

# Wind energy statistics in Finland 2013

Version: Public



[Photo: Taaleritahdas Oyj, Honkajoki wind plant]

## Wind energy year 2013

- End of year capacity in Finland: 448MW (211 turbines) Source: Finnish Wind Power Association
- End of year capacity in VTT statistics (not including all small/used turbines): 447MW (209 turbines)
  - Average size of turbine 2.1 MW, max 4.5 MW
- Production in VTT statistics: 771 GWh
- New capacity in 2013: 192.2MW (60 turbines)
  - Average size of turbine 3.2 MW, max 4.5 MW
- Removed capacity in 2013: 2.3MW (2 turbines)

## Wind energy year 2013

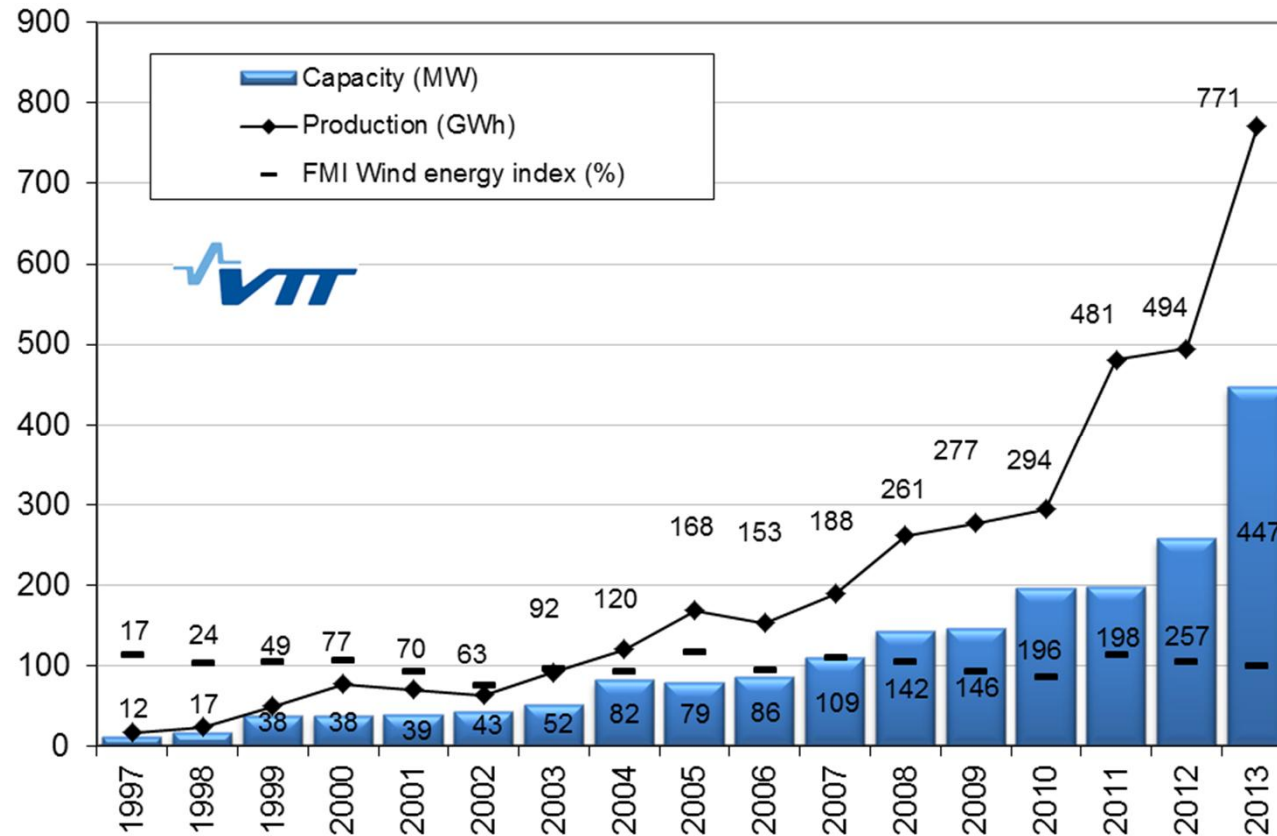
- Average capacity factor from total generation versus total capacity (for turbines operating whole year) : 26 %
- Average capacity factor for turbines\* operating the whole year: 22 % (149 turbines)
- Average capacity factor for turbines\* >2 MW, operating the whole year: 30 % (58 turbines)

\*Second-hand turbines installed inland and pilot plants are not included

- Wind production index ranged from 91% to 110% in different regions:
  - Simple averaged index 102%
  - Capacity weighted averaged index 100%
  - Production weighted averaged index 93%

