

Wind energy statistics in Finland 2012

Version: Public

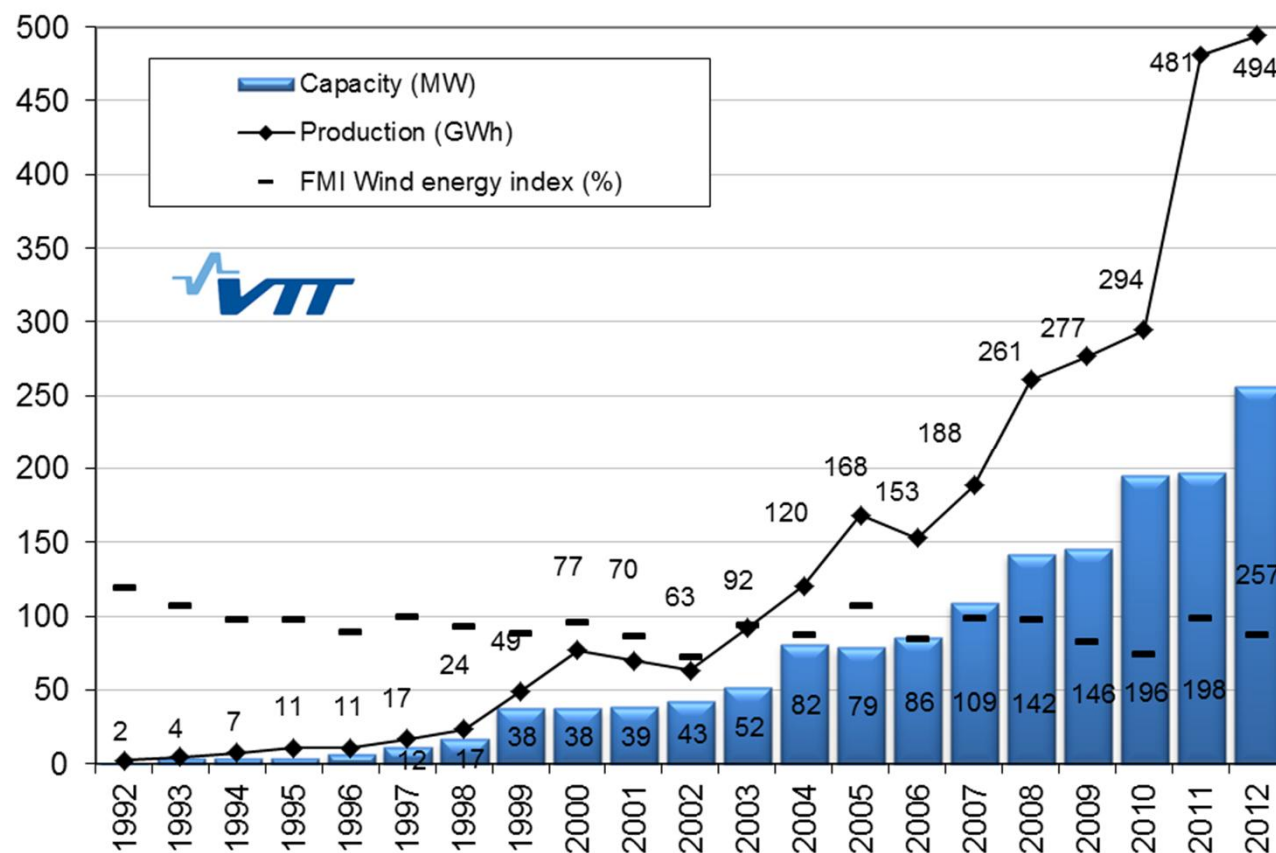


[Foto: Tuuliwatti Oy (Simo wind plant)]

Wind energy year 2012

- End of year capacity in Finland: 258MW (153 turbines) Source: Finnish Wind Power Association
- Production in Finland: 494GWh Source: Finnish Energy Industries statistics
- End of year capacity in VTT statistics (not including all small/used turbines): 257MW (151 turbines)
 - Average size of turbine 1.7 MW, max 3.6 MW
- Production in VTT statistics: 492GWh
- New capacity in 2012: 59.2MW (22 turbines)
 - Average size of turbine 2.7 MW, max 3.6 MW
- Average capacity factor: 22%
- Average capacity factor for >2 MW turbines: 29%
- Average wind production index: 91% Source: Finnish Meteorological Institute

Development of wind power capacity and production in Finland



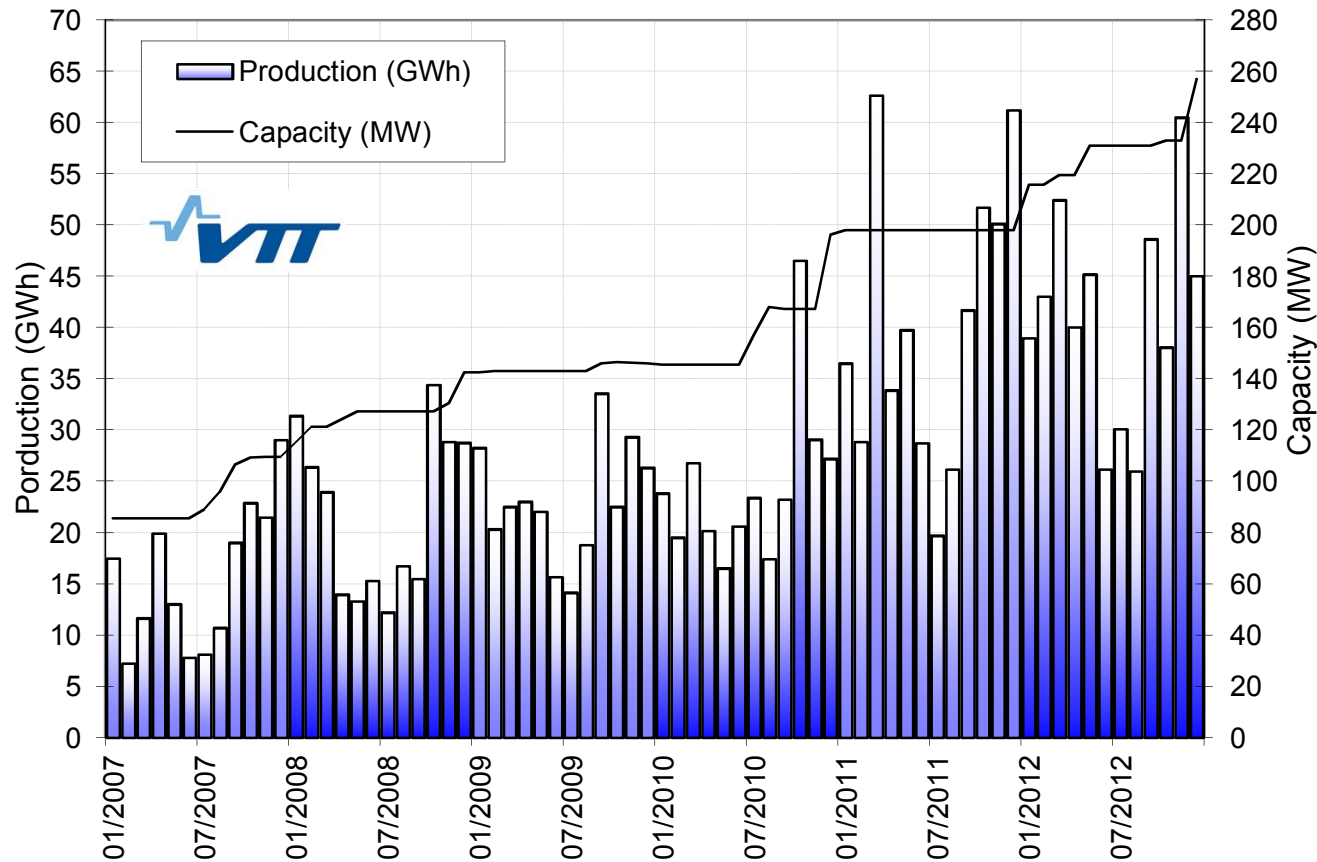
Source:

Finnish Energy Industries statistics

Finnish Meteorological Institute

Information & data from wind power producers

Monthly wind power production and capacity in Finland

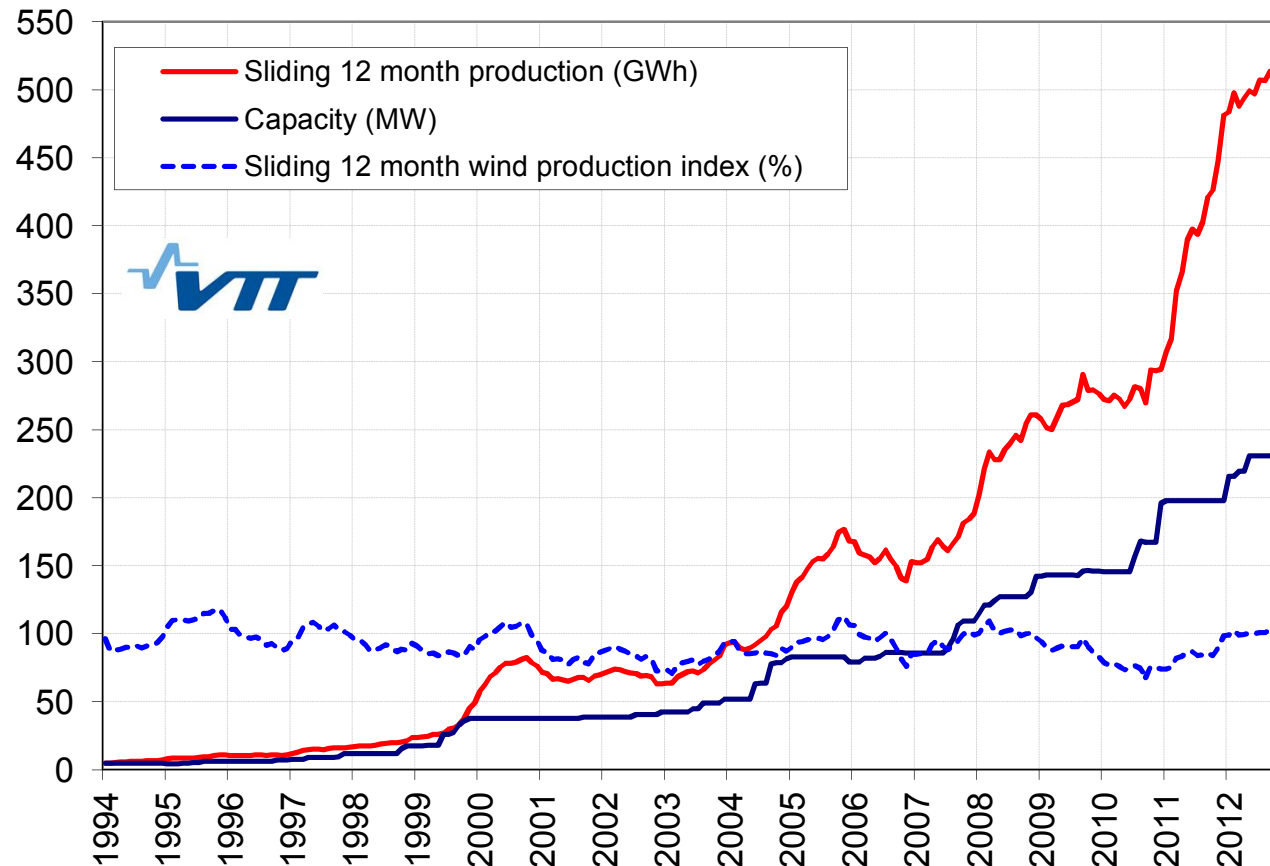


Source:

Finnish Energy Industries statistics

Information & data from wind power producers

Wind power production and production indices as 12 month sliding averages



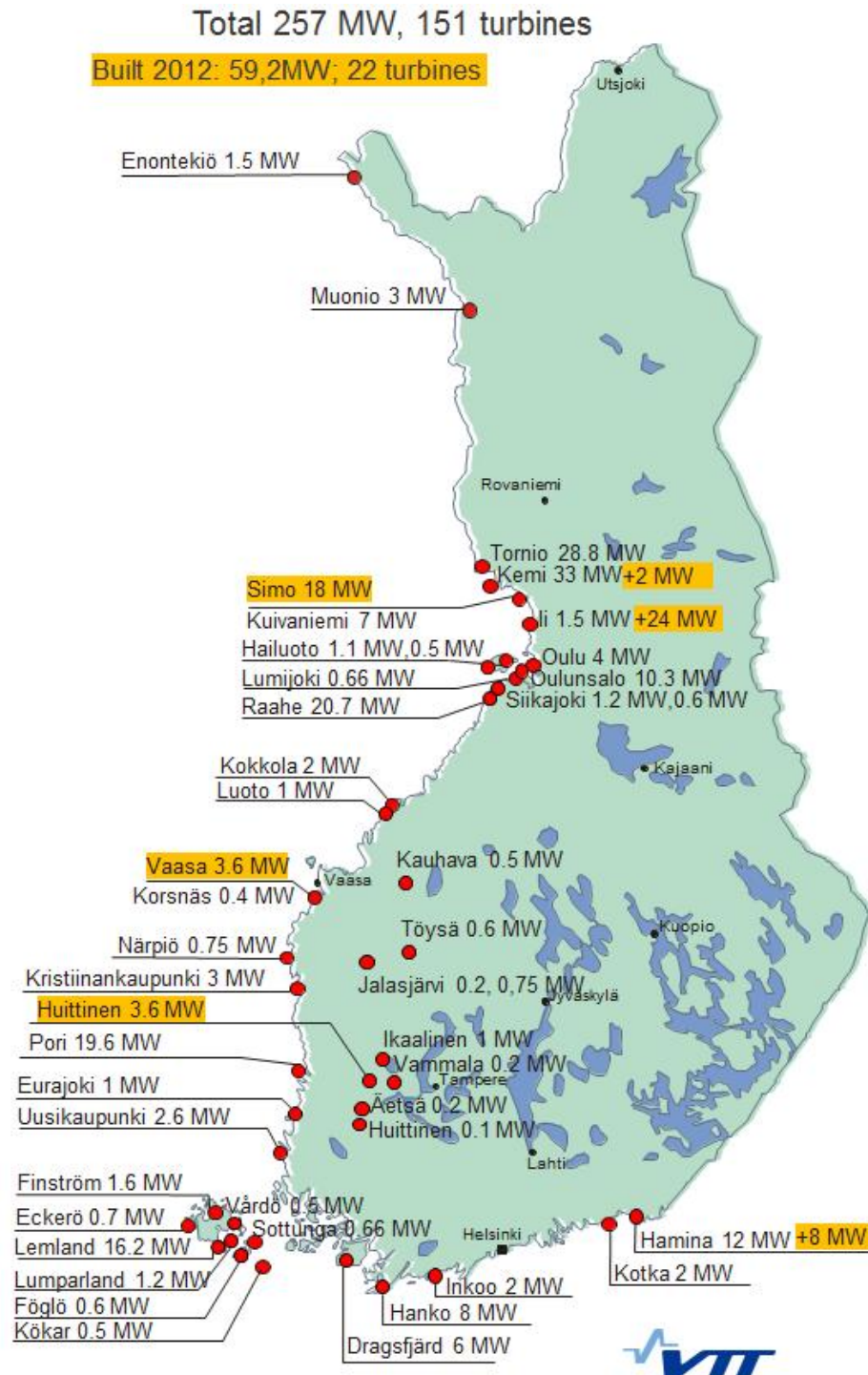
Source:

Finnish Energy Industries statistics

Finnish Meteorological Institute

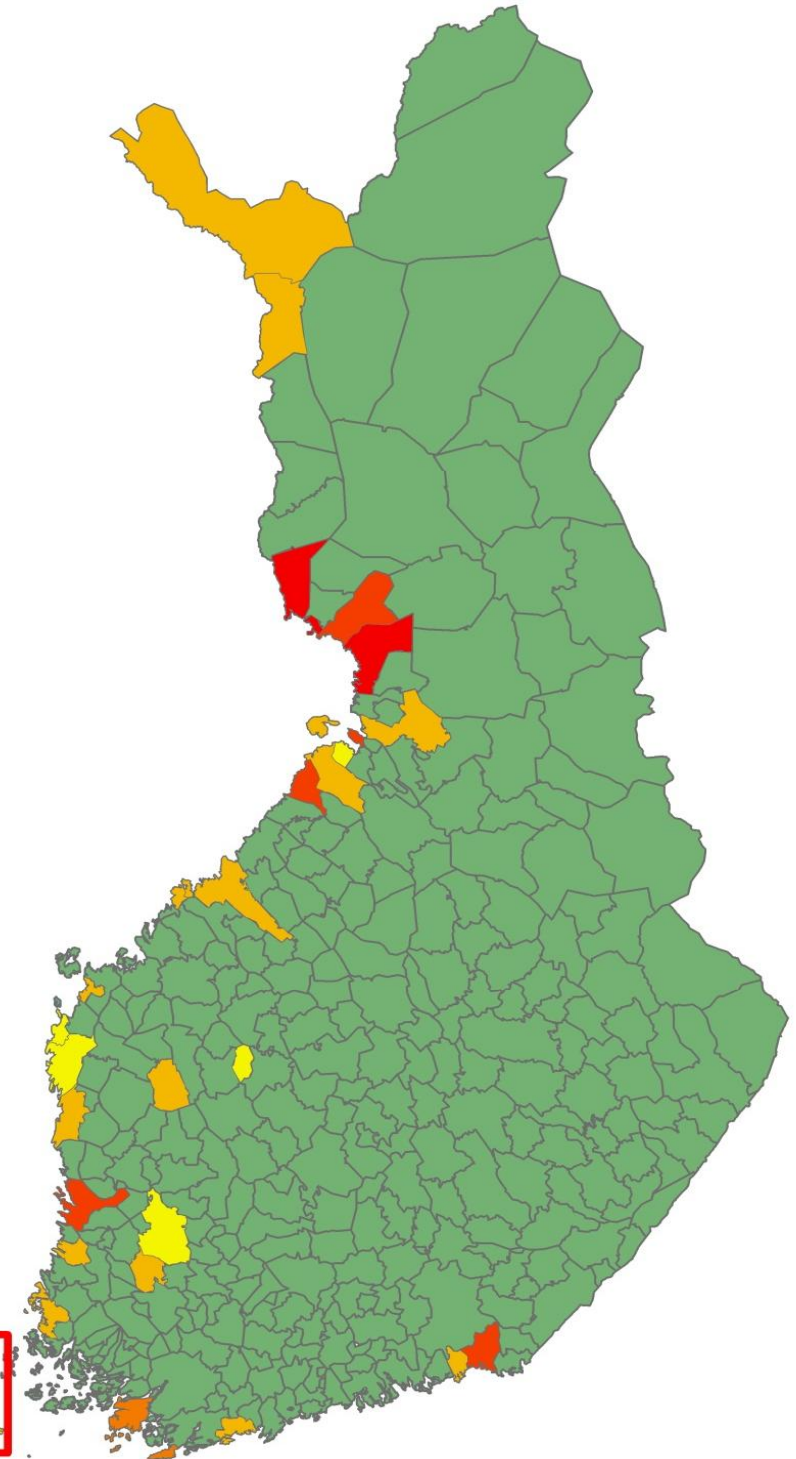
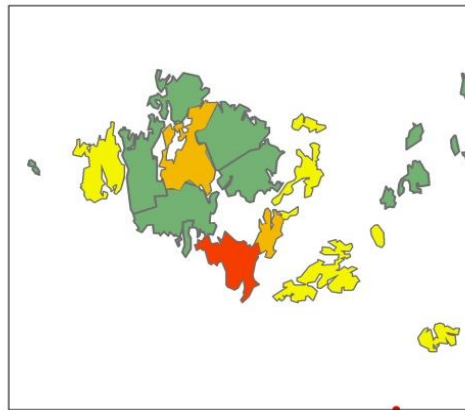
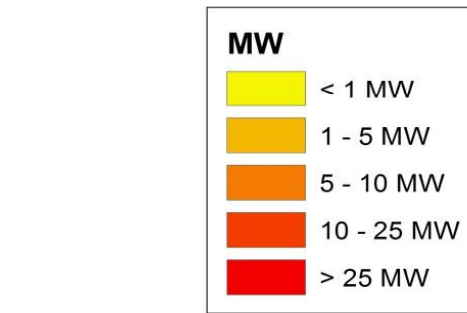
Information & data from wind power producers

Location of wind power plants at the end of 2012



Municipality	MW	%
Kemi	35,0	13,6 %
Ii	32,0	12,5 %
Tornio	28,8	11,2 %
Raahe	20,7	8,1 %
Hamina	20,0	7,8 %
Pori	19,6	7,6 %
Simo	18,0	7,0 %
Lemland	16,2	6,3 %
Oulunsalo	10,3	4,0 %
Hanko	8,0	3,1 %
Kimitoön	6,0	2,3 %
Oulu	4,0	1,6 %
Huittinen	3,7	1,4 %
Vaasa	3,6	1,4 %
Kristinestad	3,0	1,2 %
Muonio	3,0	1,2 %
Uusikaupunki	2,6	1,0 %
Ingå	2,0	0,8 %
Kokkola	2,0	0,8 %
Kotka	2,0	0,8 %
Siikajoki	1,8	0,7 %
Finström	1,6	0,6 %
Hailuoto	1,6	0,6 %
Enontekiö	1,5	0,6 %
Lumparland	1,2	0,5 %
Eurajoki	1,0	0,4 %
Larsmo	1,0	0,4 %
Jalasjärvi	1,0	0,4 %
Närpes	0,8	0,3 %
Eckerö	0,7	0,3 %
Lumijoki	0,7	0,3 %
Sottunga	0,7	0,3 %
Föglö	0,6	0,2 %
Töysä	0,6	0,2 %
Kökar	0,5	0,2 %
Vårdö	0,5	0,2 %
Sastamala	0,5	0,2 %
Korsnäs	0,4	0,2 %
Summa	257,0	100,0 %

Regional distribution of wind energy capacity in Finland in 2012



Wind turbines in Finland

Municipality&Name	Start date: m.m.yy	Owner	Manufacturer	Power kW	In statistics analysis	Stop date: m.m.yy	Info
Inkeo-Kopparnäs	11.86	Fortum Power and Heat Oy	DWT	300		01.95	Decommissioned (did not participate to statistics))
Enontekiö-Paljaselkä	02.91	Tunturituuli Oy	Nordtank	75		08.02	Moved to Huitinen
Korsnäs-Korsnäs 1,3	11.91	Korsnäsin Tuulivoimapuisto Oy	Nordtank	2 x 200	x		
Korsnäs-Korsnäs 4	11.91	Korsnäsin Tuulivoimapuisto Oy	Nordtank	200		07.09	Decommissioned
Korsnäs-Korsnäs 2	11.91	Korsnäsin Tuulivoimapuisto Oy	Nordtank	200		12.11	Decommissioned
Sottunga-Ormhälla	01.92	Ålands Vindenergiandelslag	Vestas	225		08.10	Decommissioned
Kalajoki-Rahja 1-2	04.93	Spawer Kraft Ab	Nordtank	2 x 300		10.06	Decommissioned
Siikajoki-Säikkä 1-2	04.93	Spawer Kraft Ab	Nordtank	2 x 300	x		
Kemi-Kemi 1-3	08.93	Kemin Tuulivoimapuisto Oy	Nordtank	3x300		07.10	Decommissioned
Pori-Pori 1	09.93	Pori Energia Oy	Nordtank	300	x		
Hailuoto-Marjaniemi 1-2	10.93	Spawer Kraft Ab	Nordtank	2 x 300	x		
Pelkosenniemi-Pyhätunturi	10.93	Kemijoki Arctic Technology Oy	Windworld	220		09.01	Moved to Jalasjärvi
Hailuoto-Marjaniemi 3	04.95	Spawer Kraft Ab	Nordtank	500	x		
Hailuoto-Huikku	04.95	Spawer Kraft Ab	Nordtank	500	x		
Eckerö-Bredvik	08.95	Ålands Vindenergiandelslag	Vestas	500	x		
Kuivaniemi-Vatunki 1	08.95	Leppäkosken sähkö Oy	Nordtank	500	x		
Enontekiö-Lammasoivi 1-2	10.96	Tunturituuli Oy	Bonus	2 x 450	x		
Il-Laitakari 1	01.97	Iin Energia Oy	Nordtank	500		08.10	Decommissioned
Siikajoki-Tauvo 1-2	04.97	Spawer Kraft Ab	Nordtank	2 x 600	x		
Kökar-Kökar 1	10.97	Ålands Vindenergiandelslag	Enercon	500	x		
Lemland-Knutsboda 1, 4	11.97	Ålands Vindenergiandelslag	Vestas	2 x 600	x		
Lemland-Knutsboda 2	11.97	Ålands Skogsägarförbund	Vestas	600	x		
Lemland-Knutsboda 3	11.97	Ålands Vindkraft Ab	Vestas	600	x		
Vårdö-Vårdö 1	09.98	Ålands Vindenergiandelslag	Enercon	500	x		
Finström-Pettböle 1-2	10.98	Ålands Vindkraft Ab	Enercon	2 x 500	x		
Kuivaniemi-Kuivamatalla 1-3	10.98	Leppäkosken sähkö Oy	NEGMicon	3 x 750	x		
Muonio-Olos 1-2	11.98	Tunturituuli Oy	Bonus	2 x 600	x		
Enontekiö-Lammasoivi 3	11.98	Tunturituuli Oy	Bonus	600	x		
Lumijoki-Routunkari	03.99	Lumituuli Oy	Vestas	660	x		

