18.24	06.07 19.56-20.16/20 20.54	04.27 22.26	03.15 23.44
15	09.51 15.26	08.24 17.03	06.50 18.27	06.03 19.55-20.17/22 20.57	04.24 22.29	03.14 23.46
16	09.49 15.29	08.21 17.06	06.47 18.30	06.00 19.54-20.17/23 21.00	04.21 22.32	03.13 23.47
17	09.46 15.32	08.18 17.09	06.44 18.33	05.56 19.53-20.17/24 21.03	04.18 22.35	03.12 23.48
18	09.44 15.35	08.15 17.12	06.40 18.36	05.53 19.53-20.18/25 21.06	04.15 22.38	03.12 23.48
19	09.42 15.38	08.11 17.16	06.37 18.39	05.49 19.52-20.18/26 21.09	04.12 22.41	03.11 23.49
20	09.39 15.41	08.08 17.19	06.33 18.42	05.46 19.52-20.18/26 21.12	04.09 22.44	03.11 23.50
21	09.37 15.44	08.05 16.39-16.43/4 17.22	06.30 18.45	05.43 19.51-20.17/26 21.15	04.06 22.47	03.11 23.50
22	09.34 15.47	08.01 16.35-16.46/11 17.25	06.26 18.47	05.39 19.52-20.16/24 21.18	04.03 22.50	03.11 23.50
23	09.32 15.50	07.58 16.34-16.50/16 17.28	06.23 18.50	05.36 19.52-20.16/24 21.21	04.00 22.53	03.11 23.50
24	09.29 15.53	07.55 16.32-16.51/19 17.31	06.19 18.53	05.32 19.53-20.15/22 21.24	03.58 22.56	03.12 23.50
25	09.27 15.56	07.52 16.31-16.53/22 17.34	06.16 18.56	05.29 19.53-20.14/21 21.27	03.55 22.59	03.12 23.50
26	09.24 15.59	07.48 16.30-16.53/23 17.37	06.12 18.59	05.26 19.54-20.13/19 21.30	03.52 23.02	03.13 23.49
27	09.21 16.03	07.45 16.30-16.54/24 17.40	06.09 19.02	05.22 19.56-20.11/15 21.33	03.50 23.04	03.14 23.49
28	09.19 16.06	07.42 16.29-16.54/25 17.43	06.05 19.05	05.19 19.58-20.09/11 21.36	03.47 23.07	03.15 23.48
29	09.16 16.09		07.02 20.08	05.16 20.03-20.04/1 21.39	03.44 23.10	03.16 23.47
30	09.13 16.12		06.59 20.10	05.12 21.42	03.42 23.13	03.17 23.46
31	09.10 16.15		06.55 20.13		03.39 23.15	
Potential sun hours	178	241	363	449	563	611
Sum of minutes with flicker	0	144	174	361	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 6 - Generic RD200 HH200 ABO Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1284)
Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (July, August, September, October, November, December) and rows for days (1-31). Columns contain sun rise and set times, and a final column for 'Potential sun hours'. Includes a 'Sum of minutes with flicker' row at the bottom.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





## SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 7 - Generic RD200 HH200 ABO Wind 5600 200.0 IQ! hub: 200,0 m (TOT: 300,0 m) (1285)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

	January	February	March	April	May	June
1	10.12 14.53	09.07 16.19	07.38 17.46	06.52 07.43-08.07/24 20.16	05.09 21.45	03.37 04.32-04.39/7 23.18
2	10.11 14.55	09.04 16.22	07.35 17.49	06.48 07.44-08.07/23 20.19	05.06 21.48	03.35 04.31-04.41/10 23.21
3	10.10 14.57	09.01 16.25	07.32 17.52	06.45 07.44-08.05/21 20.22	05.03 21.52	03.33 04.29-04.42/13 23.23
4	10.09 14.59	08.58 16.28	07.28 17.55	06.41 07.45-08.04/19 20.25	04.59 21.55	03.31 04.28-04.43/15 23.25
5	10.08 15.01	08.55 16.31	07.25 17.58	06.38 07.45-08.02/17 20.28	04.56 21.58	03.29 04.27-04.44/17 23.28
6	10.06 15.03	08.52 16.35	07.21 18.01	06.34 07.47-07.59/12 20.31	04.53 22.01	03.27 04.26-04.45/19 23.30
7	10.05 15.05	08.49 16.38	07.18 18.04	06.31 07.52-07.55/3 20.34	04.49 22.04	03.25 04.25-04.45/20 23.32
8	10.04 15.08	08.46 16.41	07.15 18.07	06.27 20.37	04.46 22.07	03.23 04.25-04.45/20 23.34
9	10.02 15.10	08.43 16.44	07.11 18.10	06.24 20.40	04.43 22.10	03.21 04.25-04.46/21 23.36 04.22-04.23/1
10	10.00 15.13	08.40 16.47	07.08 18.13	06.21 20.42	04.40 22.13	03.20 04.22-04.47/25 23.38
11	09.59 15.15	08.37 16.51	07.04 18.16	06.17 20.45	04.37 22.16	03.18 04.21-04.47/26 23.40
12	09.57 15.18	08.34 16.54	07.01 18.19	06.14 20.48	04.34 22.19	03.17 04.20-04.47/27 23.41
13	09.55 15.21	08.31 16.57	06.57 18.22	06.10 20.51	04.30 22.23	03.16 04.19-04.47/28 23.43
14	09.53 15.23	08.28 17.00	06.54 18.24	06.07 20.54	04.27 22.26	03.15 04.19-04.48/29 23.44
15	09.51 15.26	08.24 17.03	06.51 18.27	06.03 20.57	04.24 22.29	03.14 04.19-04.49/30 23.45
16	09.49 15.29	08.21 17.06	06.47 18.30	06.00 21.00	04.21 22.32	03.13 04.18-04.48/30 23.47
17	09.46 15.32	08.18 17.09	06.44 18.33	05.56 21.03	04.18 22.35	03.12 04.18-04.49/31 23.48
18	09.44 15.35	08.15 17.13	06.40 18.36	05.53 21.06	04.15 22.38	03.12 04.18-04.49/31 23.48
19	09.42 15.38	08.11 17.16	06.37 18.39	05.50 21.09	04.12 22.41	03.12 04.18-04.50/32 23.49
20	09.39 15.41	08.08 17.19	06.33 18.42	05.46 21.12	04.09 22.44	03.11 04.18-04.50/32 23.49
21	09.37 15.44	08.05 17.22	06.30 18.45	05.43 21.15	04.06 22.47	03.11 04.18-04.50/32 23.50
22	09.34 15.47	08.02 17.25	06.26 18.48	05.39 21.18	04.03 22.50	03.11 04.18-04.50/32 23.50
23	09.32 15.50	07.58 17.28	06.23 06.54-07.04/10 18.50	05.36 21.21	04.01 22.53	03.12 04.19-04.51/32 23.50
24	09.29 15.53	07.55 17.31	06.19 06.51-07.06/15 18.53	05.33 21.24	03.58 22.56	03.12 04.19-04.51/32 23.50
25	09.27 15.56	07.52 17.34	06.16 06.48-07.07/19 18.56	05.29 21.27	03.55 22.59	03.13 04.20-04.51/31 23.50
26	09.24 16.00	07.48 17.37	06.13 06.47-07.08/21 18.59	05.26 21.30	03.52 23.02	03.13 04.20-04.51/31 23.49
27	09.21 16.03	07.45 17.40	06.09 06.45-07.08/23 19.02	05.22 21.33	03.50 23.04	03.14 04.21-04.51/30 23.49
28	09.19 16.06	07.42 17.43	06.06 06.45-07.09/24 19.05	05.19 21.36	03.47 23.07	03.15 04.22-04.51/29 23.48
29	09.16 16.09		07.02 07.44-08.08/24 20.08	05.16 21.39	03.45 23.10	03.16 04.23-04.52/29 23.47
30	09.13 16.12		06.59 07.44-08.08/24 20.11	05.12 21.42	03.42 23.13	03.18 04.24-04.52/28 23.46
31	09.10 16.15		06.55 07.43-08.07/24 20.13		03.40 04.34-04.38/4 23.15	
Potential sun hours	178	241	363	449	563	611
Sum of minutes with flicker	0	0	184	119	4	770

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 7 - Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (1285)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

| July | August | September | October | November | December

Table with 7 columns (Days 1-31) and 7 rows (Months July-December). Each cell contains a vertical list of values representing shadow calculations for that day and month.

Potential sun hours | 599

Sum of minutes with flicker 212 0 310 0 0 0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 8 - Generic RD200 HH200 ABO Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1286)
Assumptions for shadow calculations

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

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sunrise, sunset, and shadow times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 9 - Generic RD200 HH200 ABO Wind 5600 200.0 IQI hub: 200,0 m (TOT: 300,0 m) (1287)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to June) and rows for days (1 to 31). Each cell contains a matrix of values representing sun rise, set, and shadow times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski) WTG: 9 - Generic RD200 HH200 ABO Wind 5600 200.0 IQ! hub: 200,0 m (TOT: 300,0 m) (1287)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

	July	August	September	October	November	December
1	03.19 23.45	04.39 22.29	06.10 20.46	07.34 19.02	16.37-17.21/44 08.05	09.36 14.58
2	03.21 23.43	04.42 22.26	06.13 20.42	07.37 18.58	16.36-17.21/45 08.08	09.39 14.57
3	03.22 23.42	04.45 22.23	06.16 20.39	07.40 18.55	16.36-17.21/45 08.11	09.41 14.55
4	03.24 23.41	04.48 22.20	06.19 20.35	07.43 18.51	16.36-17.21/45 08.15	09.44 14.53
5	03.26 23.39	04.51 22.16	06.22 20.32	07.46 18.48	16.36-17.20/44 08.18	09.46 14.51
6	03.28 23.37	04.54 22.13	06.25 20.28	07.48 18.45	16.36-17.20/44 08.21	09.49 14.50
7	03.30 23.35	04.57 22.10	06.27 20.25	07.51 18.41	16.36-17.19/43 08.24	09.51 14.48
8	03.32 23.34	05.00 22.07	06.30 20.21	07.54 18.38	16.36-17.19/43 08.27	09.53 14.47
9	03.34 23.32	05.03 22.04	06.33 20.18	07.57 18.34	16.36-17.18/42 08.30	13.29-13.33/4 09.55
10	03.37 23.29	05.06 22.00	06.36 20.14	08.00 18.31	16.36-17.17/41 08.33	13.26-13.37/11 09.57
11	03.39 23.27	05.09 21.57	06.39 20.11	08.03 18.27	16.37-17.16/39 08.36	13.24-13.39/15 09.59
12	03.42 23.25	05.12 21.54	06.41 20.08	08.06 18.24	16.38-17.14/36 08.40	13.23-13.41/18 10.01
13	03.44 23.23	05.15 21.50	06.44 20.04	08.08 18.21	16.38-17.13/35 08.43	13.22-13.42/20 10.03
14	03.47 23.20	05.18 21.47	06.47 20.01	08.11 18.17	16.40-17.11/31 08.46	13.22-13.43/21 10.04
15	03.49 23.18	05.21 21.44	06.50 19.57	08.14 18.14	16.41-17.09/28 08.49	13.21-13.43/22 10.06
16	03.52 23.15	05.24 21.40	06.53 19.54	08.17 18.11	16.43-17.06/23 08.52	13.21-13.44/23 10.07
17	03.55 23.13	05.27 21.37	06.55 19.50	08.20 18.07	16.46-17.03/17 08.55	13.21-13.44/23 10.08
18	03.58 23.10	05.30 21.34	06.58 19.47	08.23 18.04	16.51-16.58/7 08.58	13.21-13.45/24 10.10
19	04.00 23.07	05.33 21.30	07.01 19.43	08.26 18.01	09.01 15.26	13.21-13.45/24 10.11
20	04.03 23.05	05.36 21.27	07.04 19.40	08.29 17.57	09.04 15.23	13.21-13.45/24 10.11
21	04.06 23.02	05.39 21.23	07.06 19.36	08.32 17.54	09.07 15.21	13.21-13.45/24 10.12
22	04.09 22.59	05.42 21.20	07.09 19.33	08.35 17.51	09.10 15.18	13.21-13.45/24 10.13
23	04.12 22.56	05.45 21.17	07.12 19.29	08.38 17.47	09.13 15.16	13.23-13.46/23 10.13
24	04.15 22.53	05.47 21.13	07.15 19.26	08.41 17.44	09.16 15.13	13.23-13.46/23 10.14
25	04.18 22.50	05.50 21.10	07.17 19.22	08.44 16.41	09.19 15.11	13.23-13.46/23 10.14
26	04.21 22.48	05.53 21.06	07.20 19.19	08.47 16.38	09.22 15.09	13.24-13.45/21 10.14
27	04.24 22.45	05.56 21.03	07.23 19.15	08.50 16.34	09.25 15.07	13.25-13.46/21 10.14
28	04.27 22.42	05.59 20.59	07.26 19.12	08.53 16.31	09.28 15.04	13.26-13.45/19 10.14
29	04.30 22.38	06.02 20.56	07.29 19.09	08.56 16.28	09.31 15.02	13.26-13.45/19 10.13
30	04.33 22.35	06.05 20.53	07.31 19.05	08.59 16.25	09.33 15.00	13.27-13.44/17 10.13
31	04.36 22.32	06.08 20.49		09.02 16.22		10.12 14.51
Potential sun hours	599	504	392	307	203	146
Sum of minutes with flicker	0	0	372	652	443	30

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
--------------	-------------------------------------	---	---

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 10 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1288)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (hh:mm) and a numerical value. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 11 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1289)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Table with 12 columns: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec. Values: 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 time

Table with 13 columns: N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum. Values: 678, 512, 405, 372, 488, 734, 1013, 1177, 845, 619, 495, 545, 7883

Main data table with columns for months (January to December) and rows for days (1 to 31). Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Matrix with 2 rows and 3 columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm); First time (hh:mm) with flicker, Last time (hh:mm) with flicker, Minutes with flicker.



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 12 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1290)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, first time with flicker, and last time with flicker.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 13 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1291)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). It contains sunrise and sunset times, and a summary row for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 14 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1292)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a matrix of values representing sun rise, set, and shadow calculations. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 15 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1293)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 16 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1294)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna.riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 17 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1295)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sunrise, sunset, and shadow data. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 18 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1296)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, first time with flicker, and last time with flicker.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 19 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1297)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 20 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1298)
Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (hh:mm) and a numerical value representing sunshine probability. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 21 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1299)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 22 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1300)
Sunshine probability S (Average daily sunshine hours) []

Assumptions for shadow calculations

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

[January | February | March | April | May | June | July | August | September | October | November | December

Table with 12 columns (months) and 31 rows (days). Each cell contains a 2x2 matrix of values representing sunrise, sunset, and shadow times.

Potential sun hours

Sum of minutes with flicker

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 23 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1301)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (hh:mm) and a numerical value representing shadow duration. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 24 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1302)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 25 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1303)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow flicker data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 26 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1304)
Sunshine probability S (Average daily sunshine hours) []

Assumptions for shadow calculations

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

[January | February | March | April | May | June | July | August | September | October | November | December

Table with 12 columns (months) and 31 rows (days). Each cell contains a 2x2 grid of values representing sunrise, sunset, and shadow times.

Potential sun hours

Sum of minutes with flicker

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 27 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1305)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a pair of values representing sunrise and sunset times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 28 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1306)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a start time, end time, and duration. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 29 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1307)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 30 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1308)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna.riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 31 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1309)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time value (hh:mm) representing sunrise and sunset times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 32 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1310)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

[January | February | March | April | May | June | July | August | September | October | November | December

Table with 12 columns (months) and 31 rows (days). Each cell contains two values representing sun rise and sun set times in hh:mm format.