Source: Finnish  
Meteorological Institute

# Development of wind power capacity and production in Finland



Wind index is capacity weighted average

Source:

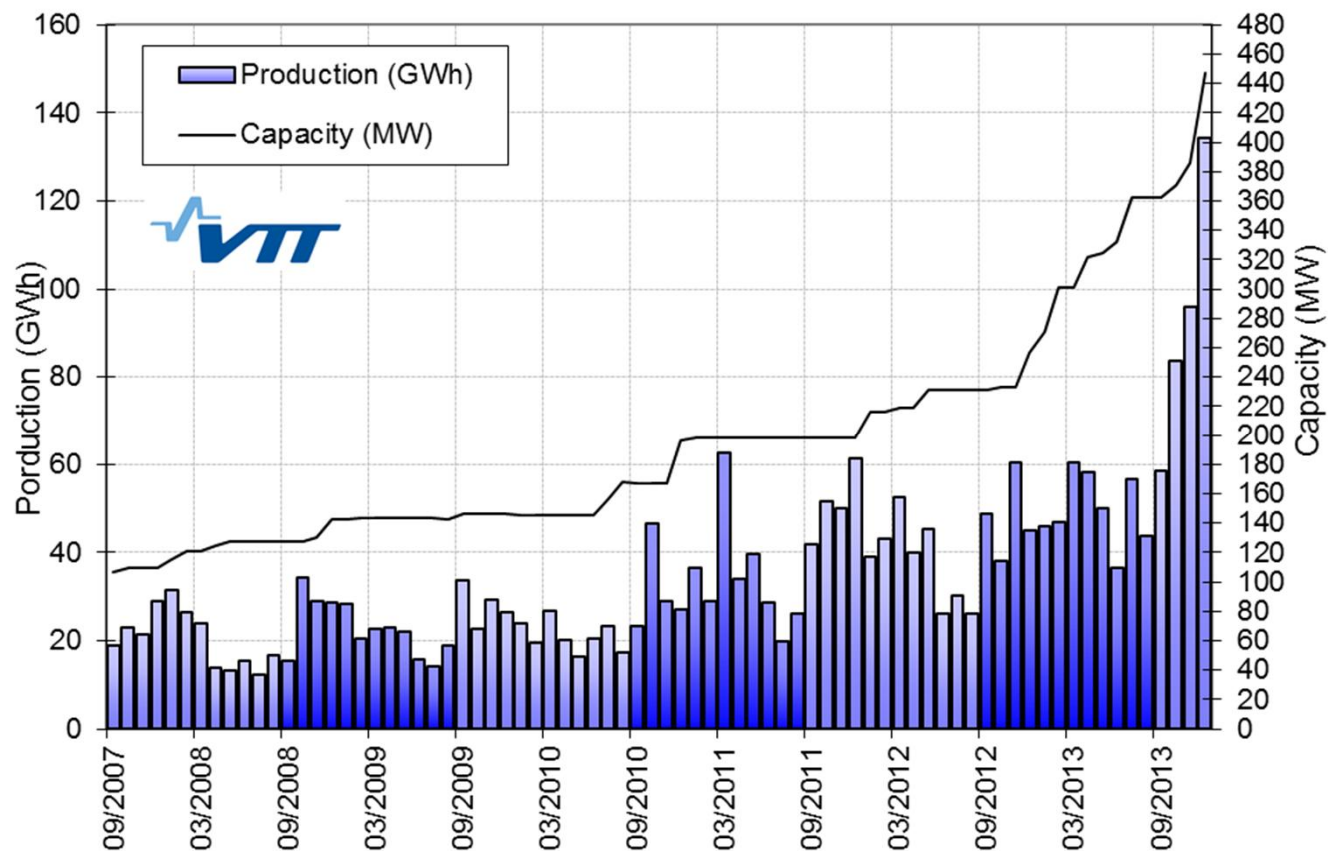
Finnish Energy Industries statistics

Finnish Meteorological Institute

Information & data from wind power producers