*Used turbine. Start date does not relate to the age of the wind turbine.

Wind turbines in Finland

Municipality&Name	Start date: mm.yy	Owner	Manufacturer	Power kW	In statistics analysis	Stop date: mm.yy	Info
Oulunsalo Riutunkari T3	08.99	Innopow er Oy	Nordex	1 300	x		
Närpiö Öskata 1	09.99	Ab Öskata Vind Närpes Oy	NEGMicon	750	x		
Kotka Kotka 1–2	09.99	Kotkan energia Oy	Bonus	2 x 1 000	x		
Muonio Olos 3–5	09.99	Tunturituuli Oy	Bonus	3 x 600	x		
Finström Pettböle 3	10.99	Ålands Vindkraft Ab	Enercon	600	x		
Föglö Brättö	09.99	Ålands Vindenergiandelslag	Enercon	600	x		
Uusikaupunki Hankosaari 1–2	10.99	Propel Voima Oy	Nordex	2 x 1 300	x		
Kuivaniemi Vatunki 2, 3, 5	11.99	Leppäkosken sähkö Oy	NEGMicon	3 x 750	x		
Oulu Vihreäsaari T1	09.01	Innopow er Oy	WinWinD	1 000	x		
Pori Meri-Pori 9	07.02	Suomen Hyötytuuli Oy	Bonus	2 000	x		
Kuivaniemi Vatunki 6	12.02	Leppäkosken sähkö Oy	Vestas	2 000	x		
Huittinen Huittinen 1	03.03*	Nordeco Oy	Nordtank	75	x		
Lumparland Lumparland 1–2	08.03	Ålands Vindenergiandelslag	Enercon	2 x 600	x		
Kokkola Kokkola T1–2	06.03	Innopow er Oy	WinWinD	2 x 1 000	x		
Kristiinankaup. Kristiina T1–3	12.03	Innopow er Oy	WinWinD	3 x 1 000	x		
Oulunsalo Riutunkari T4–6	08.03	Innopow er Oy	WinWinD	3 x 1 000	x		
Eckerö Mellanön	07.04*	JG Vind	Vestas	225	x		
Raahe Raahe 1–5	06.04	Suomen Hyötytuuli Oy	Bonus	5 x 2 300	x		
Inkoo Barö 1–2	09.04	SABA Wind Oy Ab	Enercon	2x2000		11.05	Decommissioned (to Germany)
Hanko Sandö 1–4	09.04	SABA Wind Oy Ab	Enercon	4 x 2 000	x		
Inkoo Barö 3	09.04	SABA Wind Oy Ab	Enercon	2 000	x		
Eurajoki Olkiluoto TU-1	10.04	Teollisuuden Voima Oy	WinWinD	1 000	x		
Jalasjärvi Vaasantie	07.03*	Hannu-Pekka Kivistö	Windw orld	220	x		
Oulu Vihreäsaari T2	12.04	Innopow er Oy	WinWinD	3 000	x		
Vammala Koppelo	12.04*	Maatalousyritys Pertti Tuori	Vestas	225	x		
Sottunga Kasberget	01.05*	Ålands Vindkraft Ab	Vestas	660	x		
Äetsä Marjamäenvuori	09.05*	Oittisen tila Oy	Vestas	225	x		
Eurajoki Krisantie	12.05	Ari-Matti Väkiparta	NEGMicon	250			Not participating in statistics since 01.08

*Used turbine. Start date does not relate to the age of the wind turbine.