Potential sun hours

Sum of minutes with flicker

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 33 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1311)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to June) and rows for days (1 to 31). Each cell contains sun rise and set times (hh:mm) and potential sun hours.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 33 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1311)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

	July	August	September	October	November	December		
1	03.20	04.39	06.11	07.34	08.05	14.55-15.18/23	09.35	
	23.43	22.28	20.45	19.02	16.19		14.59	
2	03.22	04.42	06.13	19.13-19.19/6	07.37	08.08	14.55-15.18/23	09.38
	23.42	22.25	20.42	18.58	16.16		14.57	
3	03.23	04.45	06.16	19.09-19.22/13	07.40	08.11	14.55-15.18/23	09.40
	23.41	22.22	20.38	18.55	16.12		14.55	
4	03.25	04.48	06.19	19.07-19.23/16	07.42	08.14	14.56-15.18/22	09.43
	23.39	22.19	20.35	18.51	16.09		14.54	
5	03.27	04.51	06.22	19.05-19.25/20	07.45	08.17	14.56-15.16/20	09.45
	23.38	22.16	20.31	18.48	16.06		14.52	
6	03.29	04.54	06.25	19.03-19.25/22	07.48	08.20	14.57-15.15/18	09.48
	23.36	22.13	20.28	18.44	16.03		14.51	
7	03.31	04.57	06.27	19.02-19.25/23	07.51	08.23	14.59-15.11/12	09.50
	23.34	22.09	20.25	18.41	16.00		14.49	
8	03.33	05.00	06.30	19.02-19.26/24	07.54	08.26	15.01-15.08/7	09.52
	23.32	22.06	20.21	18.38	15.57		14.48	
9	03.35	05.03	06.33	19.01-19.25/24	07.57	08.30	15.03-15.04/1	09.54
	23.30	22.03	20.18	18.34	15.54		14.47	
10	03.38	05.06	06.36	19.01-19.25/24	07.59	08.33		09.56
	23.28	22.00	20.14	18.31	15.51		14.46	
11	03.40	05.09	06.39	19.01-19.25/24	08.02	08.36		09.58
	23.26	21.56	20.11	18.27	15.48		14.45	
12	03.42	05.12	06.41	19.00-19.23/23	08.05	08.39		10.00
	23.24	21.53	20.07	18.24	15.46		14.44	
13	03.45	05.15	06.44	19.01-19.23/22	08.08	08.42		10.02
	23.22	21.50	20.04	18.21	15.43		14.43	
14	03.47	05.18	06.47	19.01-19.22/21	08.11	08.45		10.03
	23.19	21.46	20.00	18.17	15.40		14.42	
15	03.50	05.21	06.50	19.01-19.20/19	08.14	08.48		10.05
	23.17	21.43	19.57	18.14	15.37		14.42	
16	03.53	05.24	06.52	19.03-19.16/13	08.17	08.51		10.06
	23.14	21.40	19.53	18.11	15.34		14.41	
17	03.55	05.27	06.55	19.05-19.13/8	08.20	08.54		10.07
	23.12	21.36	19.50	18.07	15.32		14.41	
18	03.58	05.30	06.58		08.23	08.57		10.08
	23.09	21.33	19.46	18.04	15.29		14.41	
19	04.01	05.33	07.01		08.26	09.01		10.09
	23.06	21.30	19.43	18.01	15.26		14.41	
20	04.04	05.36	07.03		08.29	09.04		10.10
	23.04	21.26	19.40	17.57	15.24		14.41	
21	04.07	05.39	07.06		08.31	09.07		10.11
	23.01	21.23	19.36	17.54	15.21		14.41	
22	04.10	05.42	07.09		08.34	09.10		10.12
	22.58	21.19	19.33	17.51	15.19		14.42	
23	04.12	05.45	07.12		08.37	16.06-16.10/4	09.13	10.12
	22.55	21.16	19.29	17.47	15.16		14.42	
24	04.15	05.48	07.15		08.40	16.01-16.13/12	09.16	10.13
	22.52	21.13	19.26	17.44	15.14		14.43	
25	04.18	05.50	07.17		07.43	14.59-15.15/16	09.18	10.13
	22.50	21.09	19.22	16.41	15.12		14.44	
26	04.21	05.53	07.20		07.46	14.58-15.16/18	09.21	10.13
	22.47	21.06	19.19	16.38	15.09		14.45	
27	04.24	05.56	07.23		07.49	14.56-15.17/21	09.24	10.13
	22.44	21.02	19.15	16.35	15.07		14.46	
28	04.27	05.59	07.26		07.53	14.56-15.18/22	09.27	10.13
	22.41	20.59	19.12	16.31	15.05		14.47	
29	04.30	06.02	07.28		07.56	14.55-15.18/23	09.30	10.12
	22.38	20.56	19.08	16.28	15.03		14.48	
30	04.33	06.05	07.31		07.59	14.55-15.18/23	09.33	10.12
	22.35	20.52	19.05	16.25	15.01		14.50	
31	04.36	06.08			08.02	14.55-15.18/23		10.11
	22.32	20.49		16.22			14.51	
Potential sun hours	598	504	392	307	204	147		
Sum of minutes with flicker	0	0	302	162	149	0		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 34 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1312)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Table with 12 columns (Jan-Dec) and 1 row of values: 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 time

Table with 13 columns (N to Sum) and 1 row of values: 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Main data table with columns for months (January-December) and rows for days (1-31). Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Matrix with 2 rows and 3 columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm); First time (hh:mm) with flicker, Last time (hh:mm) with flicker, Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 35 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1313)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow data.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 36 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1314)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Table with 12 columns: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec. Values: 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 time

Table with 13 columns: N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum. Values: 678, 512, 405, 372, 488, 734, 1013, 1177, 845, 619, 495, 545, 7883

Main data table with columns for months (January to December) and rows for days (1 to 31). Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Matrix with 2 rows and 3 columns: Day in month, Sun rise (hh:mm) / Sun set (hh:mm), First time (hh:mm) with flicker / Last time (hh:mm) with flicker / Minutes with flicker.



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 37 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1315)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (e.g., 10.10 | 09.06) and a numerical value. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 38 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1316)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a range of values representing sun rise and set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna.riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 39 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1317)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (e.g., 10.11 | 09.07 | 07.38 | 06.52) and a numerical value. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 40 - Generic RD200 HH200 ABO Wind 5600 200.0 !0! hub: 200,0 m (TOT: 300,0 m) (1318)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a range of values representing sun rise and set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 41 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1319)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with 12 columns for months (January to December) and 31 rows for days. Each cell contains a range of values representing sun rise and set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 42 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200.0 m (TOT: 300.0 m) (1320)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and shadow calculations. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 43 - Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1321)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (e.g., 10.10 | 09.06 | 07.38 | 06.52 | 05.10) and a numerical value. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 44 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1454)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with 13 columns (January to December) and 31 rows (Day 1 to Day 31). Each cell contains two values representing sun rise and sun set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 45 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1455)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains two values representing sun rise and sun set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 46 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1456)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a range of sun rise and set times (hh:mm) and a numerical value representing minutes with flicker. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 47 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1457)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

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 time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (hh:mm) for sunrise and sunset. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 48 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1458)
Assumptions for shadow calculations

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

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with 13 columns (January to December) and 31 rows (Day 1 to Day 31). Each cell contains a time range (hh:mm) for sunrise and sunset. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 49 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1459)
Assumptions for shadow calculations

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

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

Table with 12 columns for months (January to December) and 31 rows for days. Each cell contains a time range (hh:mm) for sunrise and sunset. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
8.2.2023 16.18/3.5.584

SHADOW - Calendar per WTG

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)WTG: 50 - Generic RD180 HH150 7000 180.0 !O! hub: 150.0 m (TOT: 240.0 m) (1460)
Assumptions for shadow calculations

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

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

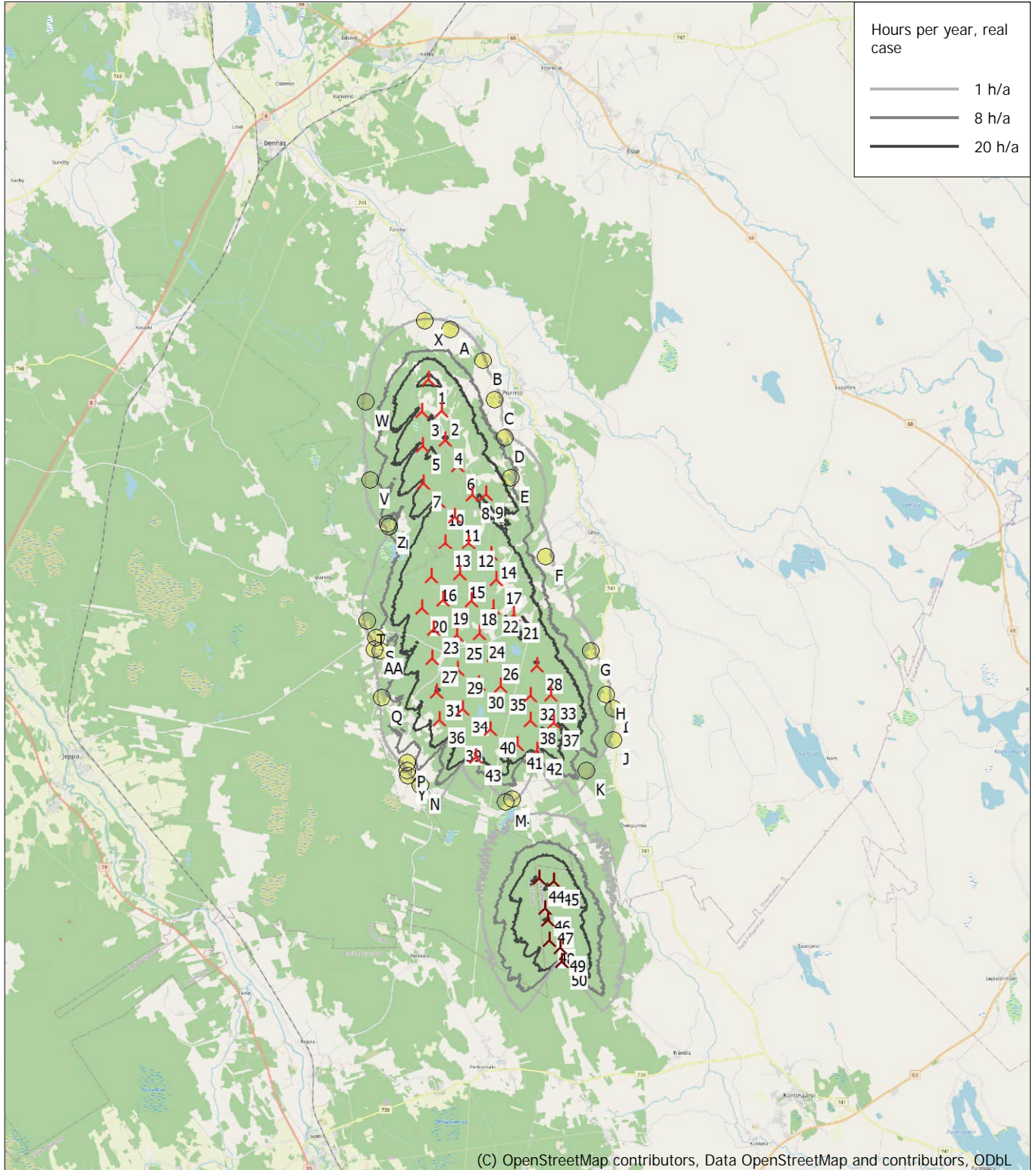
Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains two values representing sun rise and sun set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Map

Calculation: Purmo VE1 RD200x43xHH200\_real case, no forest\_20220505+ YV(Salo-Ylikoski)



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 298 020 North: 7 042 710  
 ▲ New WTG      ● Shadow receptor  
 Flicker map level: Height Contours: CONTOURLINE\_Purmon tuulivoimahanke\_0.wpo (4)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m



13.2.2023

---

Liite 11. Purmon tuulivoimahanke – varjostusmallinnuksen tulokset "real case, Luke forest" (VE1)  
Salo-Ylikosken hankkeen kanssa.

## SHADOW - Main Result

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

### 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

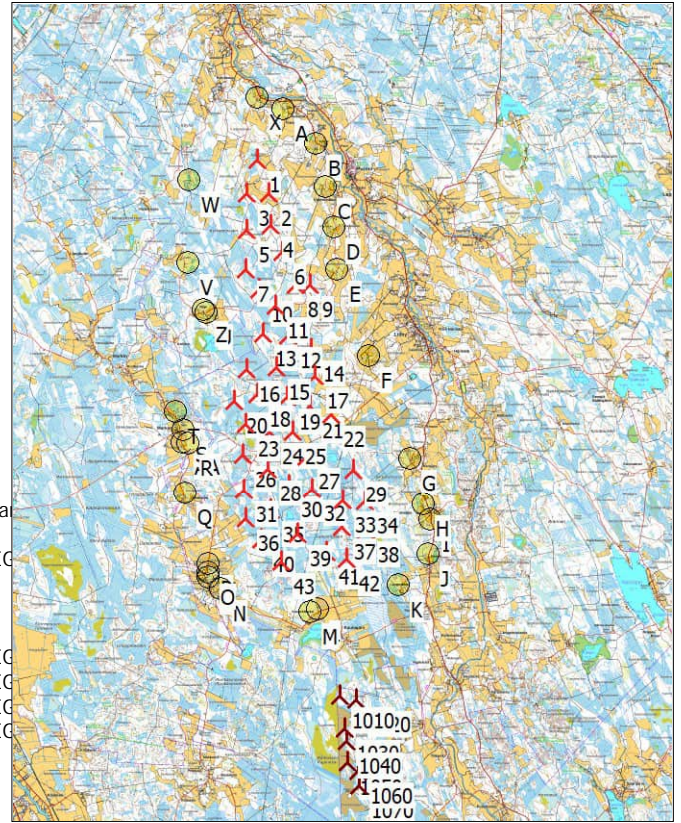
Sunshine probability S (Average daily sunshine hours) []  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

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\_Purmon tuulivoimahanke  
 Area object(s) used in calculation:  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC  
 Area object (itä1): (7)  
 Area object (itä2): (8)  
 Area object (länsi1): (9)  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC  
 Obstacles used in calculation  
 Receptor grid resolution: 1,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89

### WTGs



New WTG

Scale 1:250 000  
 Shadow receptor

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM
			[m]									
1	296 015	7 050 633	25,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
2	296 402	7 049 512	28,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
3	295 688	7 049 533	26,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
4	296 468	7 048 488	31,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
5	295 661	7 048 308	32,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
6	296 860	7 047 573	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
7	295 626	7 047 011	32,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
8	297 281	7 046 511	32,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
9	297 768	7 046 509	35,8	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
10	296 092	7 046 333	36,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
11	296 633	7 045 796	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
12	297 035	7 044 833	36,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
13	296 211	7 044 887	37,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
14	297 806	7 044 390	40,6	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
15	296 659	7 043 785	40,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
16	295 680	7 043 726	37,7	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
17	297 935	7 043 485	36,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
18	296 033	7 042 892	40,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
19	297 013	7 042 799	42,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
20	295 245	7 042 663	37,3	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
21	297 759	7 041 637	40,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
22	298 459	7 042 222	42,5	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
23	295 640	7 041 888	35,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
24	296 420	7 041 637	37,1	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
25	297 207	7 041 637	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
26	295 536	7 040 877	38,9	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
27	297 642	7 040 813	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
28	296 377	7 040 414	45,0	Generic RD200 HH20...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
29	299 185	7 040 392	48,4	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
30	297 071	7 039 884	45,8	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
31	295 591	7 039 696	41,5	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
32	297 841	7 039 740	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
33	298 849	7 039 361	49,7	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
34	299 581	7 039 334	53,6	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
35	296 466	7 039 042	47,3	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
36	295 637	7 038 744	41,5	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
37	298 820	7 038 484	53,1	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
38	299 616	7 038 389	54,3	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
39	297 367	7 038 248	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
40	296 154	7 038 055	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
41	298 305	7 037 659	50,9	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
42	298 984	7 037 431	54,8	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
43	296 802	7 037 326	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 ABO Wind-5 600	5 600	200,0	200,0	2 086	10,4
1010	298 762	7 032 913	58,6	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1020	299 290	7 032 796	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1030	298 900	7 031 842	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1040	298 977	7 031 430	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1050	299 000	7 030 729	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1060	299 358	7 030 441	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1070	299 389	7 029 959	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4

## Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	of window		(ZVI) a.g.l.
							[m]	[°]		[m]
A	Asuinrakennus A (Lillkvist)	296 866	7 052 328	26,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Torbacka)	298 274	7 049 757	28,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Kallträskvägen)	298 556	7 048 421	35,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Lomarakennus F (Källbacken)	299 710	7 044 165	37,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Kornjärvi)	301 071	7 040 772	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Långnabba)	300 689	7 036 583	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Åvistvägen)	298 031	7 035 773	52,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Åvistvägen)	294 394	7 036 982	41,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Finnabbavägen)	294 415	7 037 260	40,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Tällbacka)	293 575	7 041 715	32,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Asuinrakennus T (Norrgård)	293 326	7 042 304	30,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Asuinrakennus U (Näpi)	294 326	7 045 578	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
W	Asuinrakennus W (Åbrännan)	293 782	7 049 981	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Y	Asuinrakennus Y (Åvist)	294 403	7 036 830	41,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0

## SHADOW - Main Result

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

### Calculation Results

Shadow receptor

No.	Name	Shadow, expected values	
		Shadow hours per year [h/year]	
A	Asuinrakennus A (Lillkvist)	2:17	
B	Asuinrakennus B (Dallberga)	1:34	
C	Asuinrakennus C (Tormbacka)	1:42	
D	Asuinrakennus D (Kallträskvägen)	4:01	
E	Metsästysmaja E (Kejsarbacken)	8:33	
F	Lomarakennus F (Källbacken)	3:53	
G	Asuinrakennus G (Kornjärvi)	3:27	
H	Asuinrakennus H (Sandnabba)	3:25	
I	Asuinrakennus I (Asp)	0:00	
J	Asuinrakennus J (Stennabba)	0:00	
K	Asuinrakennus K (Långnabba)	0:00	
L	Lomarakennus L (Åvistvägen)	0:00	
M	Asuinrakennus M (Stenbacka)	0:00	
N	Asuinrakennus N (Adler)	0:00	
O	Asuinrakennus O (Åvistvägen)	4:30	
P	Asuinrakennus P (Finnabbavägen)	0:00	
Q	Asuinrakennus Q (Dalabacka)	1:58	
R	Asuinrakennus R (Kronkvist)	1:52	
S	Asuinrakennus S (Tallbacka)	6:39	
T	Asuinrakennus T (Norrgård)	0:00	
U	Asuinrakennus U (Näpi)	5:56	
V	Asuinrakennus V (Skutas)	1:49	
W	Asuinrakennus W (Åbrännan)	1:36	
X	Lomarakennus X (Dalbacka)	2:49	
Y	Asuinrakennus Y (Åvist)	0:00	
Z	Asuinrakennus Z (Nabba)	2:45	
AA	Asuinrakennus AA (Kronkvist)	1:28	

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1279)	6:40
2	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1280)	1:42
3	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1281)	1:36
4	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1282)	0:00
5	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1283)	0:00
6	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1284)	4:13
7	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1285)	2:57
8	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1286)	0:00
9	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1287)	8:18
10	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1288)	5:06
11	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1289)	0:00
12	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1290)	0:00
13	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1291)	1:29
14	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1292)	2:01
15	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1293)	0:00
16	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1294)	0:00
17	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1295)	1:51
18	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1297)	0:00
19	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1296)	0:00
20	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1298)	4:57
21	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1300)	0:00
22	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1299)	0:00
23	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1301)	1:43
24	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1303)	0:00
25	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1302)	0:00
26	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1305)	1:59
27	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1304)	0:00
28	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1307)	0:00
29	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1306)	1:37
30	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1308)	0:00

To be continued on next page...