# Monthly wind power production and capacity in Finland

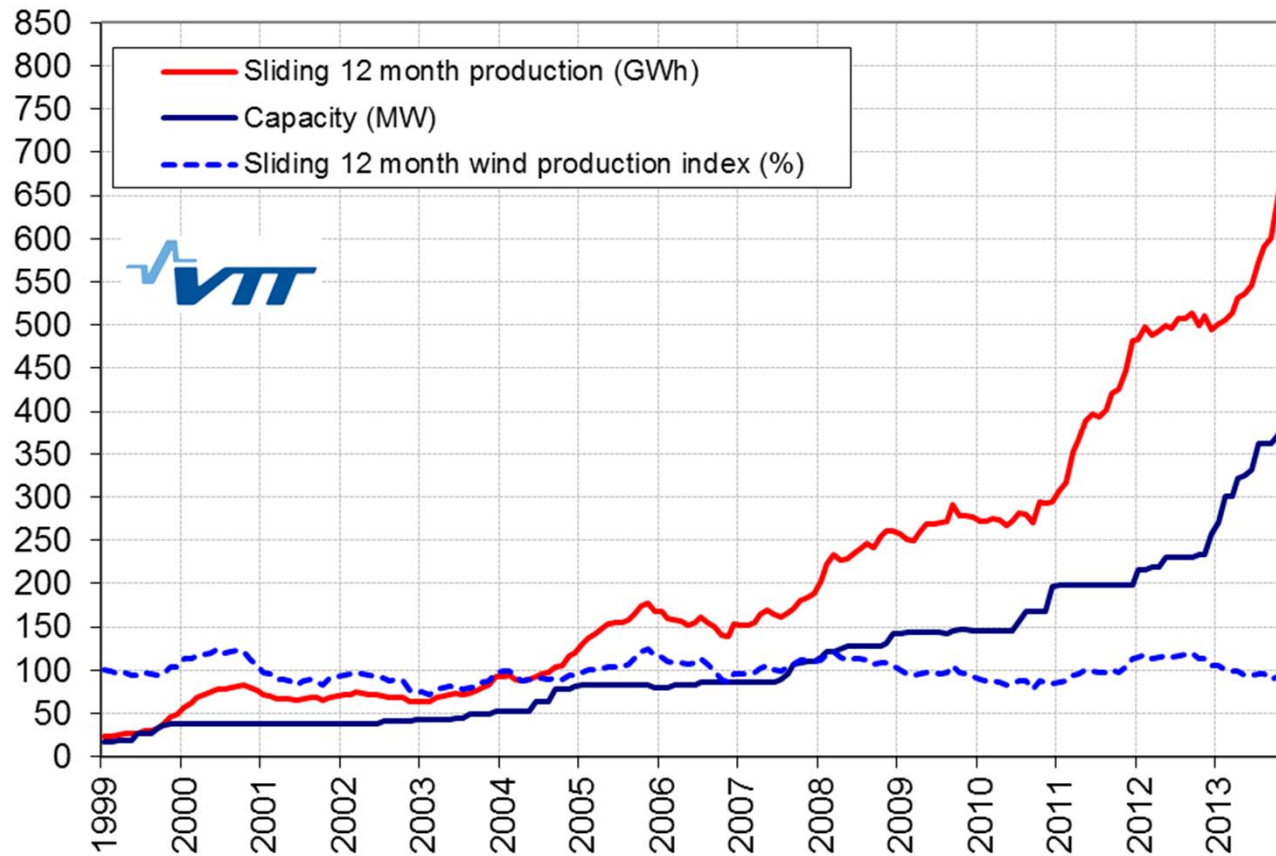


Source:

Finnish Energy Industries statistics

Information & data from wind power producers

# Wind power production and production indices as 12 month sliding averages



Wind index is capacity weighted average

Source:

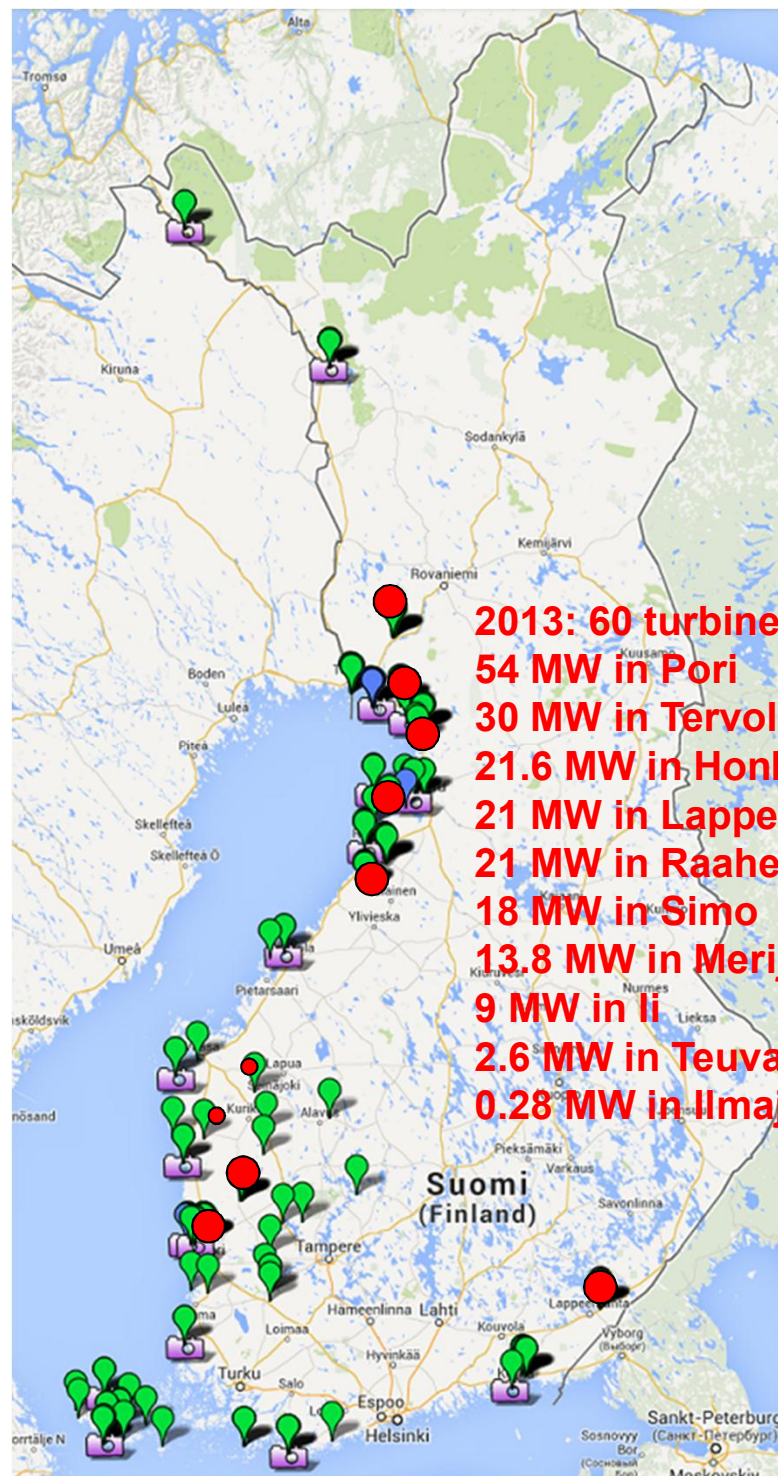
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Information & data from wind power producers

## Location of wind power plants at the end of 2013

In red –sites with new turbines in 2013



# Wind turbines in Finland



Municipality&Name	Start date: m.m.yy	Owner	Manufacturer	Power kW	In statistics analysis	Stop date: mm.yy	Info
Inkoo Kopparnäs	11.86	Fortum Power and Heat Oy	DWT	300		01.95	Decommissioned (did not participate to statistics))
Enontekiö Paljasselkä	02.91	Tunturituuli Oy	Nordtank	75		08.02	Moved to Huittinen
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	Spaw er Kraft Ab	Nordtank	2 x 300		10.06	Decommissioned
Siikajoki Säikkä 1-2	04.93	Spaw er 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	Spaw er Kraft Ab	Nordtank	2 x 300	x		
Pelkosenniemi Pyhäntunturi	10.93	Kemijoki Arctic Technology Oy	Windworld	220		09.01	Moved to Jalasjärvi
Hailuoto Marjaniemi 3	04.95	Spaw er Kraft Ab	Nordtank	500	x		
Hailuoto Huikku	04.95	Spaw er 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		
Ilaitakari 4	01.97	lin Energia Oy	Nordtank	500		08.10	Decommissioned
Siikajoki Tauvo 1-2	04.97	Spaw er 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 Kuivamatala 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		

\*Second-hand 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
Pori Meri-Pori 1–8	06.99	Suomen Hyötytuuli Oy	Bonus	8 x 1 000	x		
Oulunsalo Riutunkari T3	08.99	Innopow er Oy	Nordex	1 300		05.13	Decommissioned
Närpiö Öskata 1	09.99	Ab Öskata Vind Närpes Oy	NEGMicon	750	x		
Kotka Kotka 1	09.99	Kotkan energia Oy	Bonus	1 000	x		
Kotka Kotka 2	09.99	Kotkan energia Oy	Bonus	1 000		06.13	Decommissioned
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	Windworld	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