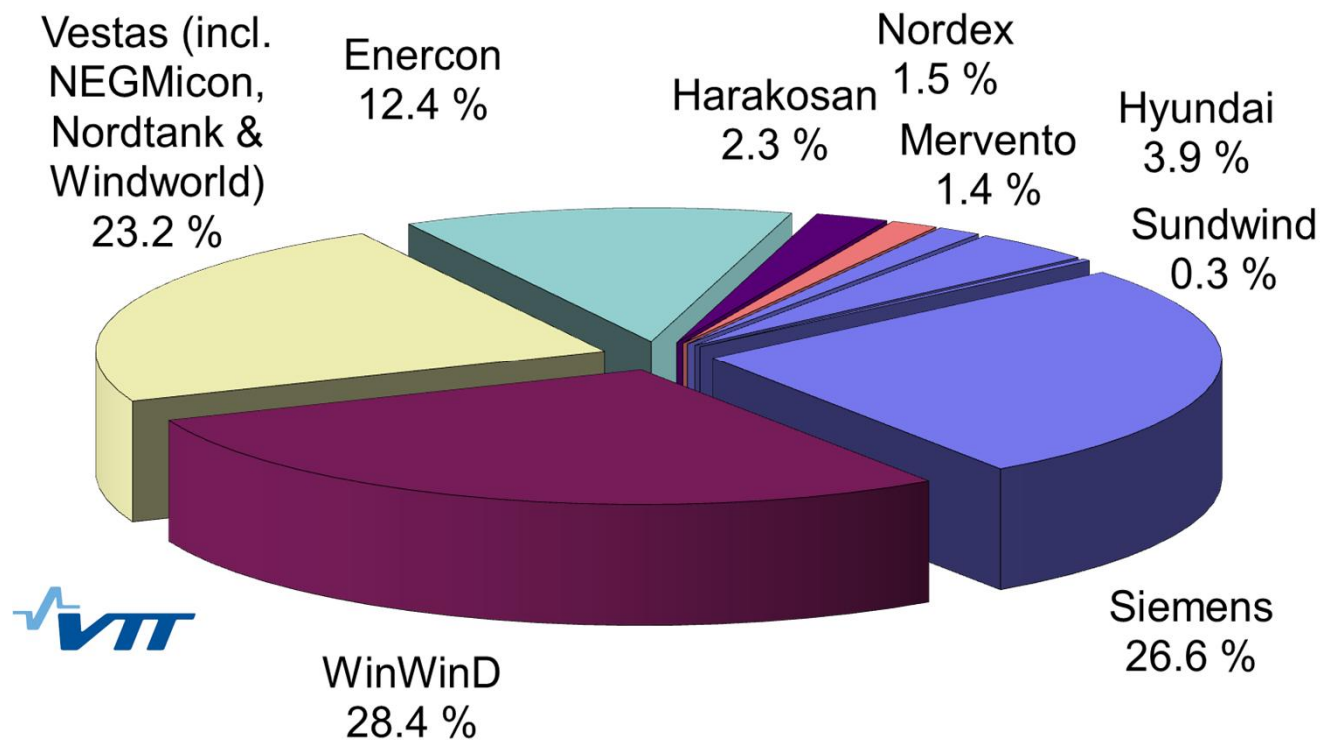
Wind turbines in Finland



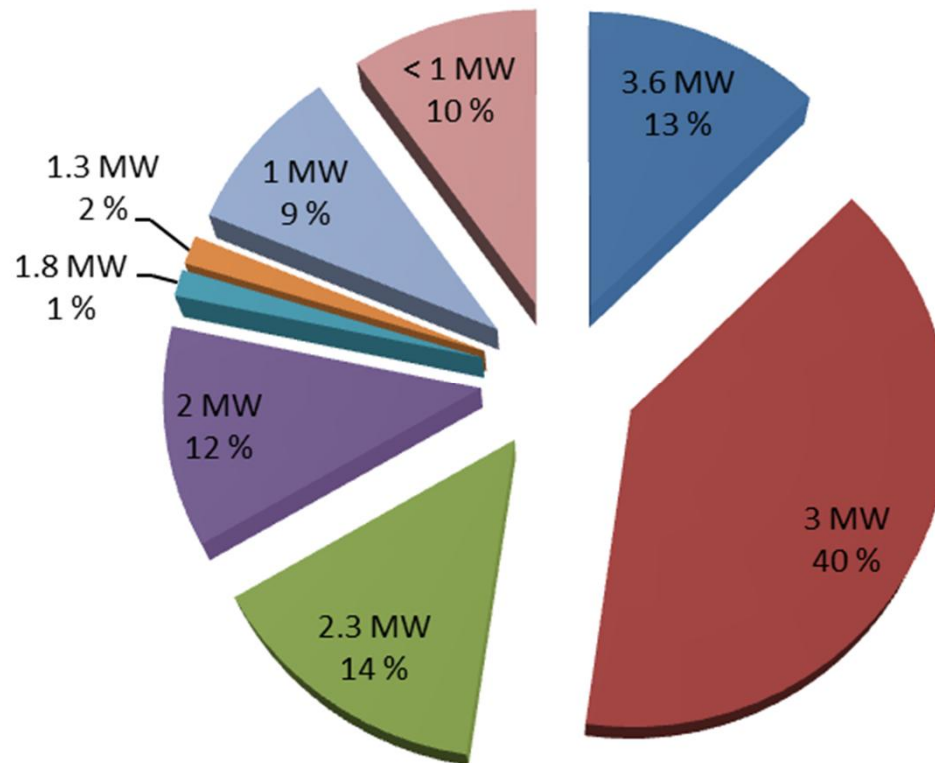
Municipality&Name	Start date: mm.yy	Owner	Manufacturer	Power kW	In statistics analysis	Stop date: mm.yy	Info
Kemi Ajos 1	12.05	Haminan Energia Oy	WinWinD	3 000	x		
Luoto Fränsviken 1	06.06	Larsmo Vindkraft	WinWinD	1 000	x		
Pori Meri-Pori 10	06.06	Porituuli Oy	WinWinD	3 000	x		
Pori Hilskansaari	07.07	Kansallistuuli Oy	WinWinD	1 000	x		
Lemland Båtskär 1–6	08.07	Leovind Ab	Enercon	6 x 2 300	x		
Dragsfjärd Högsåra 1–3	09.07	Viawind Oy	Harakosan	3 x 2 000	x		
Kemi Ajos T5	12.07	Innopower Oy	WinWinD	3 000	x		
Kemi Ajos T2–T3, T6–T7	01.08	Innopower Oy	WinWinD	4 x 3 000	x		
Kemi Ajos T4, T8–T11	12.08	Innopower Oy	WinWinD	5 x 3 000	x		
Oulunsalo Riutunkari T1–T2	05.08	Innopower Oy	WinWinD	2 x 3 000	x		
Ii Laitakari 2	02.09	Iin Energia Oy	WinWinD	1 000	x		
Töysä Riihontie 1	06.09*	Terho Riho	NegMicon	600	x		
Pori Meri-Pori 11	10.09	TuuliWatti Oy	WinWinD	3 000	x		
Raahe Raahe 6–9	06.10	Suomen Hyötytuuli Oy	Siemens	4x 2 300	x		
Pori Offshore 1	07.10	Suomen Hyötytuuli Oy	Siemens	2 300	x		
Hamina Summa 1–4	08.10	Haminan Energia Oy	WinWinD	4 x 3 000	x		
Tornio Röyttä 1–8	12.10	Rajakiiri Oy	Siemens	8 x 3 600	x		
Jalasjärvi Ilvesjoki 1	01.11*	Pramia Oy	Sundwind	750	x		
Ikaalinen 1	10.11	Ikaalisten vapaaseurakunta	Nordex	1000			Not participating in statistics since 12.11.
Simo Onkalo 1-3	01.12	Tuuliwatti Oy	Vestas	3x3000	x		
Simo Putaankangas 1-3	01.12	Tuuliwatti Oy	Vestas	3x3000	x		
Vaasa Sundom 1	03.12	Wasawind Oy	Mervento	3600			In test use 2012
Huittinen Pahkionvuori 1-2	05.12	Lännen Lintu Oy	Enercon	2x1800	x		
Hamina Mäkelänkangas 1-4	05.12	Suomen Voima Oy	Hyundai	4x2000	x		
Kemi Sumi 1	10.12	Sumituuli Oy	Hyundai	2000			In test use 2012
Ii Olhava 1-8	11.12	TuuliWatti Oy	Vestas	8x3000	x		

*Used turbine. Start date does not relate to the age of the wind turbine.

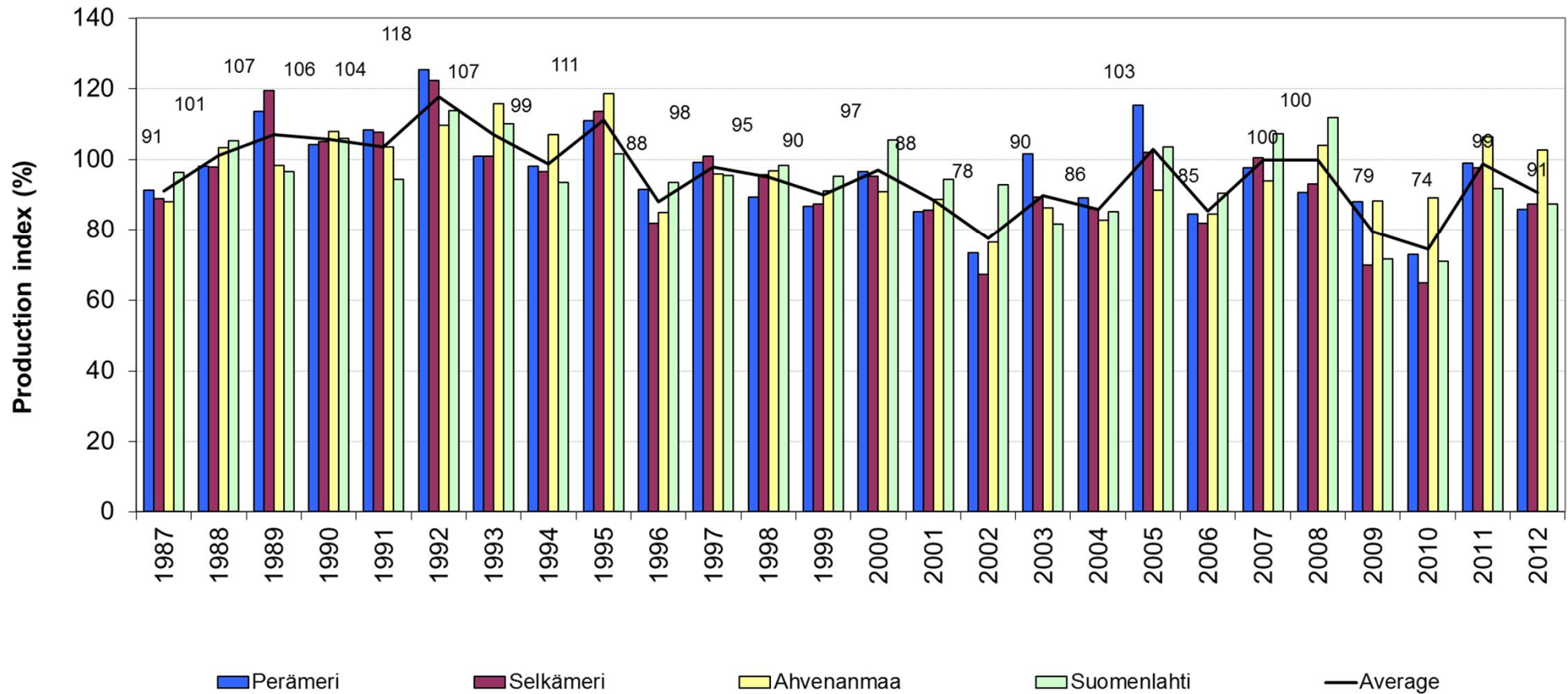
Manufacturer shares of wind energy capacity in Finland at the end of 2012 (total 257 MW)