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 16.27/3.5.584

## SHADOW - Main Result

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

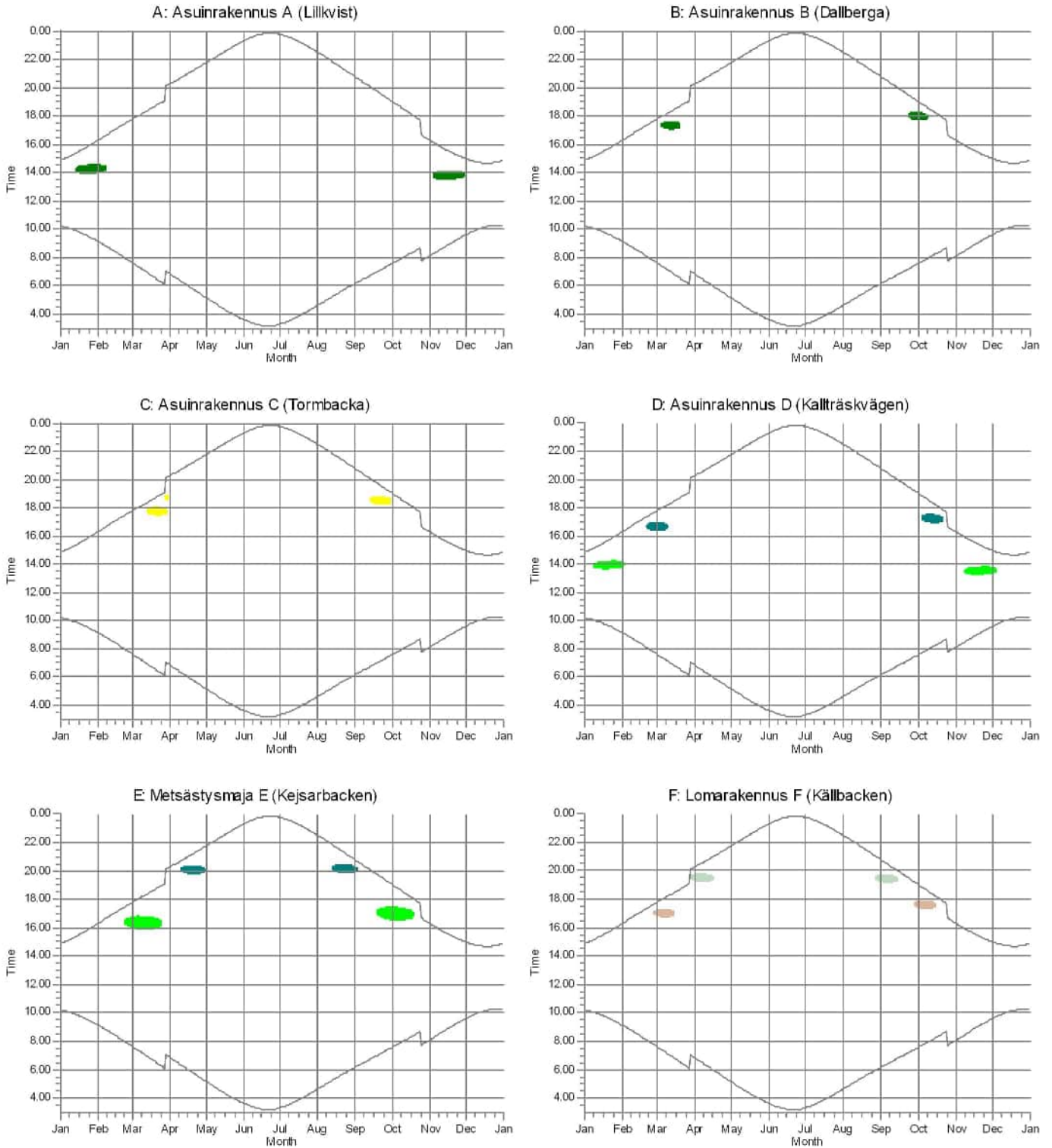
...continued from previous page

No.	Name	Expected [h/year]
31	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1309)	1:58
32	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1313)	0:00
33	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1310)	0:00
34	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1311)	3:41
35	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1312)	0:00
36	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1314)	0:00
37	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1316)	0:00
38	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1315)	1:34
39	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1318)	0:00
40	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1317)	4:30
41	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1319)	0:00
42	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1320)	0:00
43	Generic RD200 HH200 ABO Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1321)	0:00
1010	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1454)	0:00
1020	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1455)	0:00
1030	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1456)	0:00
1040	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1457)	0:00
1050	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1458)	0:00
1060	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1459)	0:00
1070	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1460)	0:00

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.

## SHADOW - Calendar, graphical

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

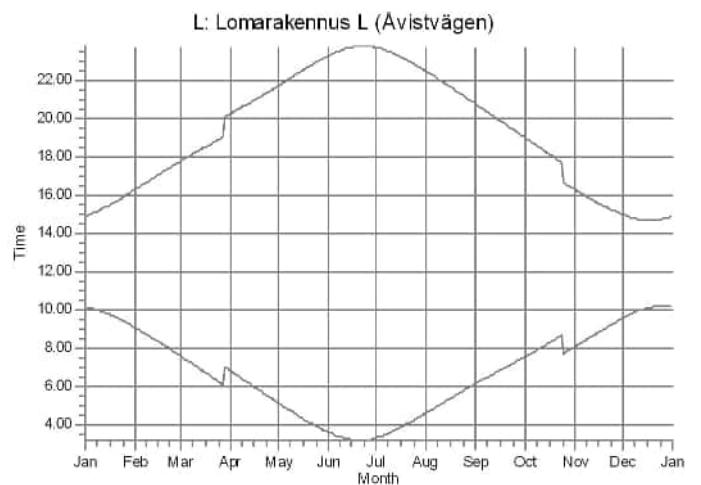
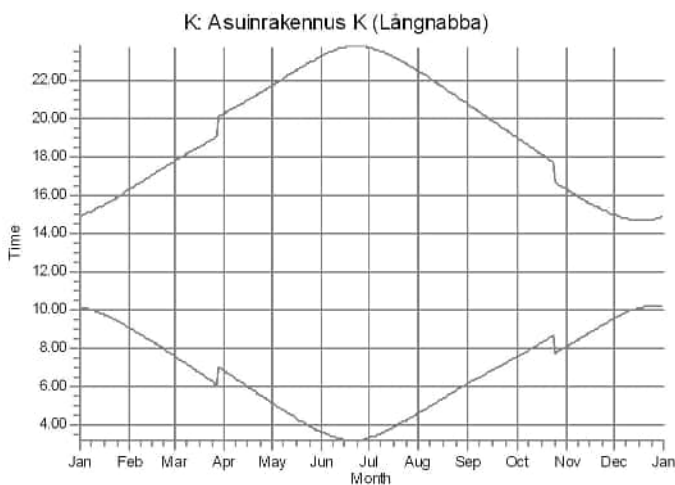
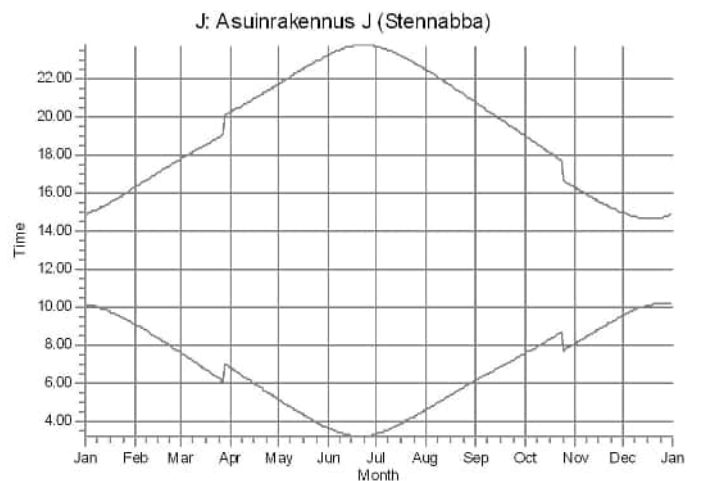
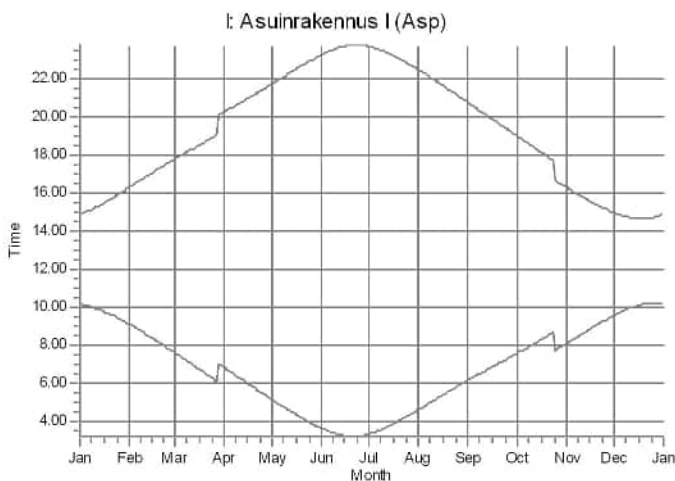
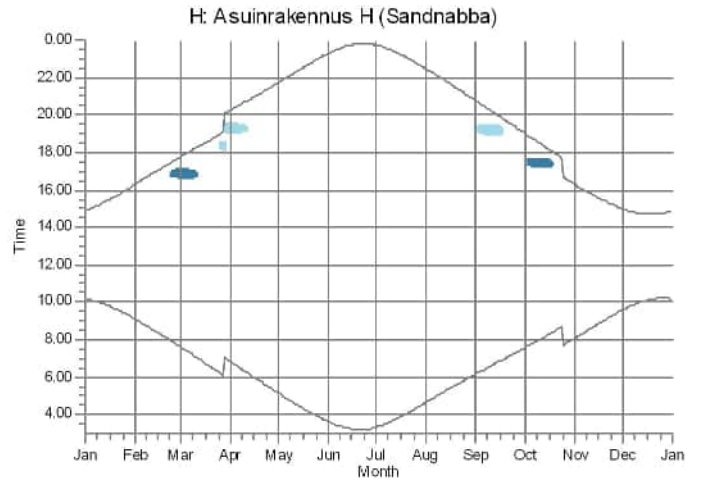
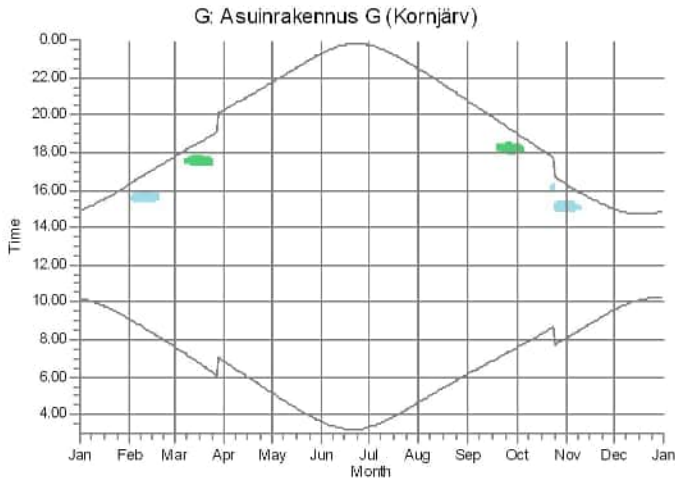


WTGs

- 1: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1279)
- 2: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1280)
- 6: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1284)
- 9: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1287)
- 14: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1292)
- 17: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1295)

## SHADOW - Calendar, graphical

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)



WTGs

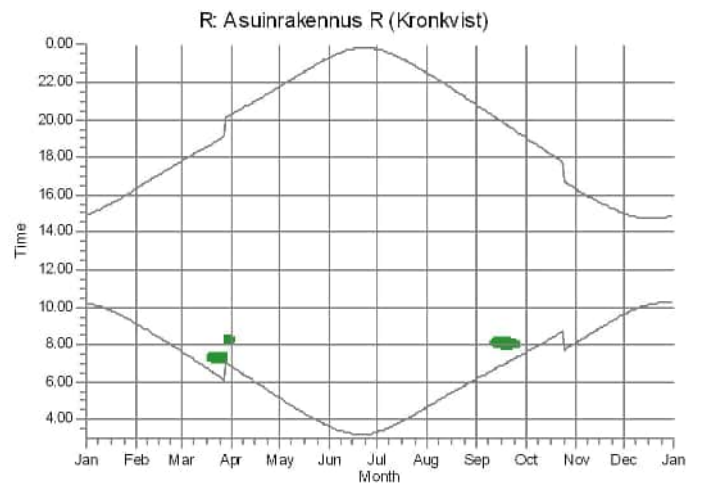
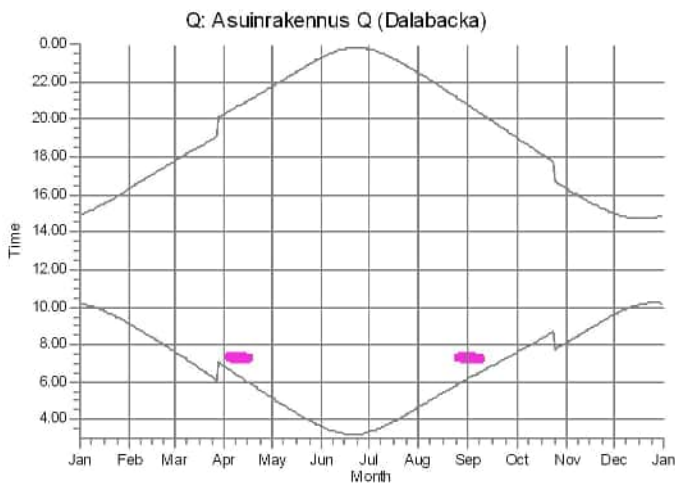
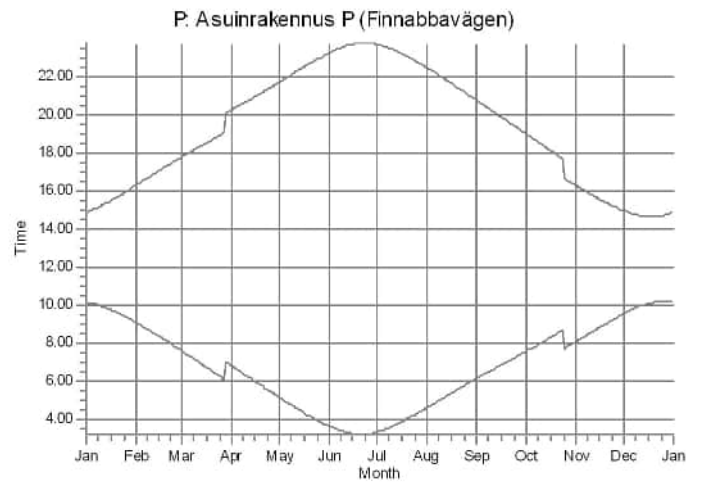
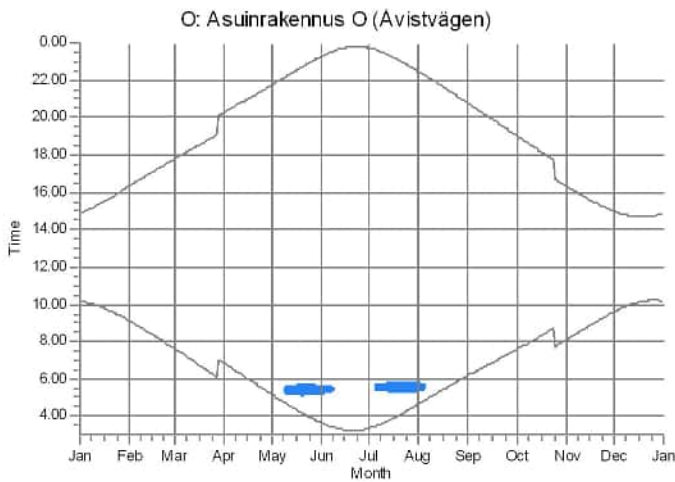
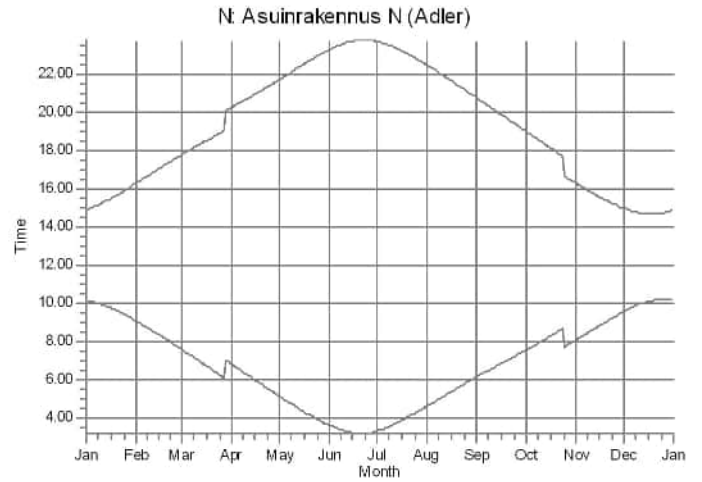
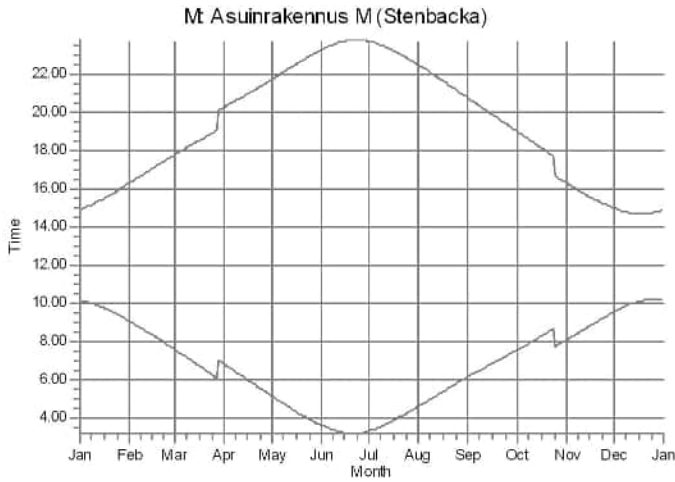
29: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1306)