\*Second-hand 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 Hliskansaari	07.07	Kansallistuuli Oy	WinWinD	1 000	x		
Lemland Båtskår 1–6	08.07	Leovind Ab	Enercon	6 x 2 300	x		
Dragsfjärd Högsåra 1–3	09.07	Viaw ind Oy	Harakosan	3 x 2 000	x		
Kemi Ajos T5	12.07	Innopow er Oy	WinWinD	3 000	x		
Kemi Ajos T2–T3, T6–T7	01.08	Innopow er Oy	WinWinD	4 x 3 000	x		
Kemi Ajos T4, T8–T11	12.08	Innopow er Oy	WinWinD	5 x 3 000	x		
Oulunsalo Riutunkari T1–T2	05.08	Innopow er Oy	WinWinD	2 x 3 000	x		
li Laitakari 2	02.09	lin Energia Oy	WinWinD	1 000	x		
Töysä Riihontie 1	06.09*	Terho Riiho	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	Sundw ind	750	x		
Ikaalinen 1	10.11	Ikaalisten vapaaseurakunta	Nordex	1000			Not participating in statistics since 12.11.

\*Second-hand turbine. Start date does not relate to the age of the wind turbine.

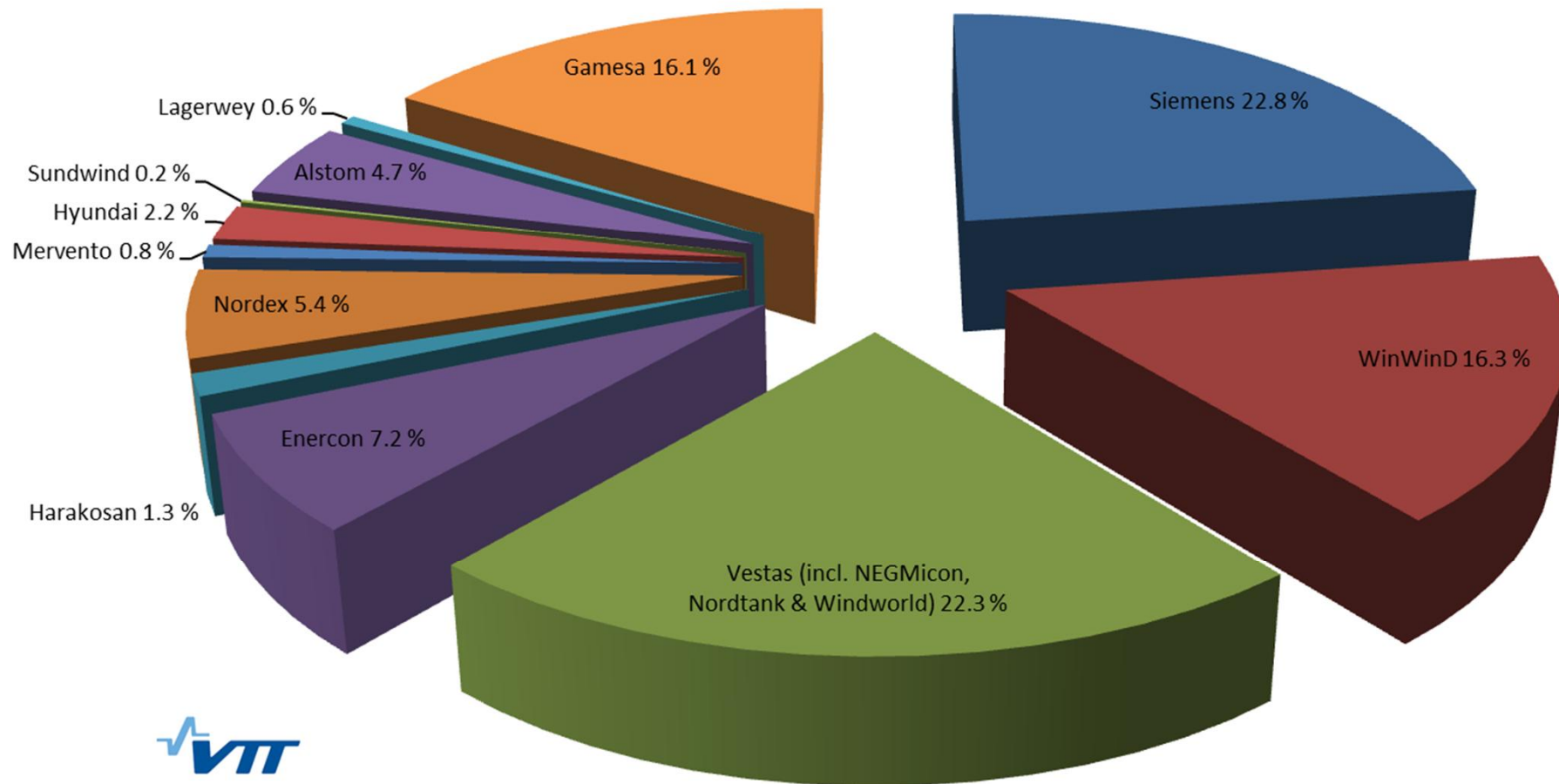
# Wind turbines in Finland



Municipality&Name	Start date: mm.yy	Owner	Manufacturer	Power kW	In statistics analysis	Stop date: mm.yy	Info