Size of turbines installed in Finland at the end of 2012 (total 257 MW)



Wind resource was less than average in 2012 except in Åland



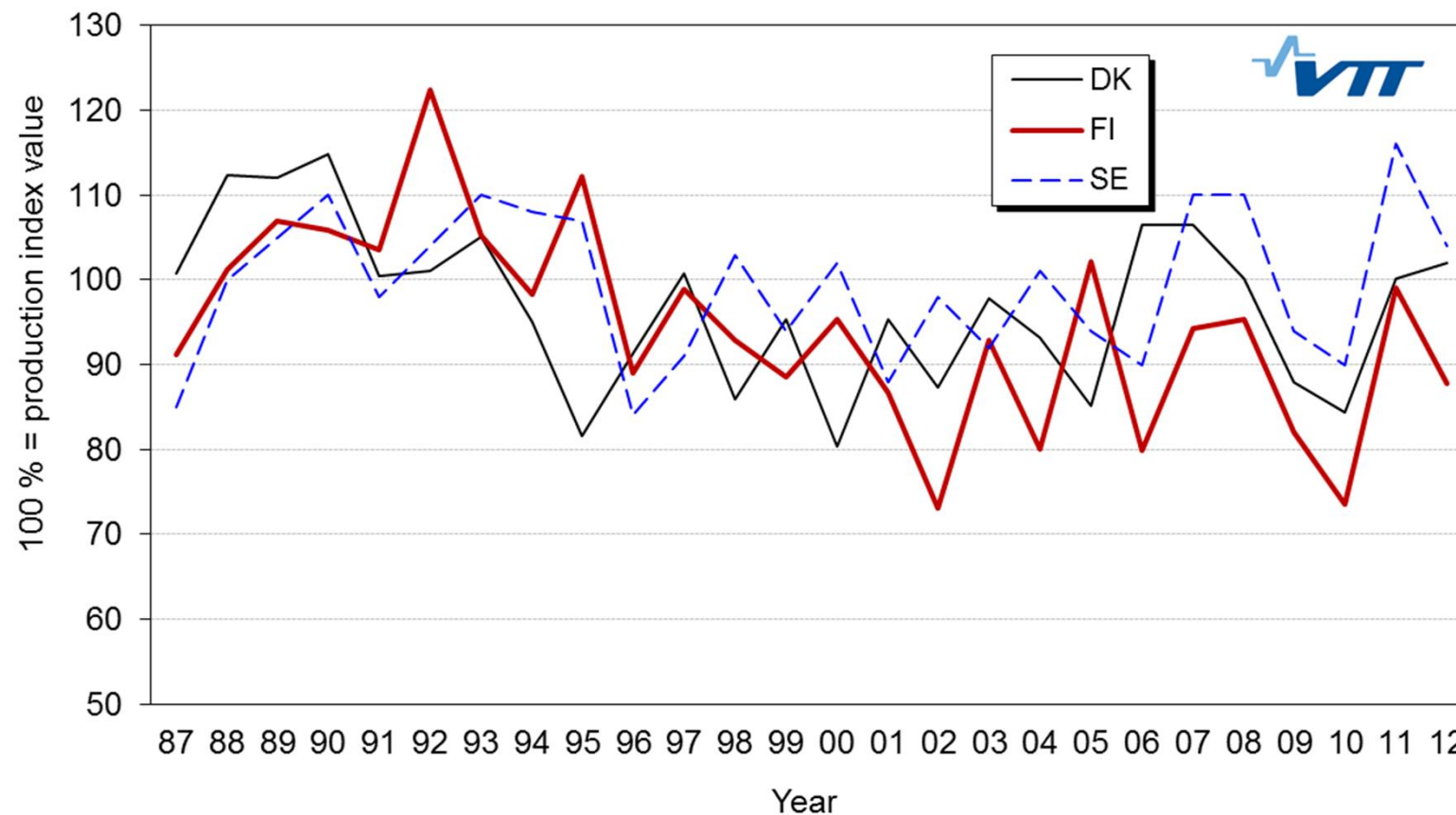
Wind production index, yearly

(100% means average production 1987–2001). Average of four indices is marked with line and label. (Perämeri: Gulf of Bothnia, North. Selkämeri: Gulf of Bothnia, South. Ahvenanmaa: Åland. Suomenlahti: Gulf of Finland.)

Source:

Finnish Meteorological Institute

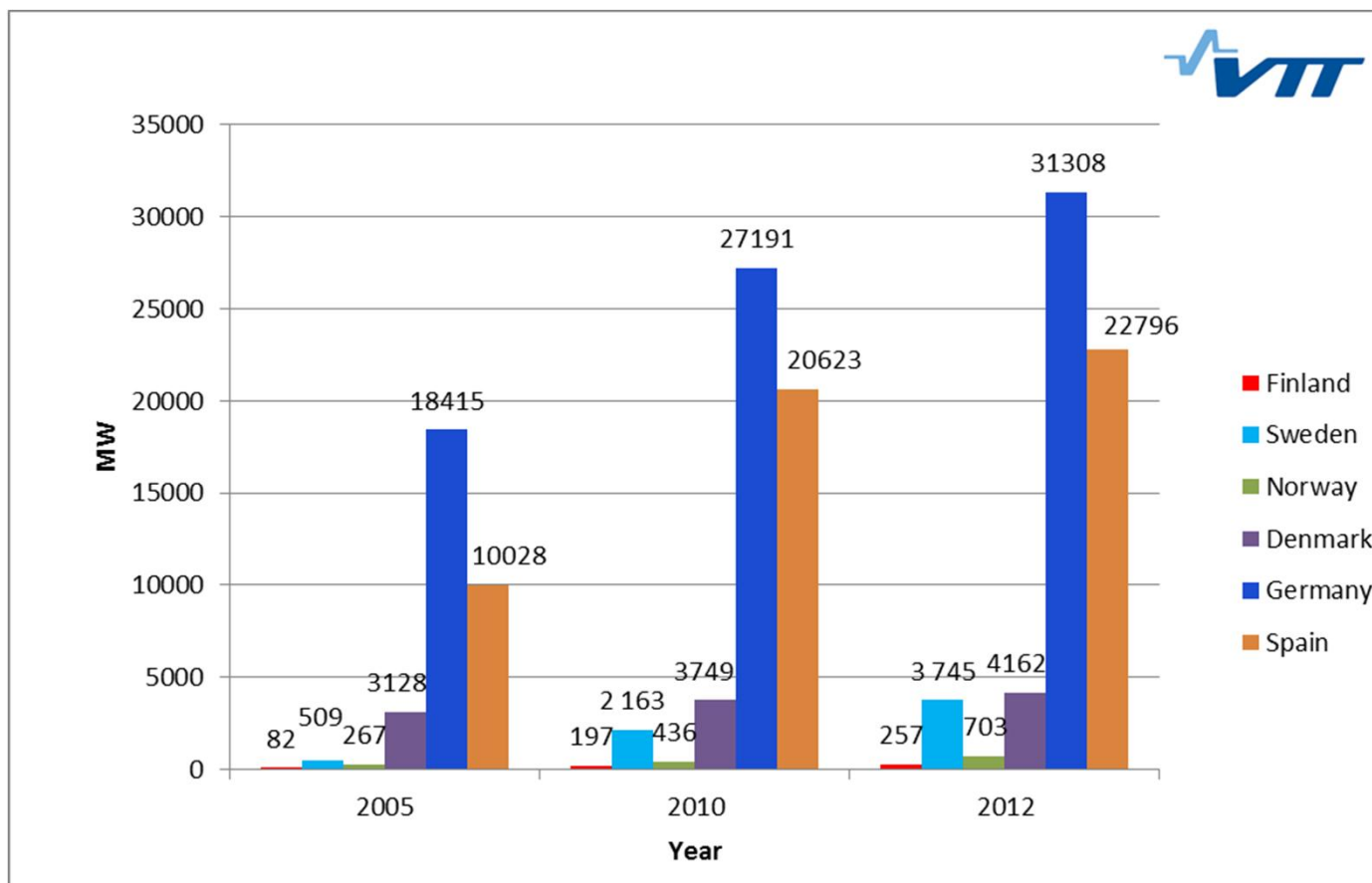
Wind resource variability in Nordic countries



Wind resource variations in Finland, Sweden and Denmark. Production index, yearly.