34: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1311)

38: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1315)

## SHADOW - Calendar, graphical

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)



WTGs

26: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1305)

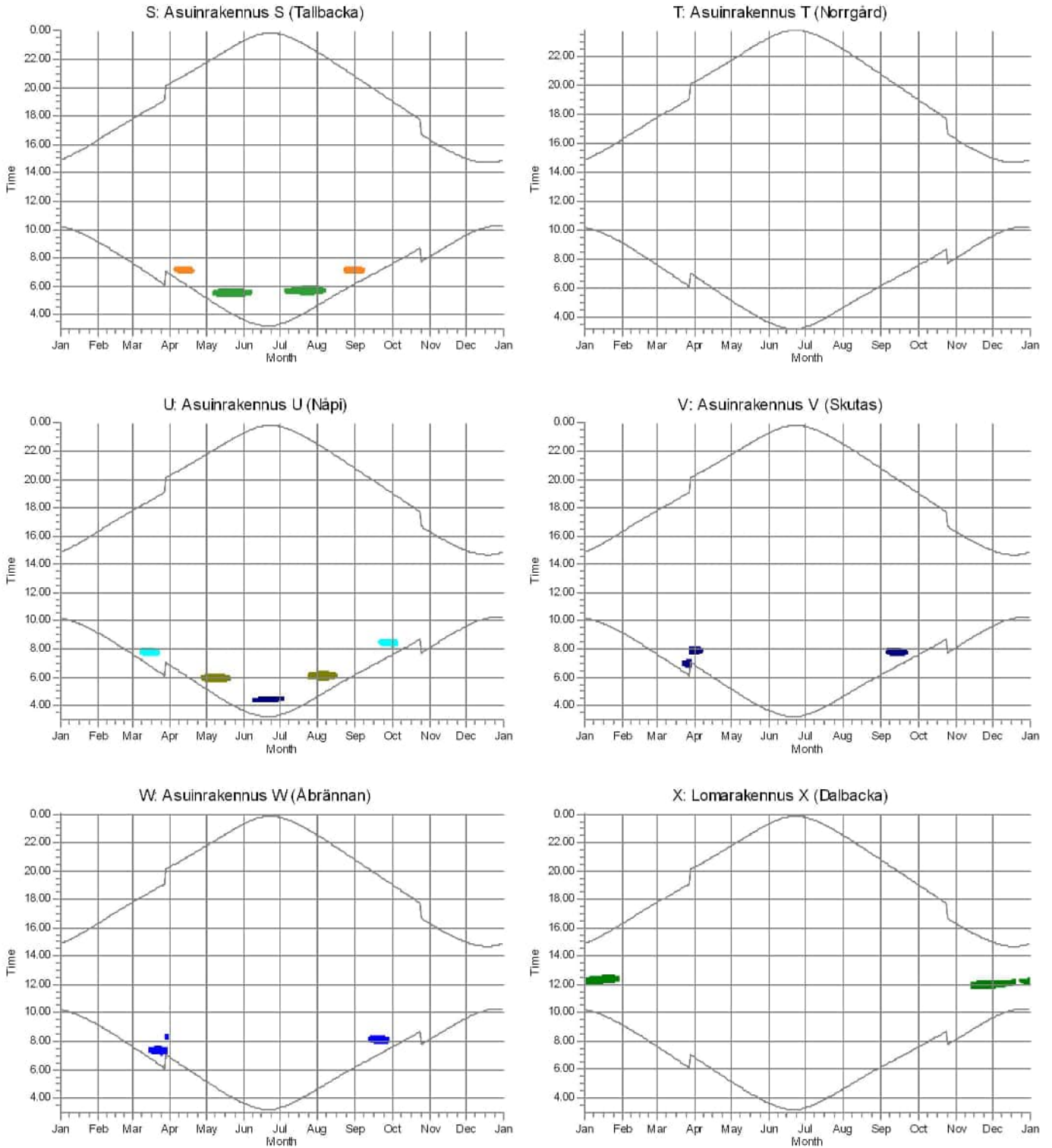
31: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1309)

40: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1317)



## SHADOW - Calendar, graphical

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)

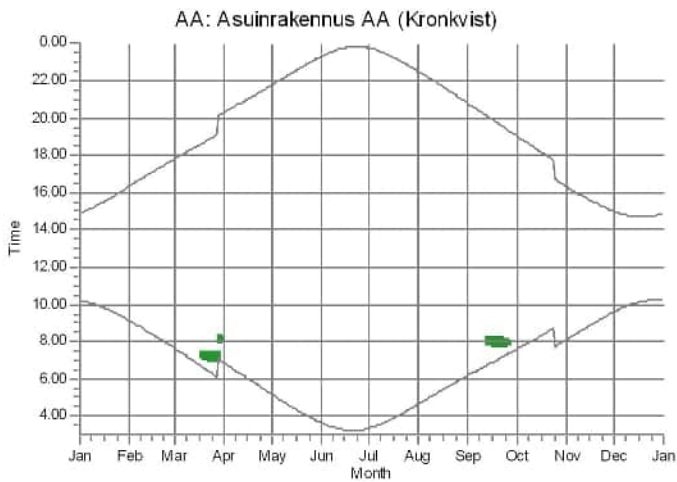
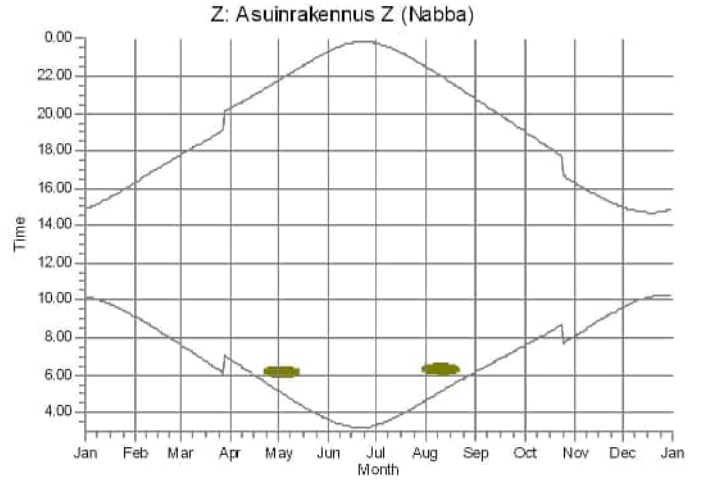
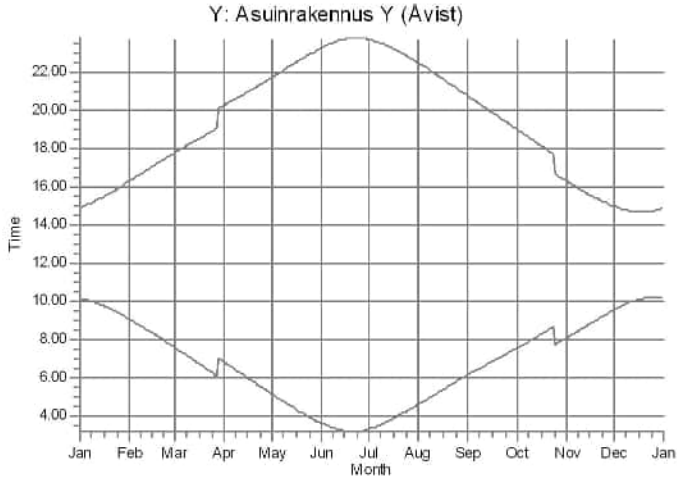


WTGs

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>1: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1279)</li> <li>3: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1281)</li> <li>7: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1285)</li> </ul> | <ul style="list-style-type: none"> <li>10: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1288)</li> <li>13: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1291)</li> <li>20: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1298)</li> </ul> | <ul style="list-style-type: none"> <li>23: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1301)</li> </ul> |
|---|--|--|

## SHADOW - Calendar, graphical

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)



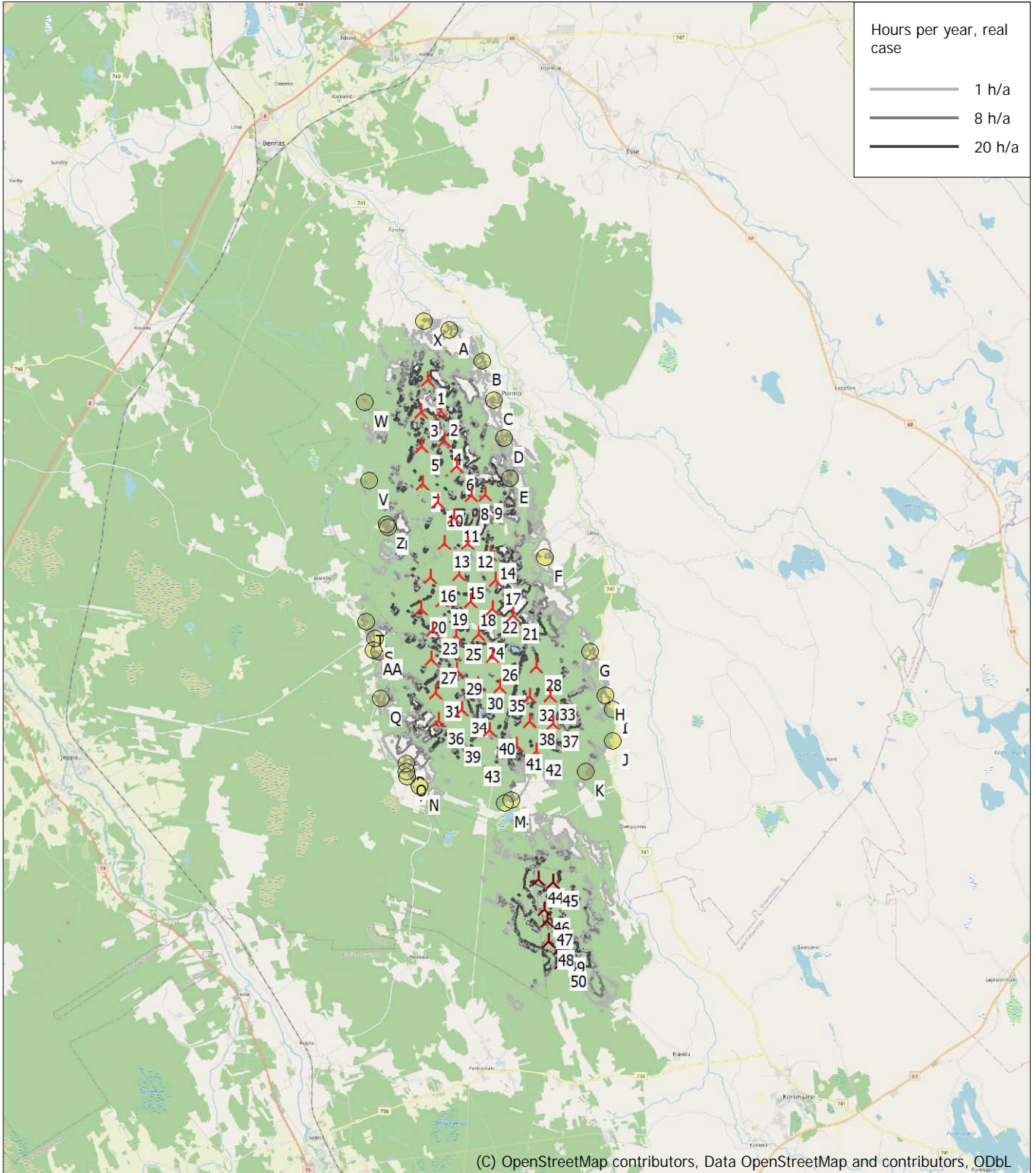
WTGs

10: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1288)

26: Generic RD200 HH200 ABO Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1305)

## SHADOW - Map

Calculation: Purmo VE1\_RD200x43xHH200\_real case, Luke forest\_20220505+YV(Salo-Ylikoski)



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 298 020 North: 7 042 710  
 New WTG      Shadow receptor  
 Flicker map level: Height Contours: CONTOURLINE\_Purmon tuulivoimahanke\_0.wpo (4)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

13.2.2023

---

Liite 12. Purmon tuulivoimahanke – varjostusmallinnuksen tulokset "real case, no forest" (VE2)  
Salo-Ylikosken hankkeen kanssa.