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	x		
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	x		
Il Olhava 1-8	11.12	TuuliWatti Oy	Vestas	8x3000	x		
Ilmajoki Kiikerinkylä 1	01.13*	Hautala Power	Enercon	200	x		
Merijärvi Ristivuori 1-6	01.13	Perhönjoki Oy	Siemens	6x2300	x		
Tervola Varevaara 1-10	02.13	Tuuliwatti Oy	Vestas	10x3000	x		
Honkajoki Kirkkokallio 1-9	05.13	Taaleritehdas Oy	Nordex	9x2400	x		
Lappeenranta Muukko 1-7	06.13	Tuulisaimaa Oy	Alstom	7x3000	x		
Raahe Kopsa 1-7	08.13	Puhuri Oy	Siemens	7x3000	x		
Teuva Pettumäki 1	11.13	Kari Komsu, Jaakko Niemi	Lagerwey	2600	x		
Simo Leipiö	10.13	TuuliWatti Oy	Gamesa	4x4500	x		
Il Olhava 9-11	11.13	TuuliWatti Oy	Vestas	3x3300	x		
Pori Peittoonkorpi 1-12	12.13	TuuliWatti Oy	Gamesa	12x4500	x		

\*Second-hand turbine. Start date does not relate to the age of the wind turbine.

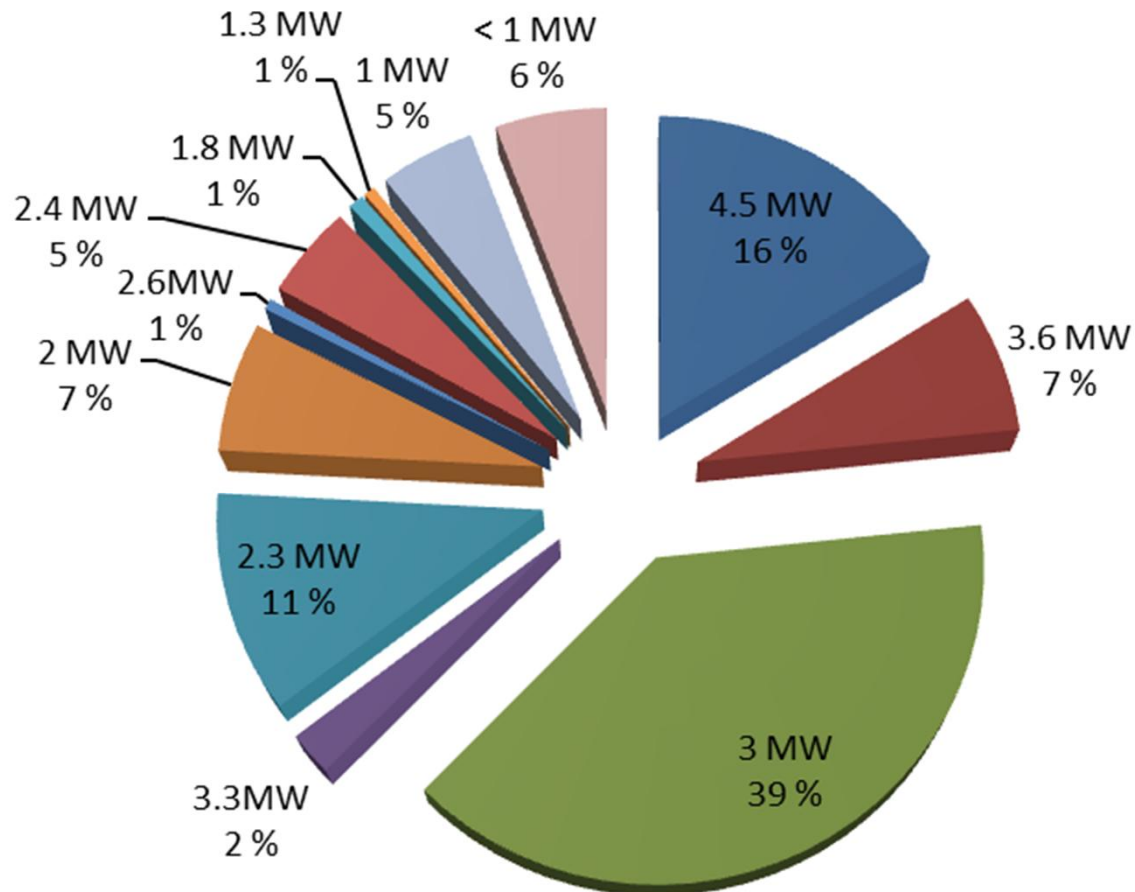
# Manufacturer shares of wind energy capacity in Finland at the end of 2013 (total 447 MW\*)