Source:
 Finnish Meteorological Institute
<http://vindstat.com/files/%C3%85rsrapport-2012-.pdf>
<http://www.vindstat.dk>
<http://www.naturlig-energi.dk>

Wind Power capacity in Finland and Europe



Cumulative total capacity in Europe at the end of 2012: 109 817 MW

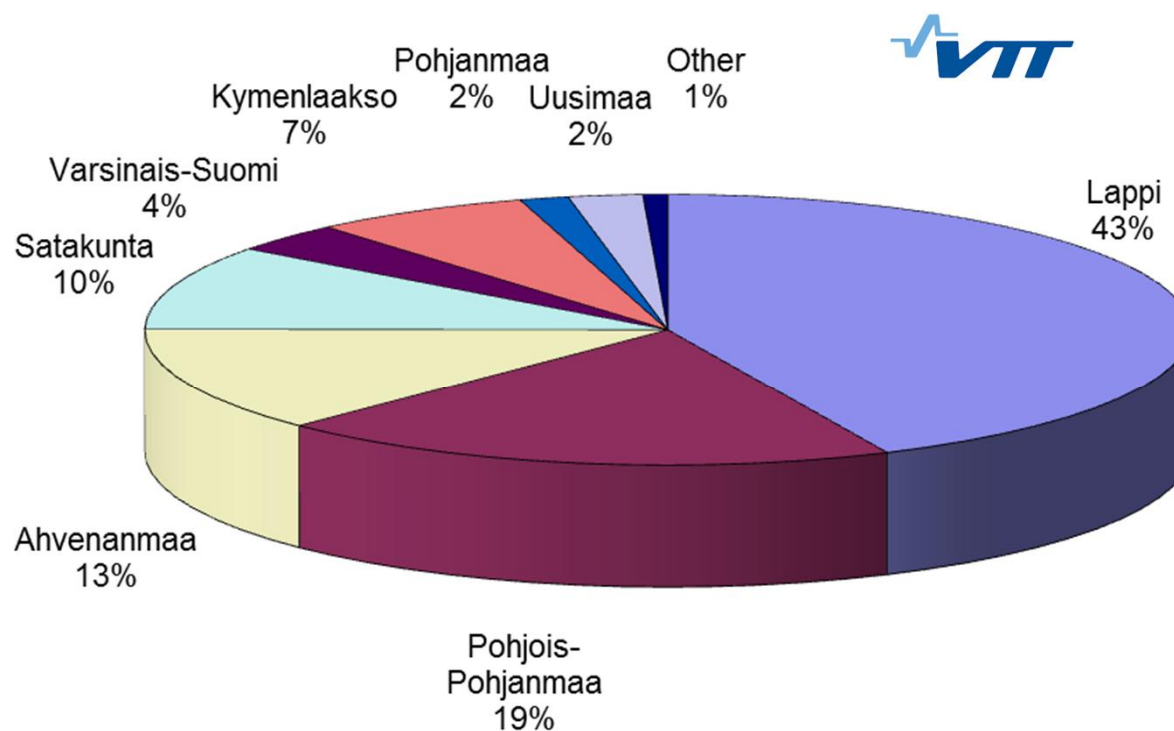
Cumulative global capacity at the end of 2012: 283 048 MW

Source:

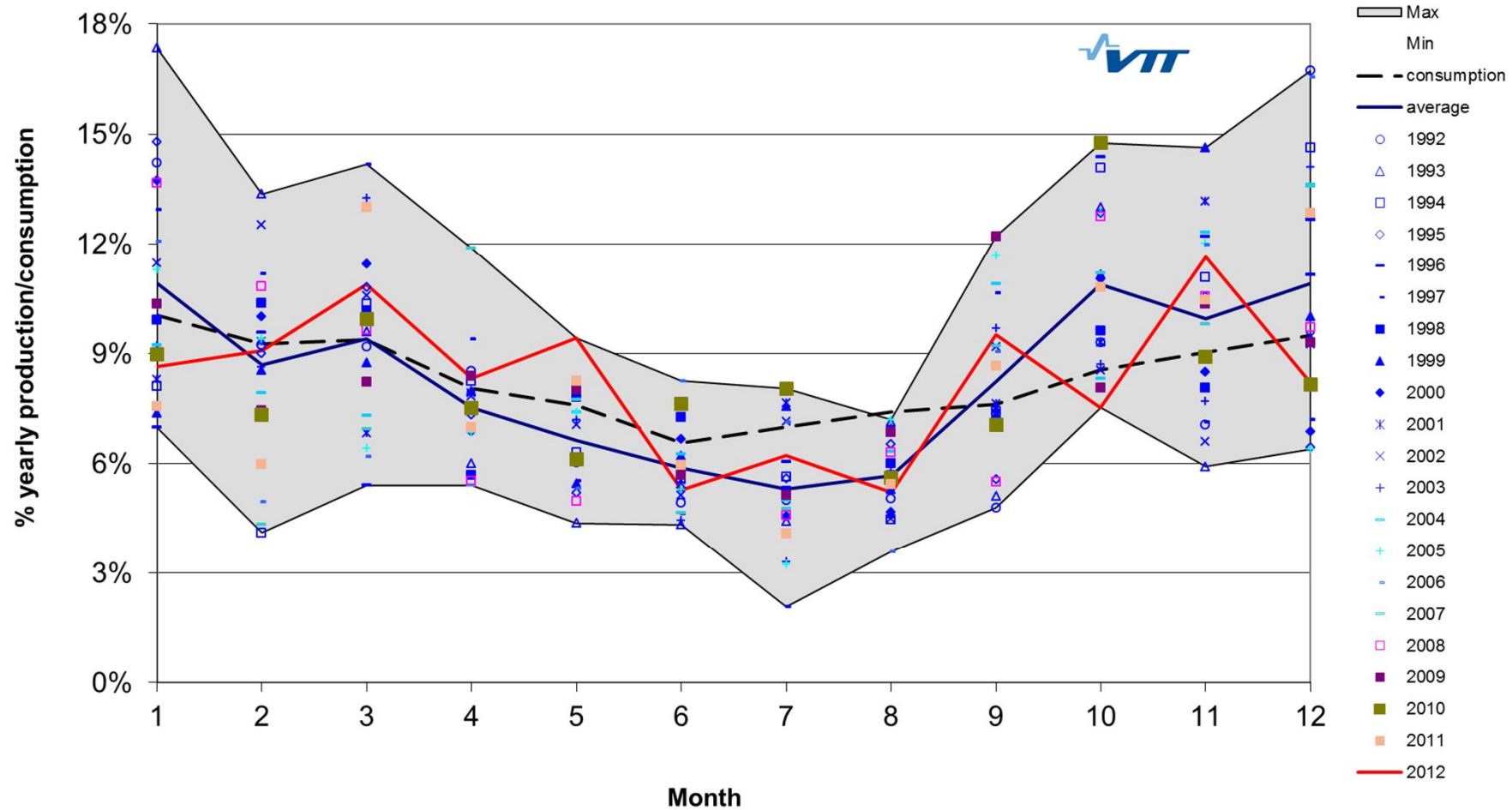
GLOBAL WIND STATISTICS 2013

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Regional distribution of wind energy production in Finland