## SHADOW - Main Result

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

### 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) []  
 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 time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

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\_Purmon tuulivoimahanke  
 Obstacles used in calculation  
 Receptor grid resolution: 1,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89

### WTGs



Scale 1:400 000  
 New WTG  
 Shadow receptor

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
2	296 402	7 049 512	28,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
3	295 688	7 049 533	26,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
4	296 468	7 048 488	31,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
5	295 661	7 048 308	32,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
6	296 860	7 047 573	35,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
7	295 626	7 047 011	32,3	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
8	297 281	7 046 511	32,8	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
10	296 092	7 046 333	36,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
11	296 633	7 045 796	35,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
12	297 035	7 044 833	36,9	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
13	296 211	7 044 887	37,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
14	297 806	7 044 390	40,6	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
15	296 659	7 043 785	40,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
16	295 680	7 043 726	37,7	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
18	296 033	7 042 892	40,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
19	297 013	7 042 799	42,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
20	295 245	7 042 663	37,3	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
21	297 759	7 041 637	40,9	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
22	298 459	7 042 222	42,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
23	295 640	7 041 888	35,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
24	296 420	7 041 637	37,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
25	297 207	7 041 637	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
27	297 642	7 040 813	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
28	296 377	7 040 414	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
29	299 185	7 040 392	48,4	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
30	297 071	7 039 884	45,8	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
31	295 591	7 039 696	41,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
32	297 823	7 039 673	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
33	298 849	7 039 361	49,7	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
34	299 581	7 039 334	53,6	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
35	296 466	7 039 042	47,3	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
36	295 637	7 038 744	41,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
37	298 820	7 038 484	53,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
39	297 367	7 038 248	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
40	296 154	7 038 055	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
41	298 305	7 037 659	50,9	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
42	298 984	7 037 431	54,8	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Shadow data					
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM	
			[m]										
1010	298 762	7 032 913	58,6	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1020	299 290	7 032 796	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1030	298 900	7 031 842	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1040	298 977	7 031 430	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1050	299 000	7 030 729	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1060	299 358	7 030 441	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4	
1070	299 389	7 029 959	60,0	Generic RD180 HH15...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	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.
A	Asuinrakennus A (Lillkvist)	296 866	7 052 328	26,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Tornbacka)	298 274	7 049 757	28,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Kallträskvägen)	298 556	7 048 421	35,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Lomarakennus F (Källbacken)	299 710	7 044 165	37,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Kornjärvi)	301 071	7 040 772	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Långnabba)	300 689	7 036 583	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Åvistvägen)	298 031	7 035 773	52,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Åvistvägen)	294 394	7 036 982	41,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Finnabbavägen)	294 415	7 037 260	40,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Asuinrakennus T (Norrgård)	293 326	7 042 304	30,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Asuinrakennus U (Nåpi)	294 326	7 045 578	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
W	Asuinrakennus W (Åbrännan)	293 782	7 049 981	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Y	Asuinrakennus Y (Åvist)	294 403	7 036 830	41,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	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 (Lillkvist)	0:00	
B	Asuinrakennus B (Dallberga)	0:00	
C	Asuinrakennus C (Tornbacka)	1:42	
D	Asuinrakennus D (Kallträskvägen)	1:58	
E	Metsästysmaja E (Kejsarbacken)	5:17	
F	Lomarakennus F (Källbacken)	2:01	
G	Asuinrakennus G (Kornjärvi)	3:27	
H	Asuinrakennus H (Sandnabba)	1:51	
I	Asuinrakennus I (Asp)	0:00	
J	Asuinrakennus J (Stennabba)	0:00	
K	Asuinrakennus K (Långnabba)	2:49	
L	Lomarakennus L (Åvistvägen)	0:00	
M	Asuinrakennus M (Stenbacka)	0:00	
N	Asuinrakennus N (Adler)	0:00	
O	Asuinrakennus O (Åvistvägen)	4:30	

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
P	Asuinrakennus P (Finnabbavägen)	3:43
Q	Asuinrakennus Q (Dalabacka)	1:58
R	Asuinrakennus R (Kronkvist)	6:45
S	Asuinrakennus S (Tallbacka)	6:39
T	Asuinrakennus T (Norrgård)	2:05
U	Asuinrakennus U (Näpi)	5:56
V	Asuinrakennus V (Skutas)	1:49
W	Asuinrakennus W (Åbrännan)	1:36
X	Lomarakennus X (Dalbacka)	0:00
Y	Asuinrakennus Y (Ävist)	0:00
Z	Asuinrakennus Z (Nabba)	6:28
AA	Asuinrakennus AA (Kronkvist)	0:00

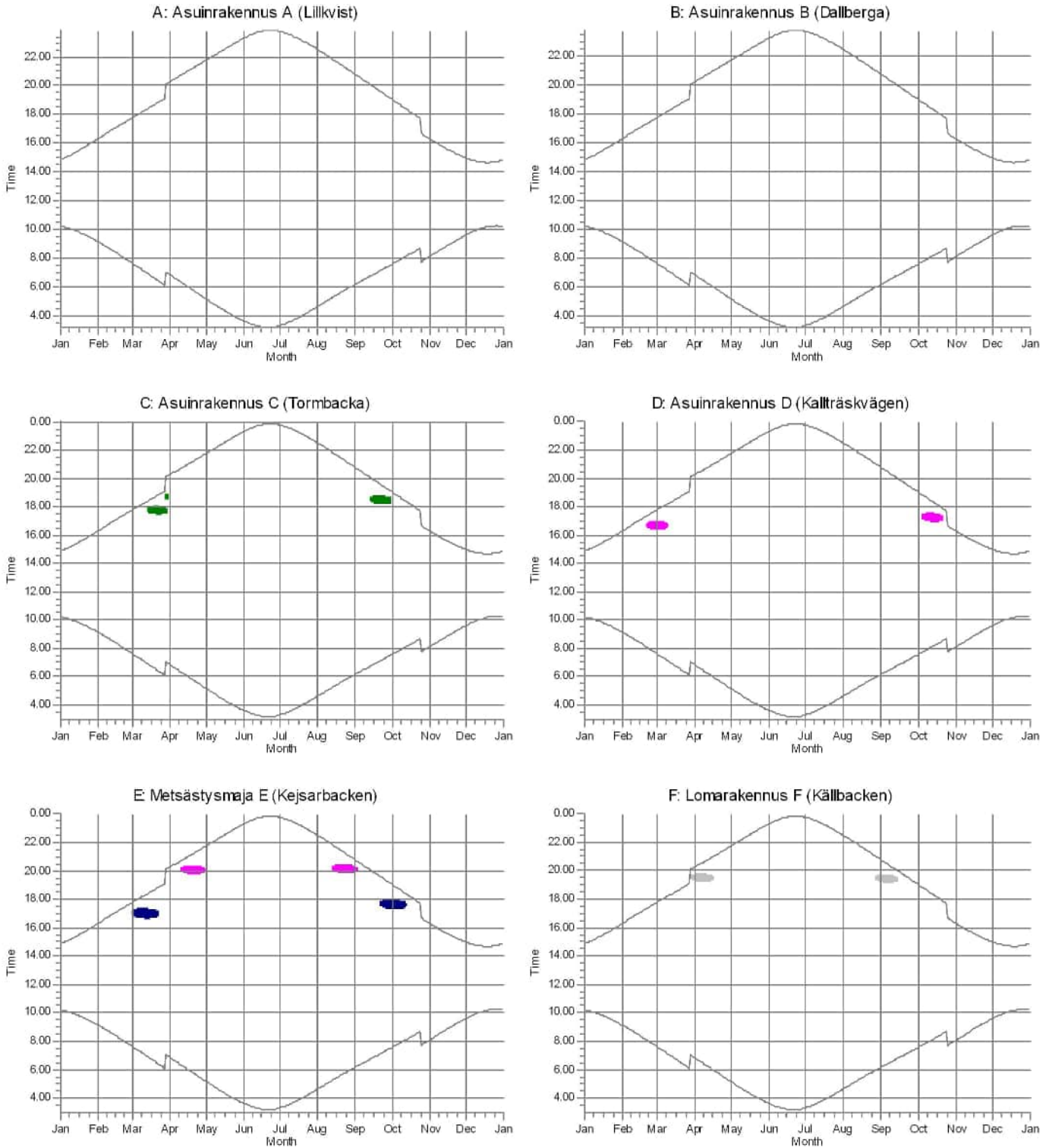
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
2	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1233)	1:42
3	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1234)	1:36
4	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1235)	0:00
5	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1236)	0:00
6	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1237)	4:13
7	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1238)	6:15
8	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1239)	3:02
10	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1240)	5:06
11	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1241)	0:00
12	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1242)	0:00
13	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1243)	1:29
14	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1244)	2:01
15	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1245)	0:00
16	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1246)	0:00
18	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1248)	0:00
19	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1247)	0:00
20	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1249)	11:21
21	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1251)	0:00
22	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1250)	0:00
23	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1252)	4:10
24	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1254)	0:00
25	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1253)	0:00
27	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1255)	0:00
28	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1257)	0:00
29	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1256)	1:37
30	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1258)	0:00
31	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1259)	1:58
32	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1263)	0:00
33	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1260)	0:00
34	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1261)	3:41
35	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1262)	0:00
36	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1264)	0:00
37	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1265)	0:00
39	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1267)	0:00
40	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1266)	8:14
41	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1268)	0:00
42	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1269)	2:49
1010	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1454)	0:00
1020	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1455)	0:00
1030	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1456)	0:00
1040	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1457)	0:00
1050	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1458)	0:00
1060	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1459)	0:00
1070	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1460)	0:00

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.

## SHADOW - Calendar, graphical

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)



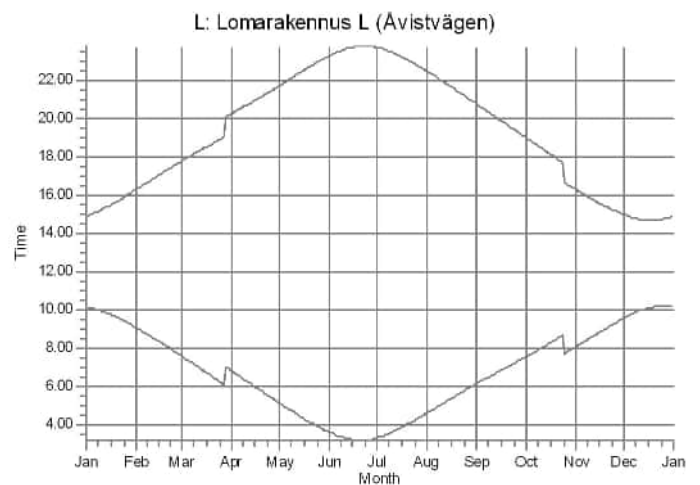
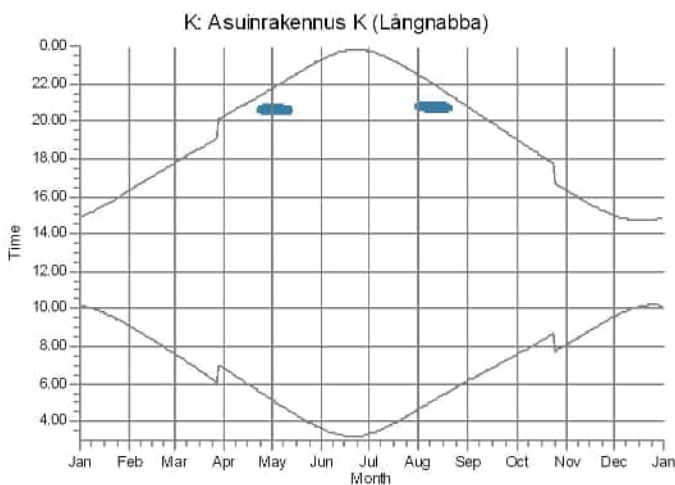
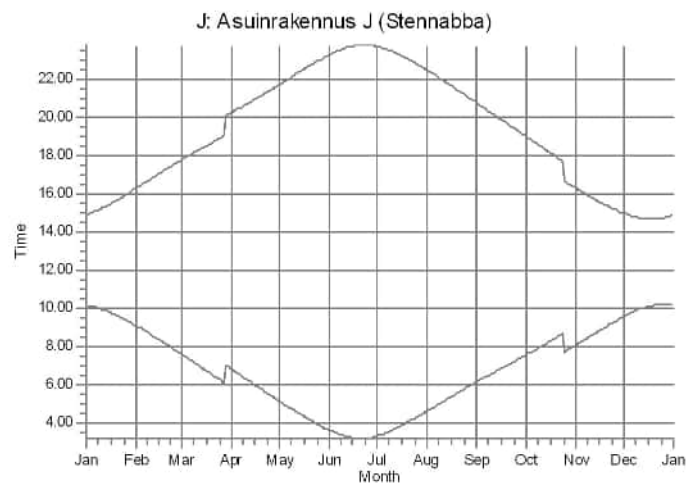
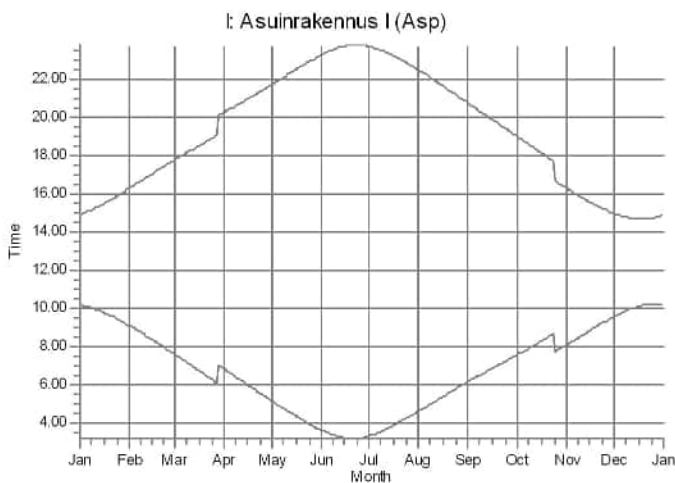
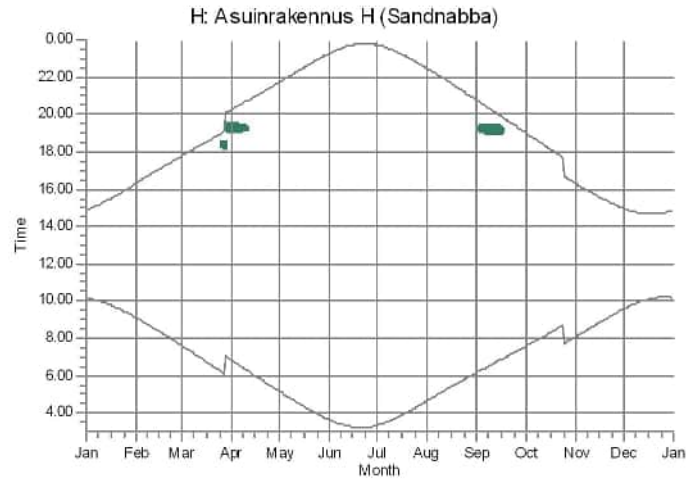
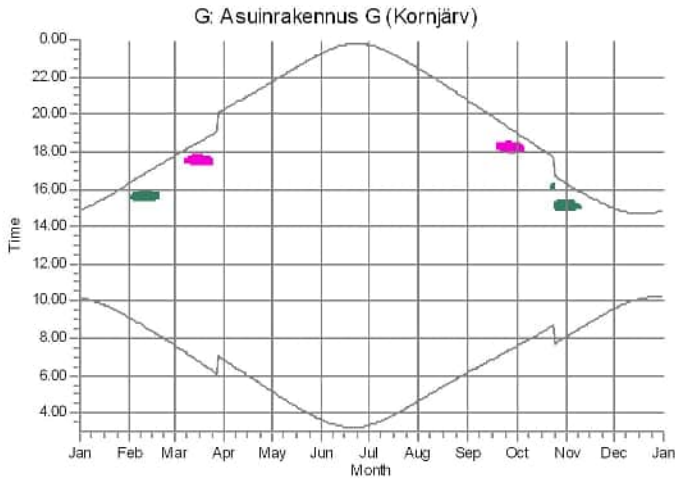
WTGs

- 2: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1233)
- 8: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1239)
- 6: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1237)
- 14: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1244)



## SHADOW - Calendar, graphical

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

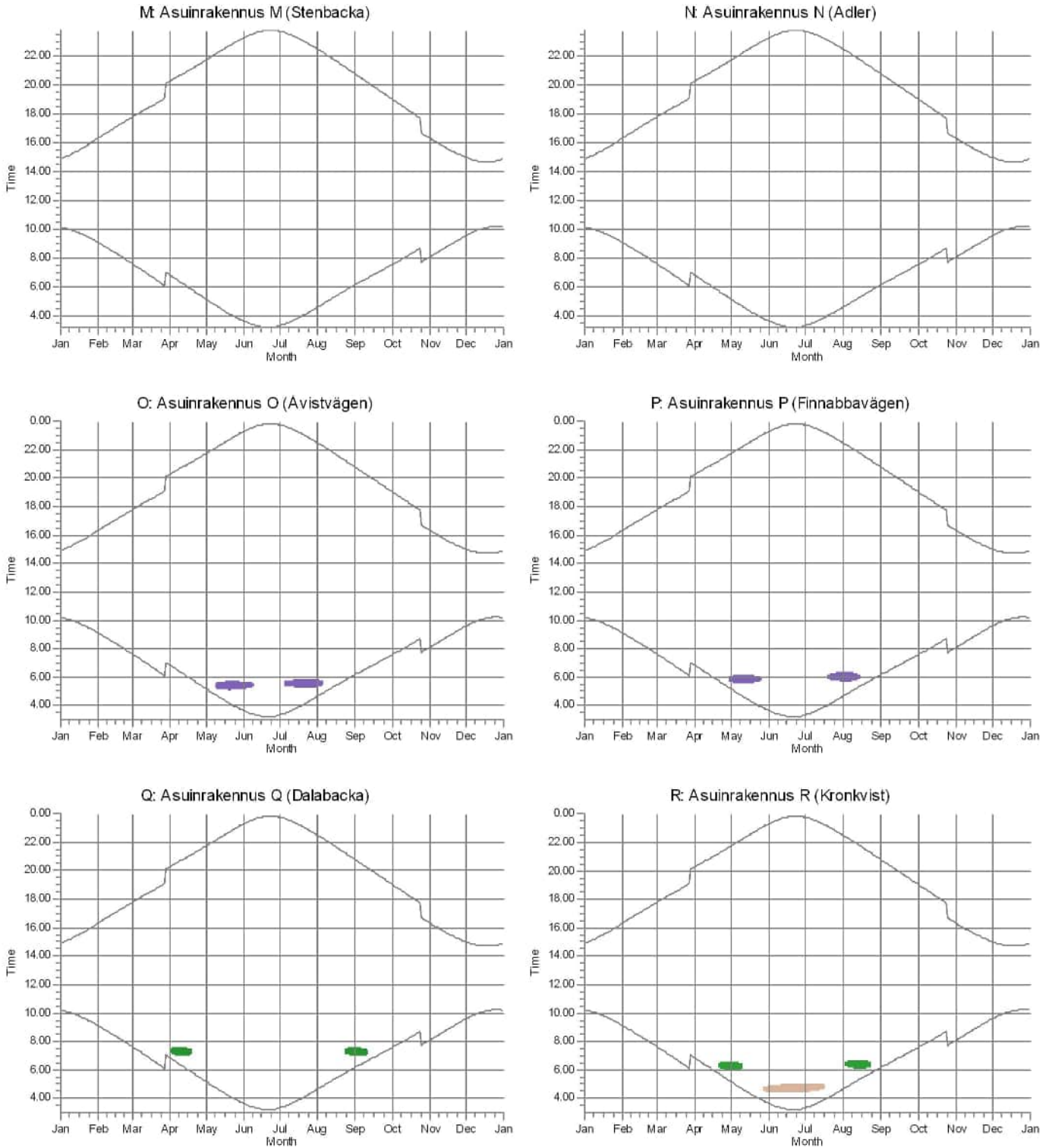


WTGs

29: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1256)    34: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1261)    42: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1269)