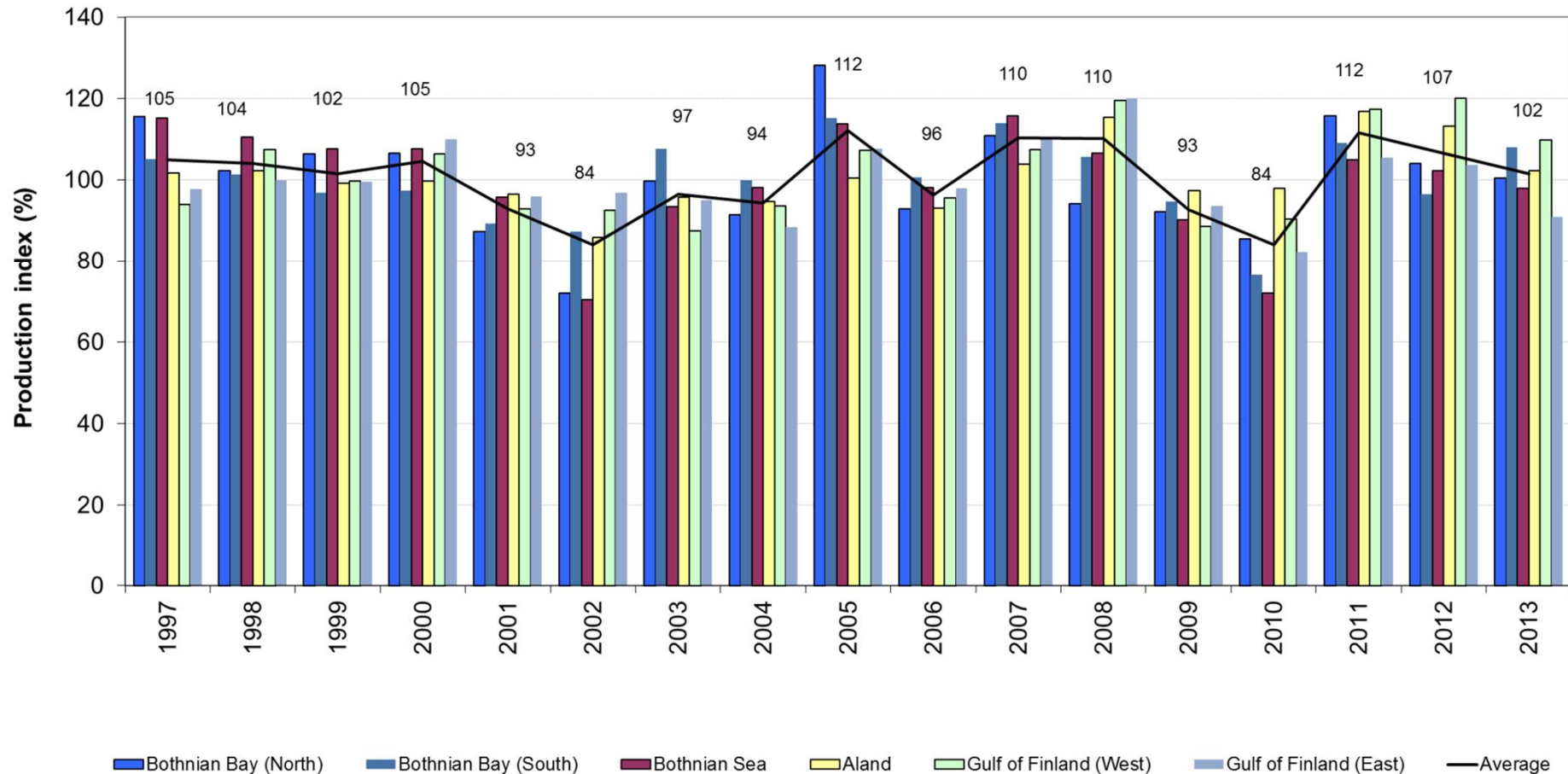
(\*not including all small/used turbines)