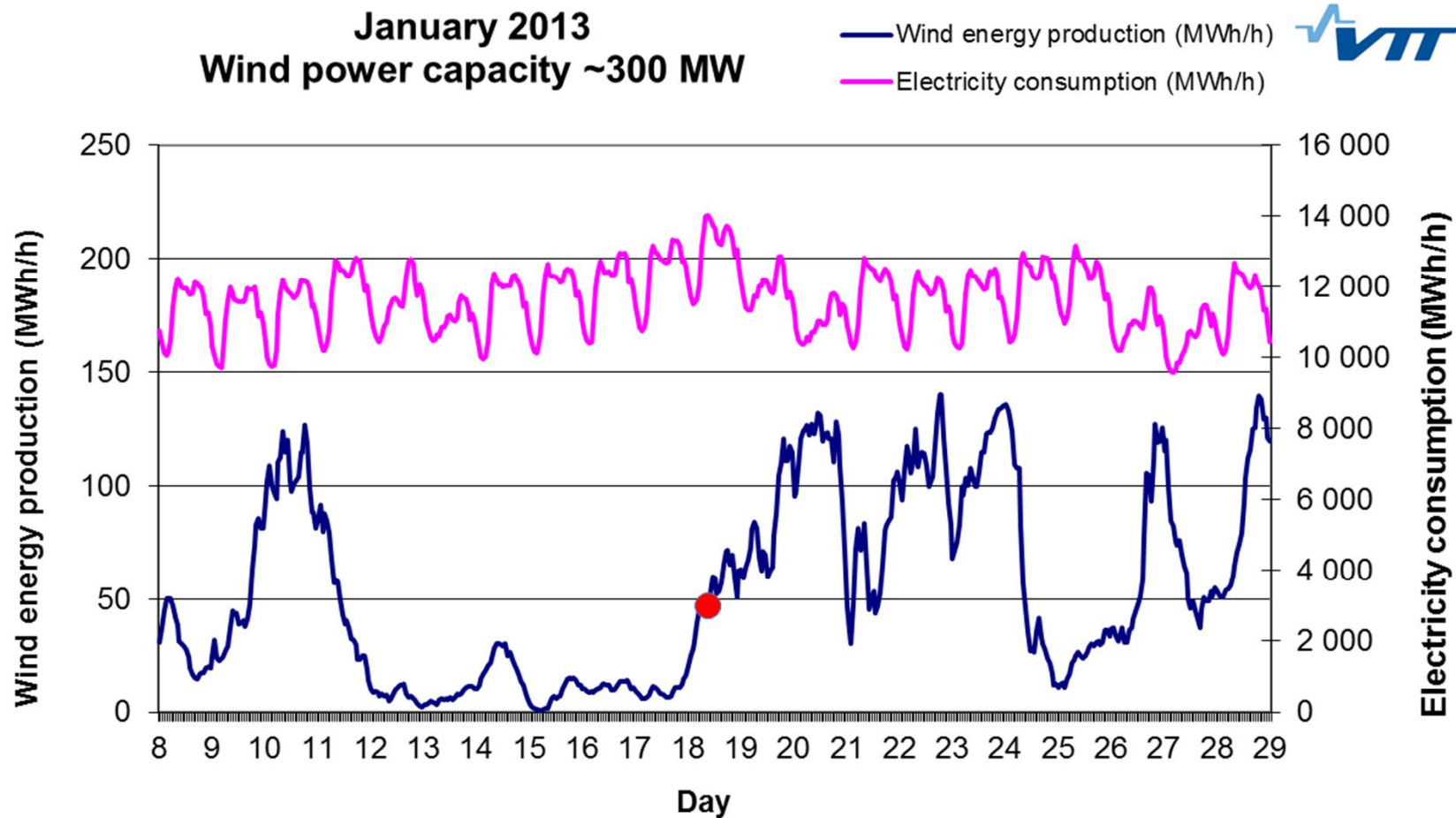


Seasonal variation of wind power production in comparison to electricity consumption in Finland



Source:
Finnish Energy Industries statistics

The hourly time series of wind power production and electricity consumption during the time of peak load in winter 2012-13



Source:
Finnish Energy Industries statistics
Fingrid electricity consumption time series

Wind power production during the highest peak load in Finland

Winter	National peak	Wind power [MWh/h]	Wind power/Capacity [%]	Wind power capacity [MW]
1993-94	11.2.94 at 20-21	0.5	13 %	4.0
1994-95	31.1.95 at 20-21	1.4	36 %	3.8
1995-96	9.2.96 at 20-21	0.0	1 %	5.3
1996-97	19.12.96 at 08-09	1.7	35 %	4.8
1997-98	2.2.98 at 08-09	1.1	16 %	6.5
1998-99	29.1.99 at 08-09	3.4	20 %	17.4
1999-2000	25.1.00 at 08-09	9.1	26 %	35.4
2000-01	5.2.01 at 08-09	1.5	4 %	35.4
2001-02	2.1.02 at 16-17	3.9	14 %	28.3
2002-03	3.1.03 at 17-18	0.9	4 %	24.3
2003-04	11.2.04 at 18-19	7.1	19 %	36.6
2004-05	28.1.05 at 18-19	11.6	14 %	80.6
2005-06	20.1.06 at 08-09	15.3	20 %	76.6
2006-07	8.2.07 at 07-08	3.3	4 %	83.6
2007-08	4.1.08 at 17-18	47.9	46 %	104.4
2008-09	16.1.09 at 9-10	12.3	9 %	139.8
2009-10	28.1.10 at 8-9	81.2	57 %	142.8
2010-11	18.2.11 at 9-10	4.8	2 %	193.3
2011-12	3.2.2012 at 18-19	35.9	17 %	211.8
2012-13	18.1.2013 at 9-10	52.2	17 %	301.1

Average of all years: 19 %
Average of years when wind power capacity >75MW: 21 %

Source:
Fingrid electricity consumption
time series

Wind power production during the highest peak load hours in Finland has been between 2-54 % of installed capacity (during 10 largest peaks during all the years in the table)

Year	Whole year	During 10 peaks	During 50 peaks	During 100 peaks
	Average (min-max)	Average (min-max)	Average (min-max)	Average (min-max)
2005	23 % (0-82 %)	12 % (2-22 %)	13 % (1-37 %)	12 % (1-44 %)
2006	21 % (0-81 %)	30 % (19-45 %)	28 % (3-61 %)	28 % (3-69 %)
2007	23 % (0-86 %)	11 % (2-27 %)	10 % (1-27 %)	10 % (1-28 %)
2008	25 % (0-86 %)	36 % (15-54 %)	37 % (12-77 %)	40 % (4-79 %)
2009	22 % (0-80 %)	23 % (18-29 %)	24 % (11-37 %)	23 % (7-61 %)
2010	22 % (0-85 %)	46 % (4-70 %)	32 % (4-70 %)	30 % (4-70 %)
2011	28 % (0-83 %)	4 % (2-5 %)	8 % (1-25 %)	12 % (1-57 %)
2012	25% (0-80 %)	16% (10-23 %)	16% (3-32 %)	15% (3-36 %)

Average and range of production all year and during 10, 50 and 100 highest peaks

Source:
Finnish Energy Industries statistics
Fingrid electricity consumption time series

Contact information

Mr. Ville Turkia and Dr. Hannele Holttinen

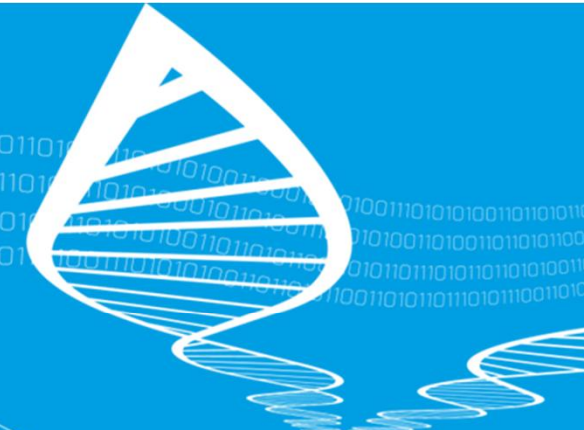
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- This presentation is free of charge and available for public use.
- The more detailed version of the year report can be purchased on request. It includes turbine specific production and availability, monthly wind indices and some more information and tables.

This report is based on information provided from the wind power producers in Finland as well as Energy Technologies Finland (ET), who are gratefully acknowledged. If there are any mistakes in the data please contact Ville Turkia.



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