## SHADOW - Calendar, graphical

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

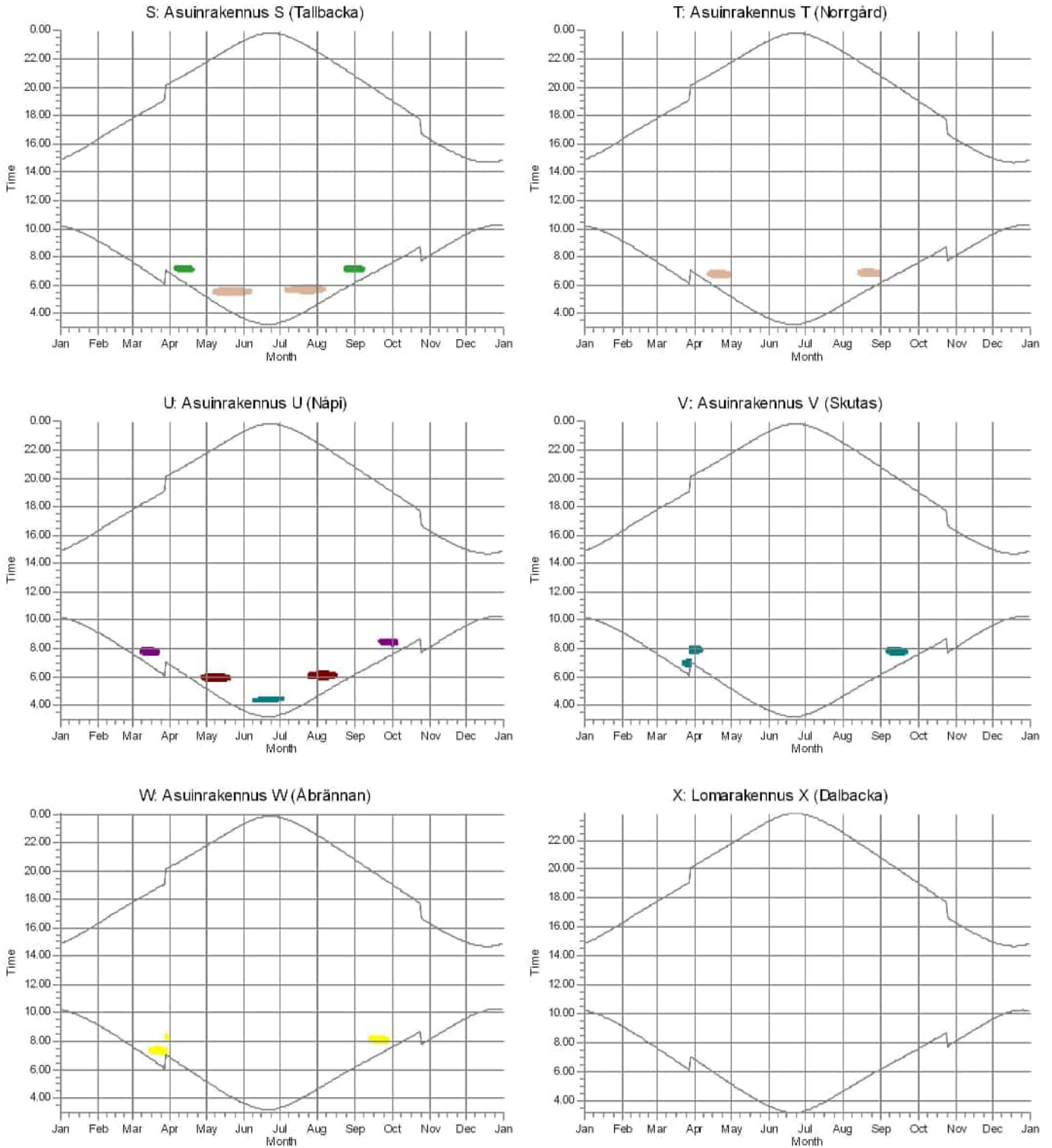


WTGs

- 20: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1249)
- 31: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1259)
- 23: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1252)
- 40: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1266)

## SHADOW - Calendar, graphical

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)

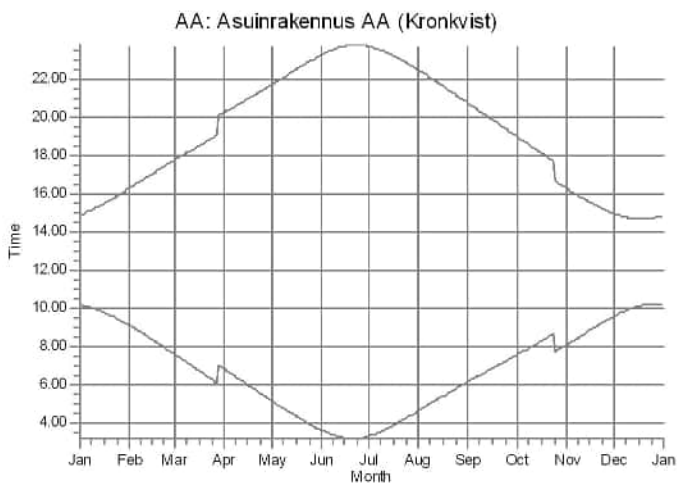
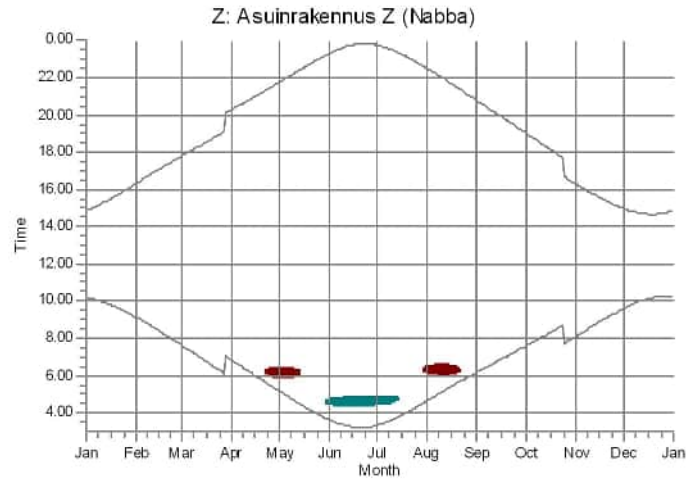
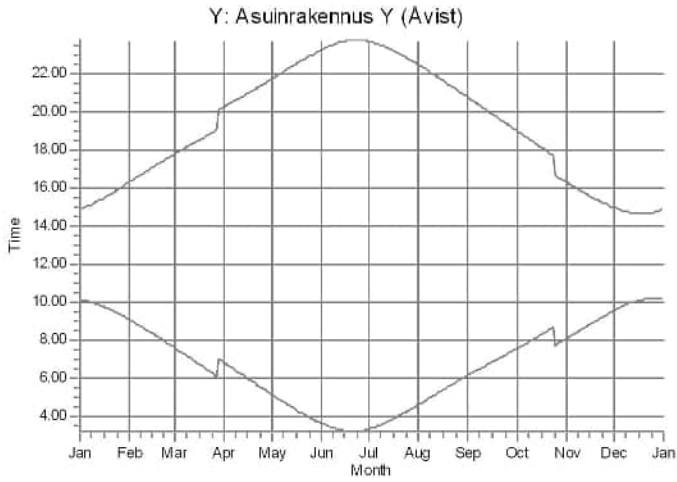


WTGs

- |  |  |  |
|--|--|--|
| <ul style="list-style-type: none"> <li>3: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1234)</li> <li>7: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1238)</li> </ul> | <ul style="list-style-type: none"> <li>10: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1240)</li> <li>13: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1243)</li> </ul> | <ul style="list-style-type: none"> <li>20: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1249)</li> <li>23: Generic RD200 HH200 Abo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1252)</li> </ul> |
|--|--|--|

## SHADOW - Calendar, graphical

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)



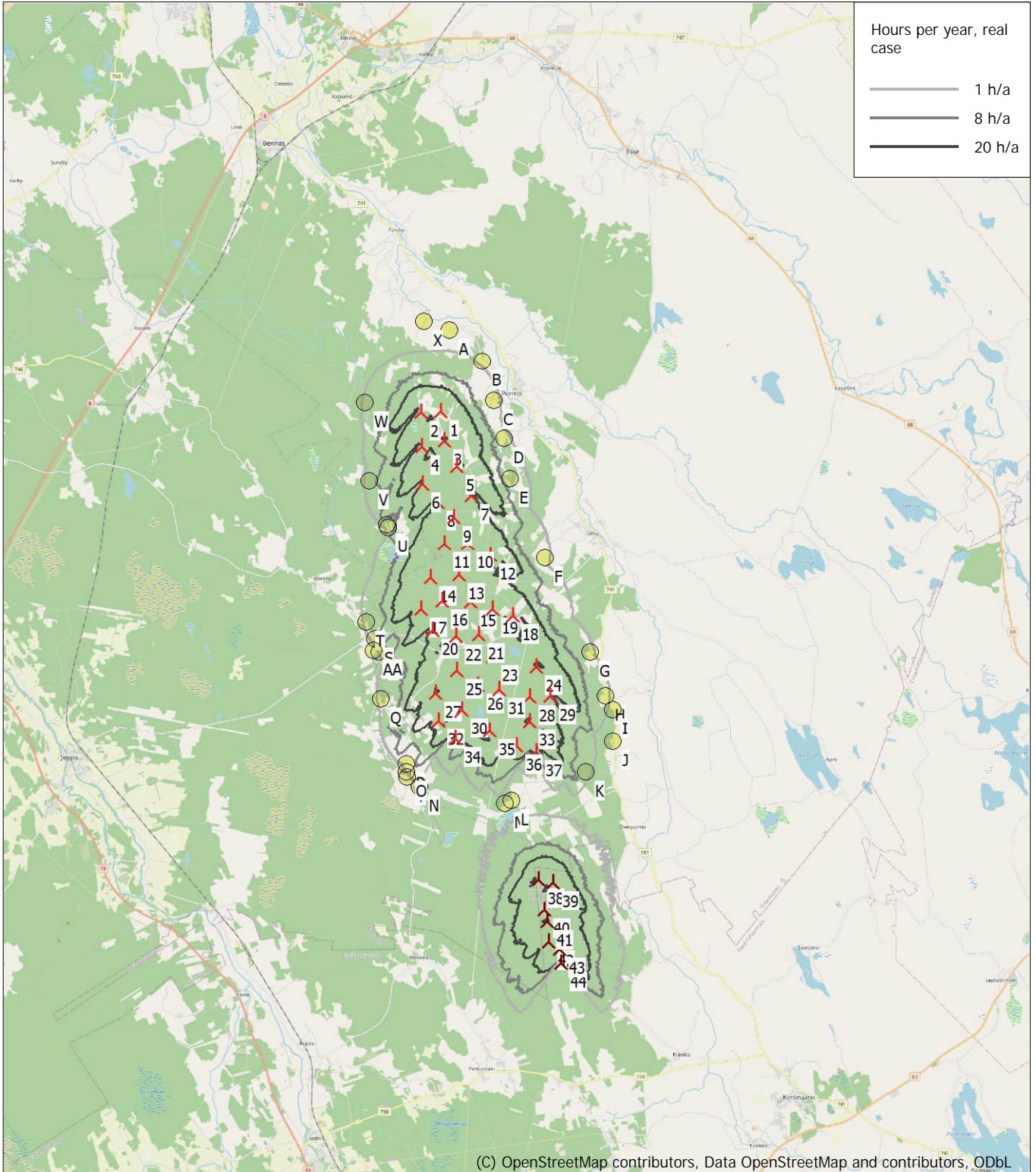
WTGs

7: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1238)

10: Generic RD200 HH200 Åbo Wind 5600 200.0 IOI hub: 200.0 m (TOT: 300.0 m) (1240)

## SHADOW - Map

Calculation: Purmo VE2\_RD200x37xHH200\_real case, no forest\_20220505+YV(Salo-Ylikoski)



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 298 020 North: 7 042 710

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_Purmon tuulivoimahanke\_0.wpo (4)

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

13.2.2023

---

Liite 13. Purmon tuulivoimahanke – varjostusmallinnuksen tulokset "real case, no forest" (VE3)  
Salo-Ylikosken hankkeen kanssa.

Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 8.2.2023 16.37/3.5.584

## SHADOW - Main Result

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)

### 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) []  
 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 time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 678 512 405 372 488 734 1 013 1 177 845 619 495 545 7 883

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\_Purmon tuulivoimahanke  
 Obstacles used in calculation  
 Receptor grid resolution: 1,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89

### WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM
			[m]									
27	297 642	7 040 813	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
29	299 163	7 040 378	48,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
31	295 591	7 039 696	41,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
32	297 843	7 039 671	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
34	299 581	7 039 334	53,6	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
37	298 820	7 038 484	53,1	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
39	297 381	7 038 242	47,5	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
40	296 154	7 038 055	45,0	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
41	298 289	7 037 664	50,4	Generic RD200 HH200...	No	Generic	RD200 HH200 Åbo Wind-5 600	5 600	200,0	200,0	2 086	10,4
1010	298 762	7 032 913	58,6	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1020	299 290	7 032 796	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1030	298 900	7 031 842	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1040	298 977	7 031 430	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1050	299 000	7 030 729	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1060	299 358	7 030 441	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	10,4
1070	299 389	7 029 959	60,0	Generic RD180 HH150...	Yes	Generic	RD180 HH150-7 000	7 000	180,0	150,0	2 264	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 (Lillkvist)	296 866	7 052 328	26,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Dallberga)	297 952	7 051 163	25,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Tornbacka)	298 274	7 049 757	28,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Kallträskvägen)	298 556	7 048 421	35,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Metsästysmaja E (Kejsarbacken)	298 663	7 047 017	33,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Lomarakennus F (Källbacken)	299 710	7 044 165	37,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Kornjärvi)	301 071	7 040 772	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Sandnabba)	301 519	7 039 228	51,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Asp)	301 749	7 038 736	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Asuinrakennus J (Stennabba)	301 661	7 037 581	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Långnabba)	300 689	7 036 583	55,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Ävistvägen)	298 031	7 035 773	52,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Stenbacka)	297 753	7 035 671	53,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Adler)	294 812	7 036 441	44,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...

## SHADOW - Main Result

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)

...continued from previous page

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]
O	Asuinrakennus O (Åvistvägen)	294 394	7 036 982	41,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Finnabbavägen)	294 415	7 037 260	40,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Dalabacka)	293 652	7 039 610	40,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Asuinrakennus R (Kronkvist)	293 736	7 041 267	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Tallbacka)	293 575	7 041 715	32,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Asuinrakennus T (Norrgård)	293 326	7 042 304	30,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Asuinrakennus U (Näpi)	294 326	7 045 578	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Skutas)	293 741	7 047 247	32,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
W	Asuinrakennus W (Åbrännan)	293 782	7 049 981	22,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
X	Lomarakennus X (Dalbacka)	296 008	7 052 686	21,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Y	Asuinrakennus Y (Åvist)	294 403	7 036 830	41,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Z	Asuinrakennus Z (Nabba)	294 257	7 045 675	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
AA	Asuinrakennus AA (Kronkvist)	293 533	7 041 290	31,7	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 (Lillkvist)	0:00
B	Asuinrakennus B (Dallberga)	0:00
C	Asuinrakennus C (Tormbacka)	0:00
D	Asuinrakennus D (Kallträskvägen)	0:00
E	Metsästysmaja E (Kejsarbacken)	0:00
F	Lomarakennus F (Källbacken)	0:00
G	Asuinrakennus G (Kornjärvi)	3:25
H	Asuinrakennus H (Sandnabba)	1:51
I	Asuinrakennus I (Asp)	0:00
J	Asuinrakennus J (Stennabba)	0:00
K	Asuinrakennus K (Långnabba)	0:00
L	Lomarakennus L (Åvistvägen)	0:00
M	Asuinrakennus M (Stenbacka)	0:00
N	Asuinrakennus N (Adler)	0:00
O	Asuinrakennus O (Åvistvägen)	4:30
P	Asuinrakennus P (Finnabbavägen)	3:43
Q	Asuinrakennus Q (Dalabacka)	1:58
R	Asuinrakennus R (Kronkvist)	0:00
S	Asuinrakennus S (Tallbacka)	0:00
T	Asuinrakennus T (Norrgård)	0:00
U	Asuinrakennus U (Näpi)	0:00
V	Asuinrakennus V (Skutas)	0:00
W	Asuinrakennus W (Åbrännan)	0:00
X	Lomarakennus X (Dalbacka)	0:00
Y	Asuinrakennus Y (Åvist)	0:00
Z	Asuinrakennus Z (Nabba)	0:00
AA	Asuinrakennus AA (Kronkvist)	0:00

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

No.	Name	Expected [h/year]
27	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1270)	0:00
29	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1271)	1:35
31	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1272)	1:58
32	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1274)	0:00
34	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1273)	3:41
37	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1275)	0:00
39	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1277)	0:00
40	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1276)	8:14
41	Generic RD200 HH200 Åbo Wind 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (1278)	0:00
1010	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1454)	0:00
1020	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1455)	0:00

To be continued on next page...



Project:

Purmon tuulivoimahanke

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

8.2.2023 16.37/3.5.584

## SHADOW - Main Result

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)

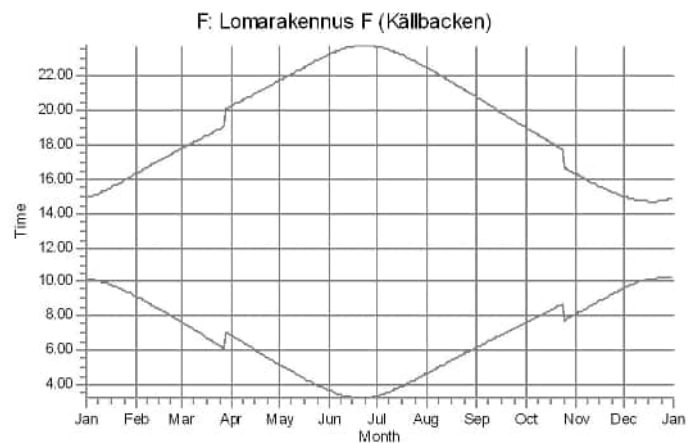
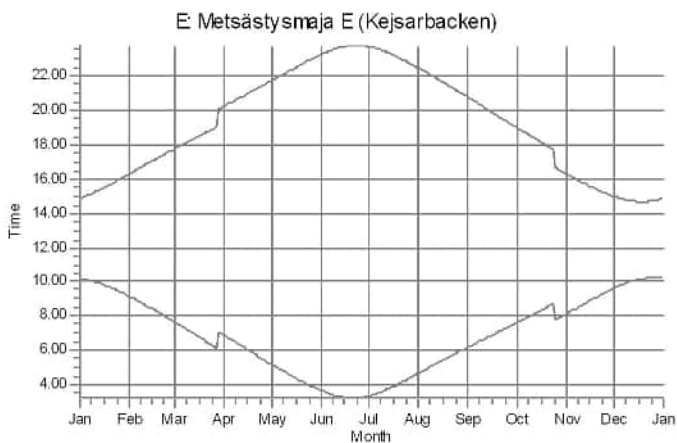
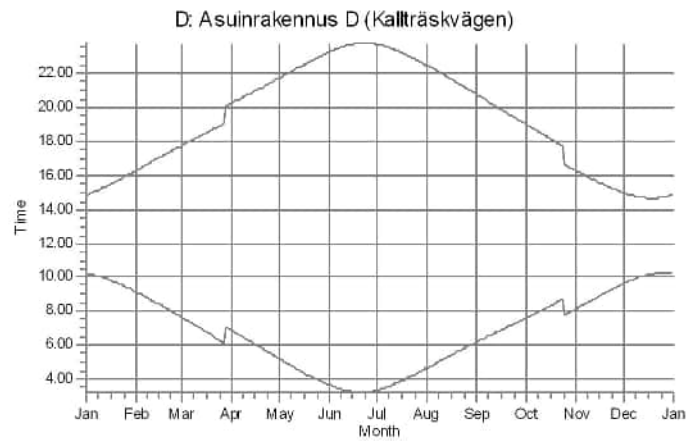
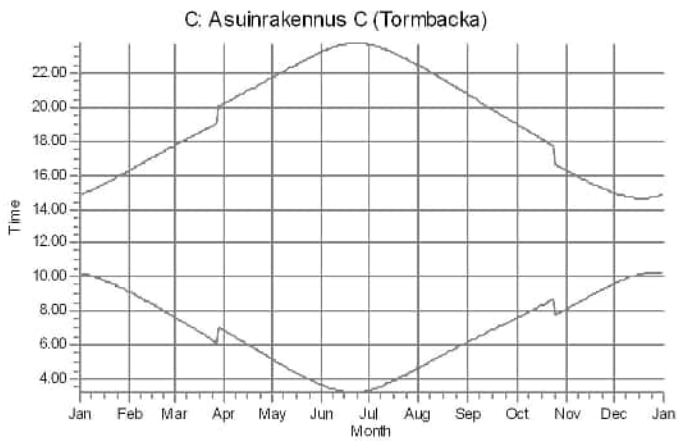
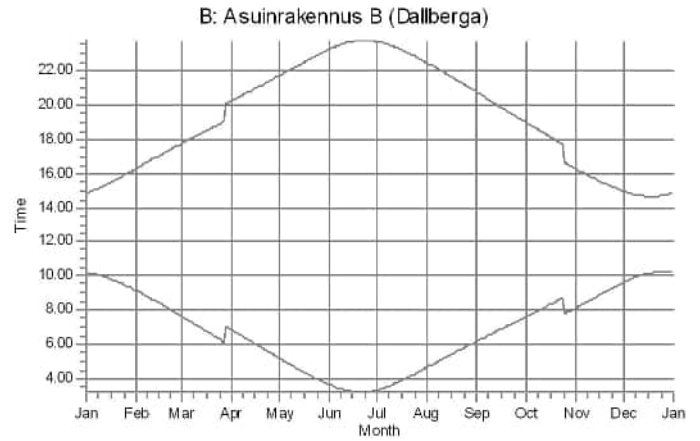
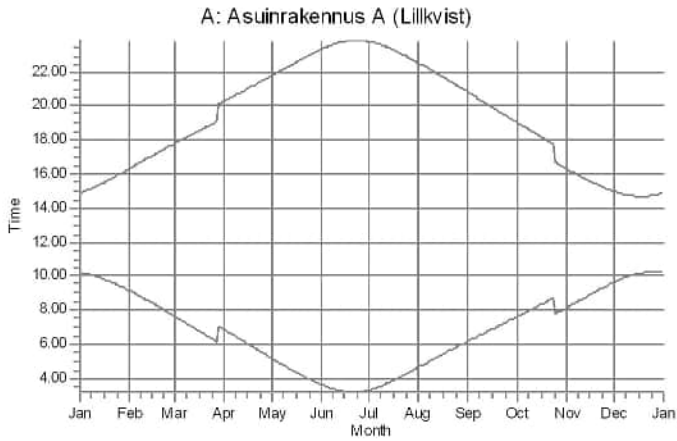
...continued from previous page

No.	Name	Expected [h/year]
1030	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1456)	0:00
1040	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1457)	0:00
1050	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1458)	0:00
1060	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1459)	0:00
1070	Generic RD180 HH150 7000 180.0 !O! hub: 150,0 m (TOT: 240,0 m) (1460)	0:00

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.

## SHADOW - Calendar, graphical

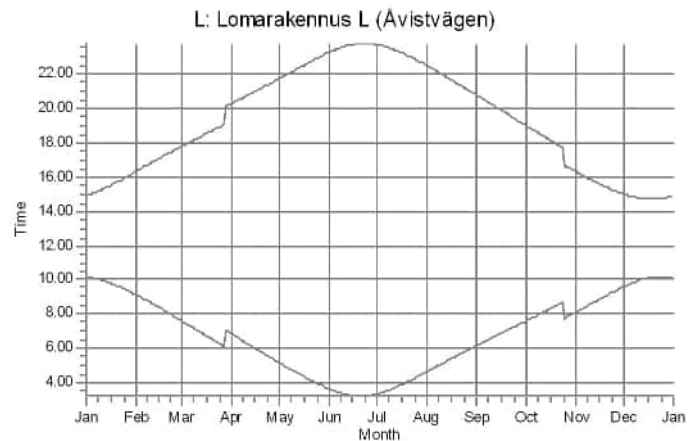
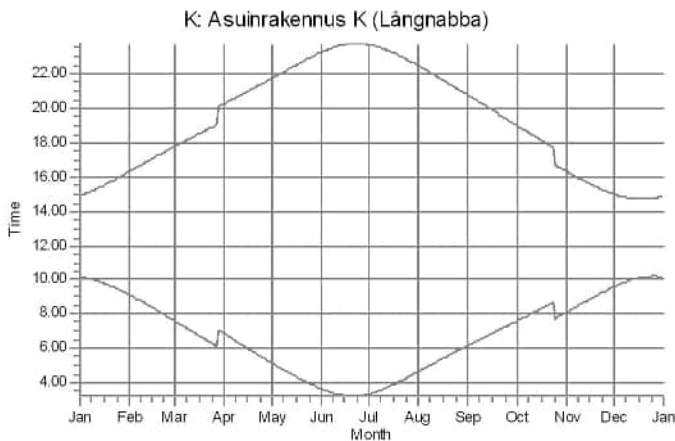
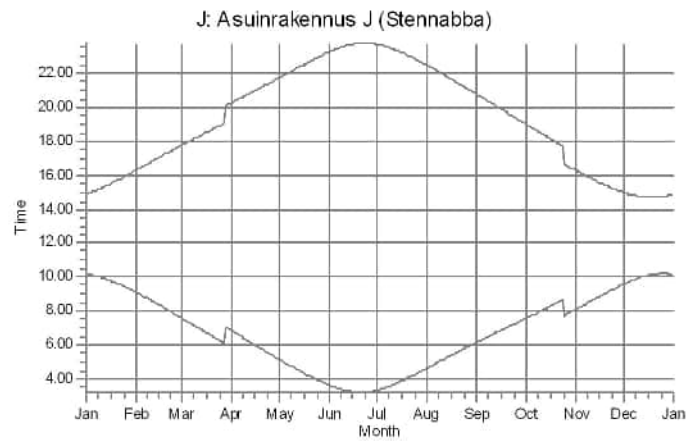
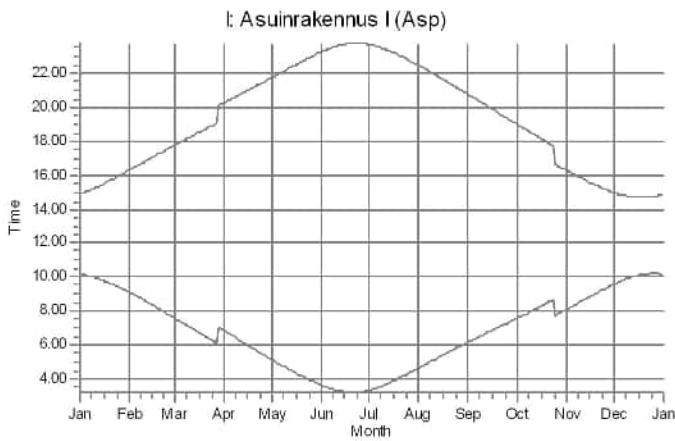
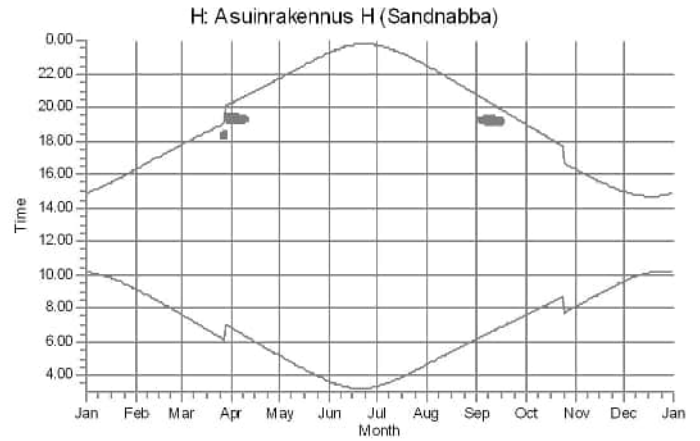
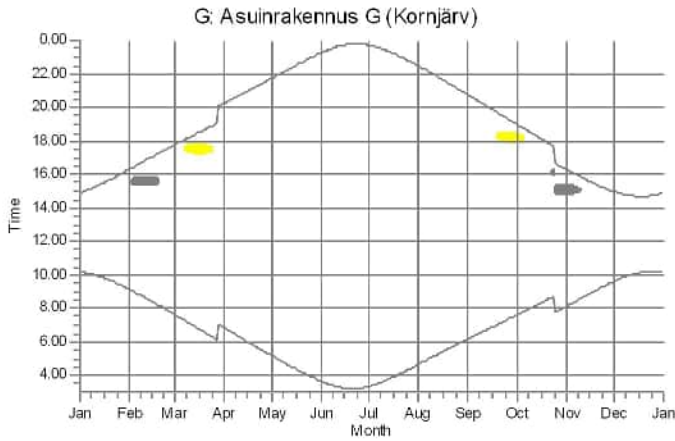
Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



WTGs

## SHADOW - Calendar, graphical

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



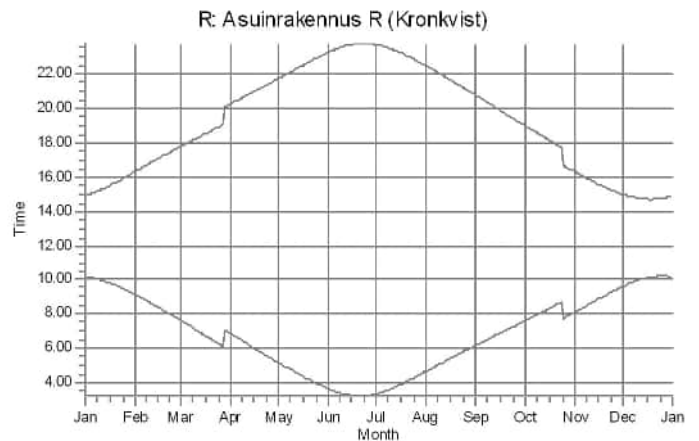
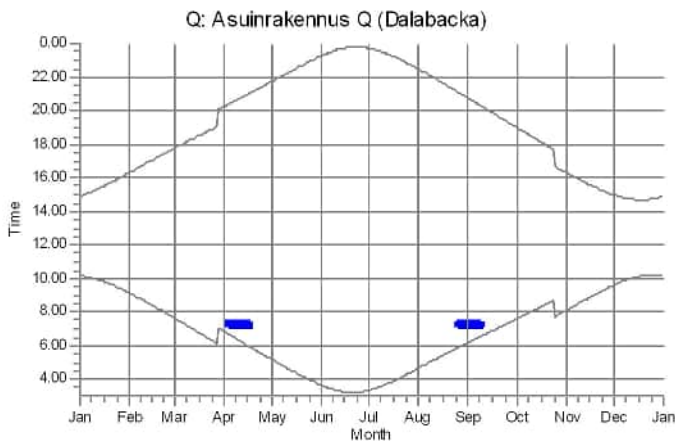
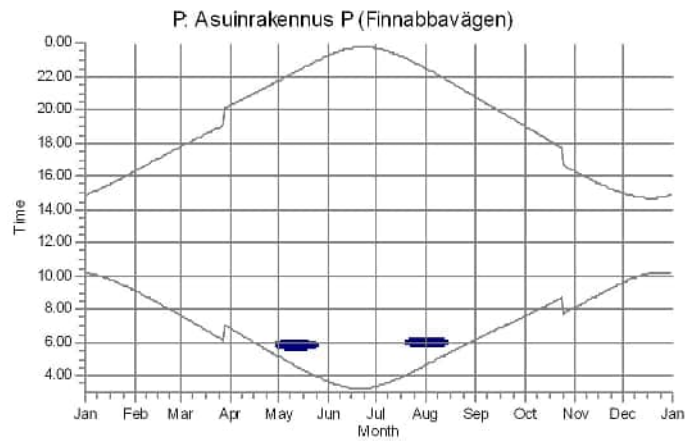
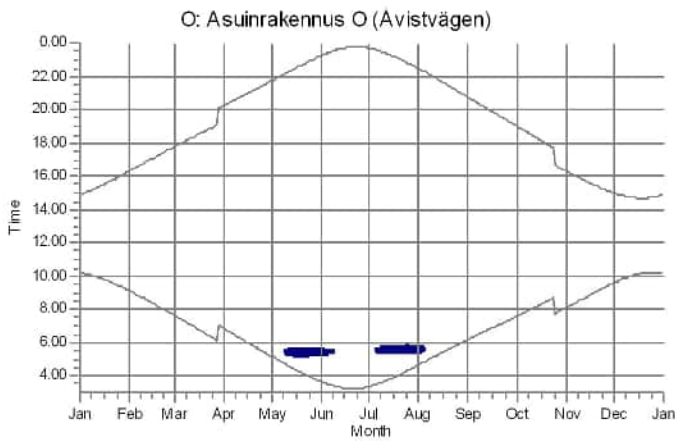
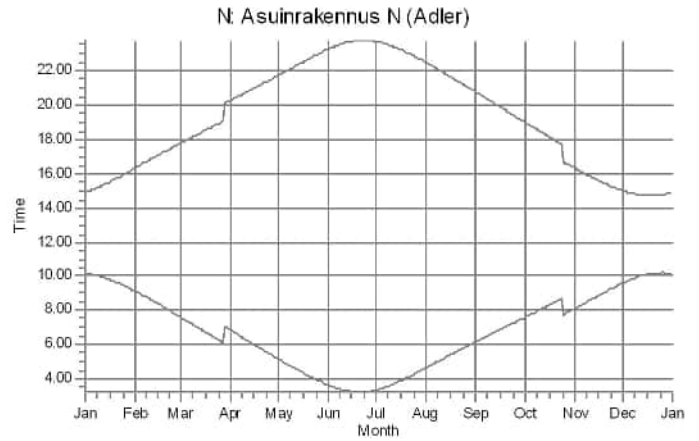
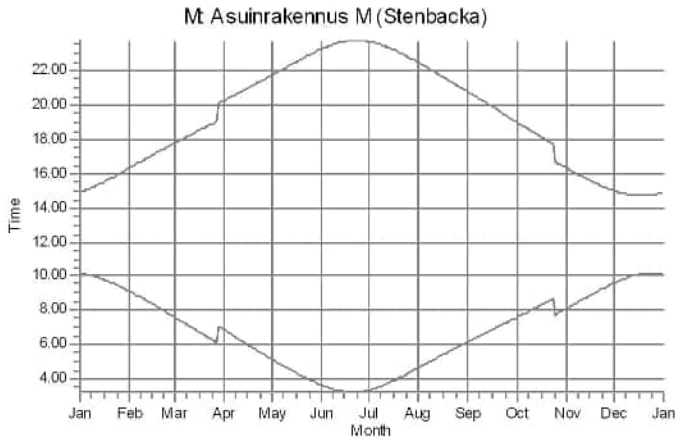
WTGs

29: Generic RD200 HH200 Åbo Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1271)

34: Generic RD200 HH200 Åbo Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1273)

## SHADOW - Calendar, graphical

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



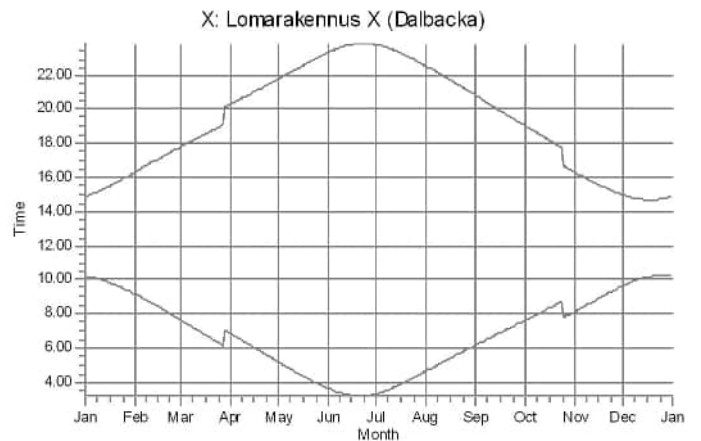
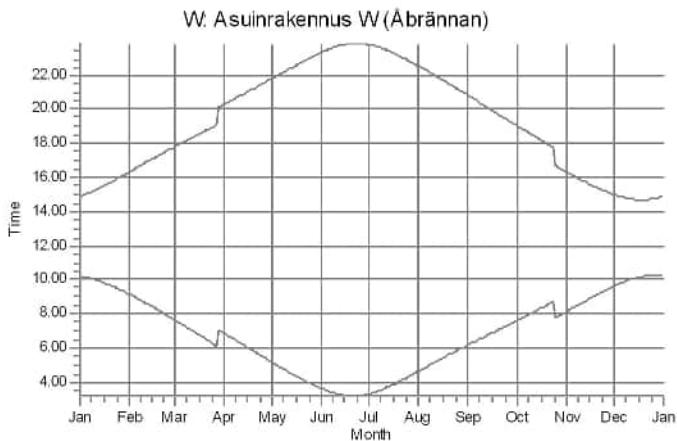
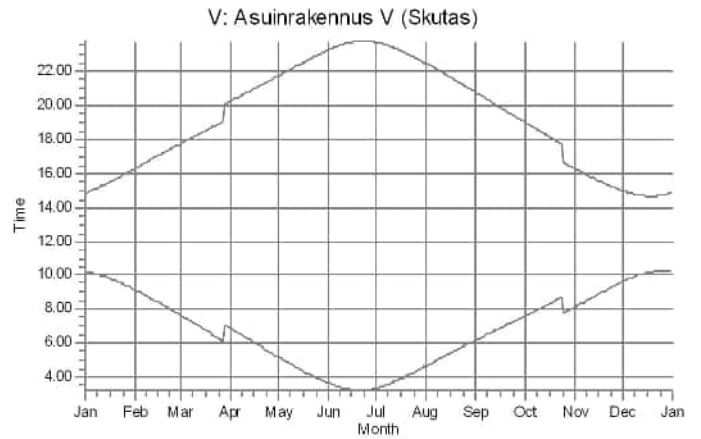
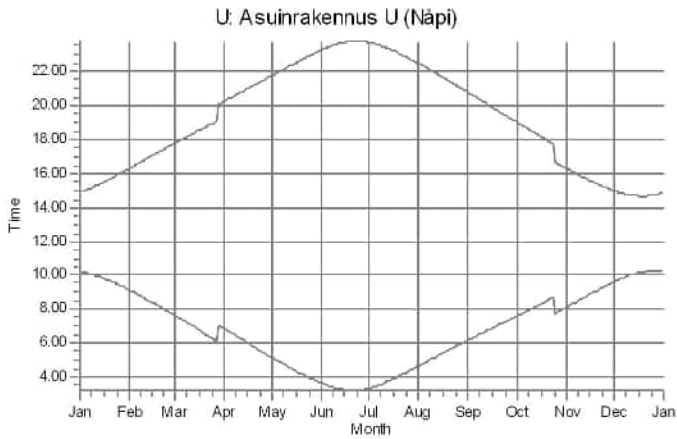
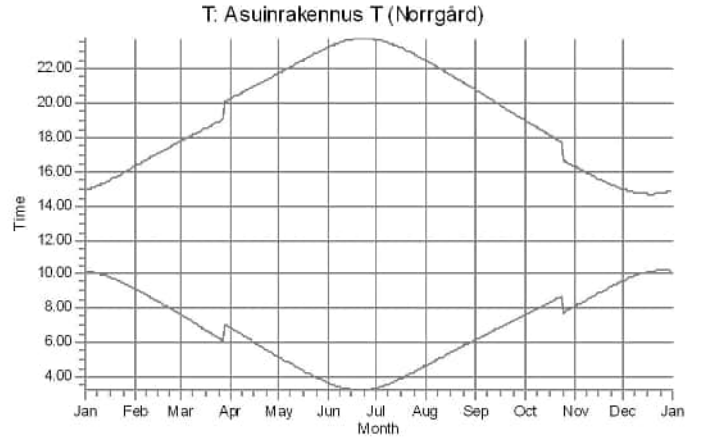
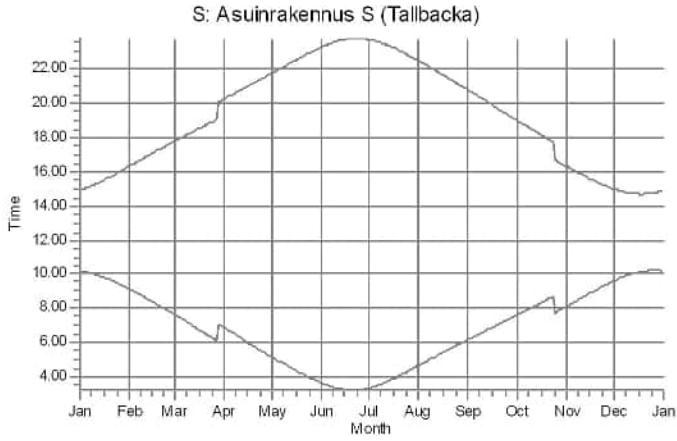
WTGs

31: Generic RD200 HH200 Åbo Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1272)

40: Generic RD200 HH200 Åbo Wind 5600 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (1276)

## SHADOW - Calendar, graphical

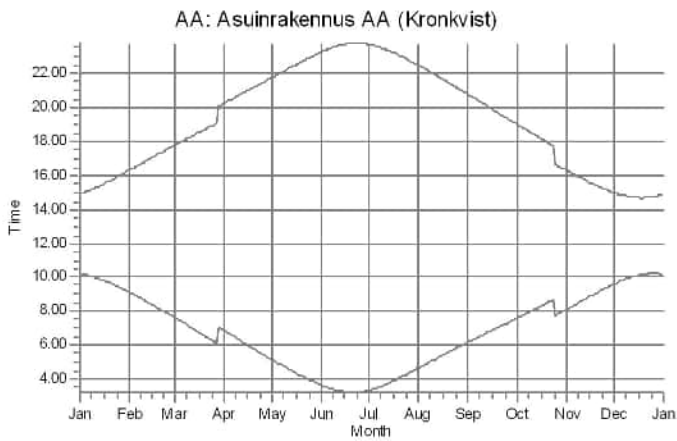
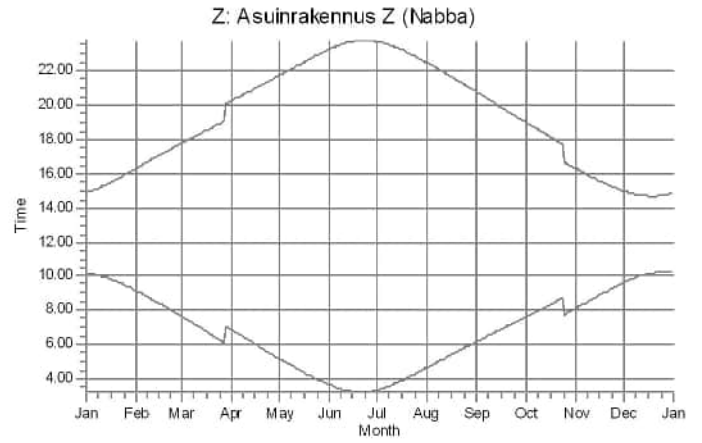
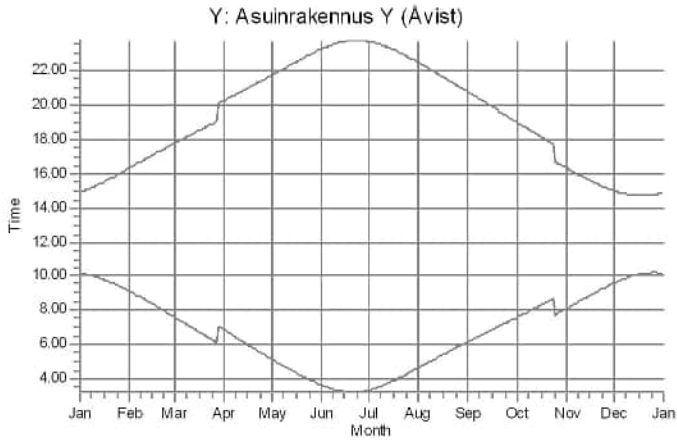
Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



WTGs

## SHADOW - Calendar, graphical

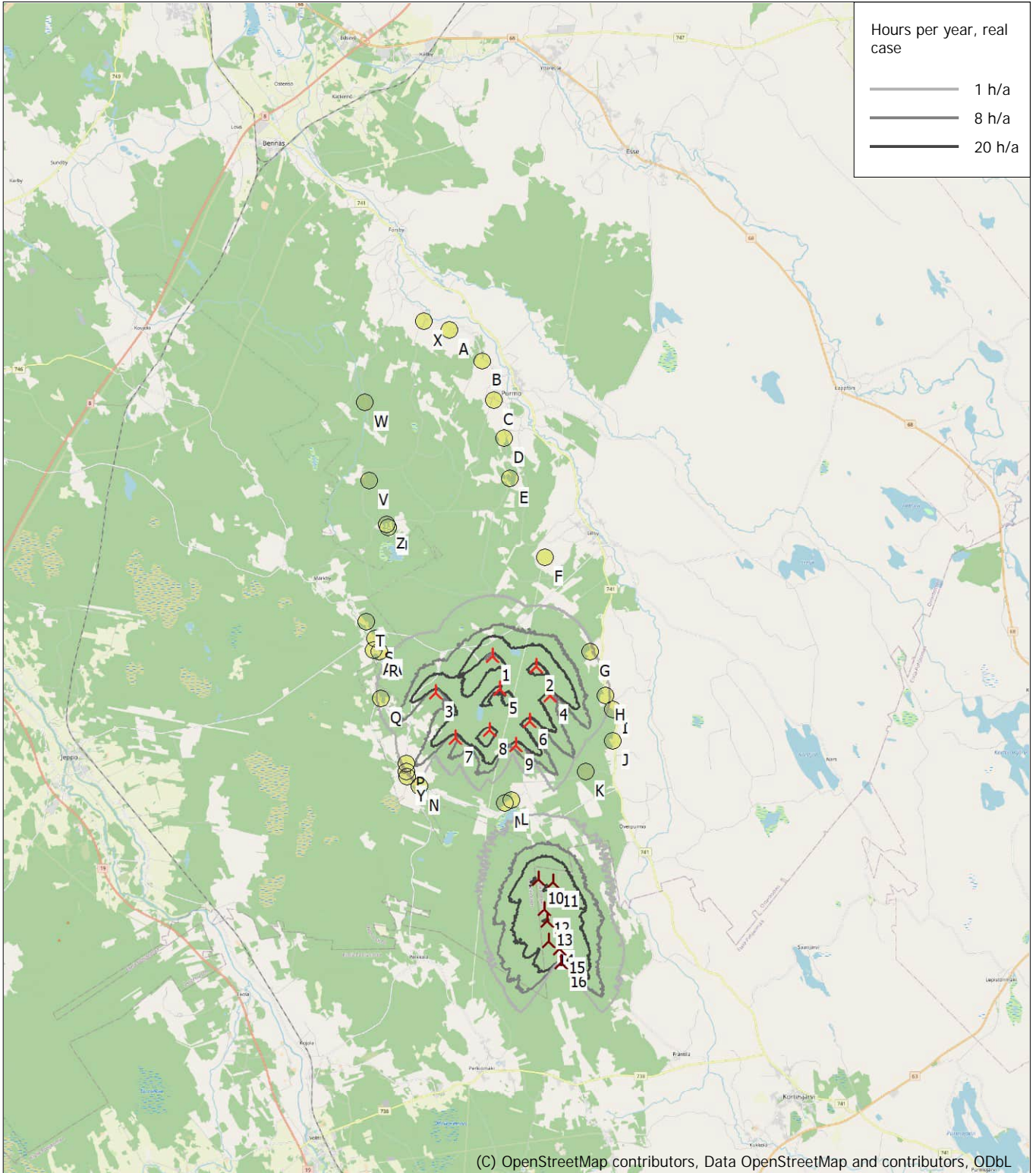
Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



WTGs

## SHADOW - Map

Calculation: Purmo VE3\_RD200x9xHH200\_real case, no forest\_20220505+YV(Yli-Salokoski)



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 298 020 North: 7 042 710  
 New WTG      Shadow receptor  
 Flicker map level: Height Contours: CONTOURLINE\_Purmon tuulivoimahanke\_0.wpo (4)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m