# Size of turbines installed in Finland at the end of 2013 (total 447 MW, average 2.1 MW)



# Wind resource was close to the long time average in 2013



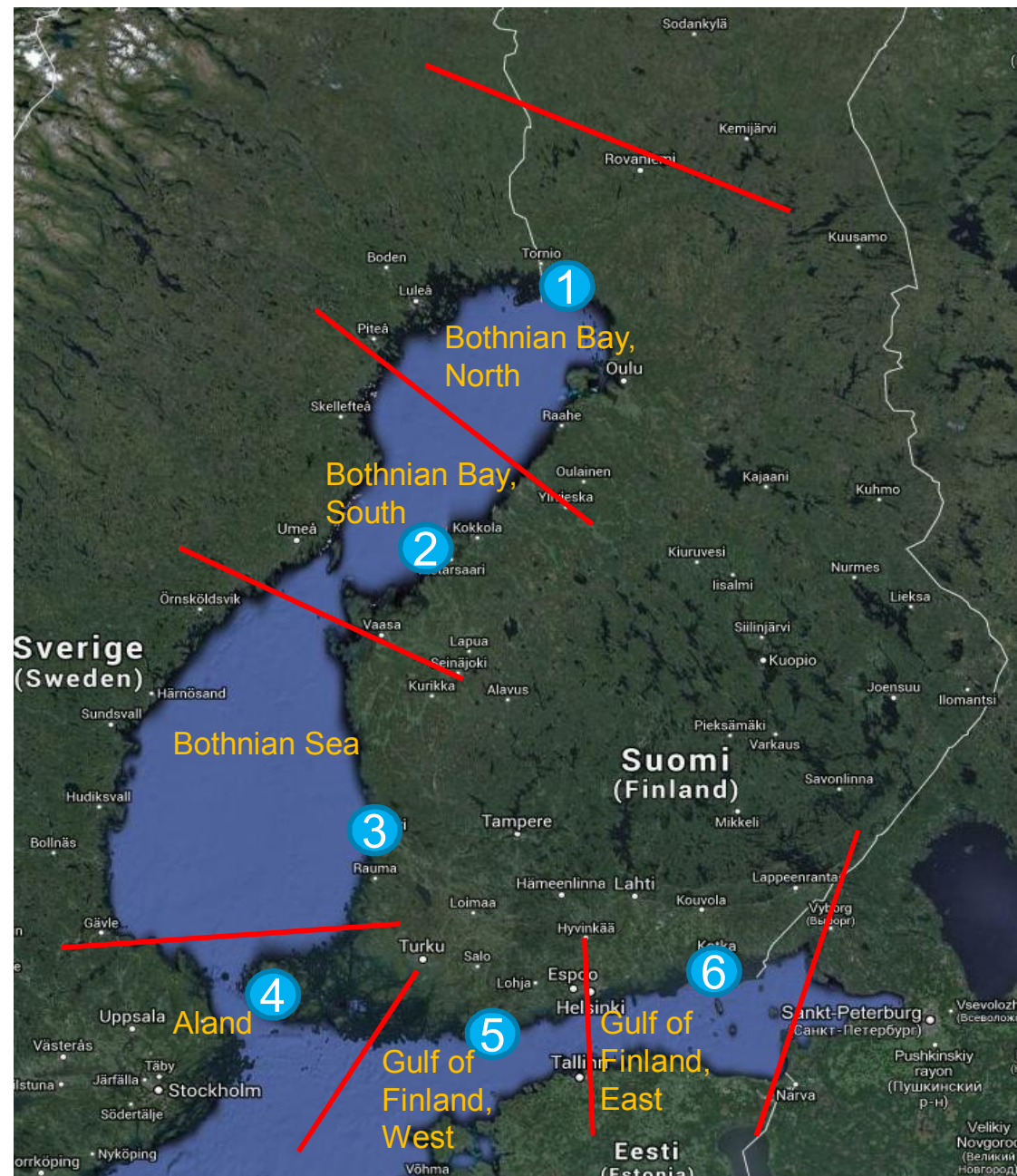
## Wind production index (simple average), yearly

(100% means average production 1997–2011). Average of four indices is marked with line and label. (Perämeri: Bothnian Bay, Selkämeri: Bothnian Sea, Ahvenanmaa: Aland, Suomenlahti: Gulf of Finland.)

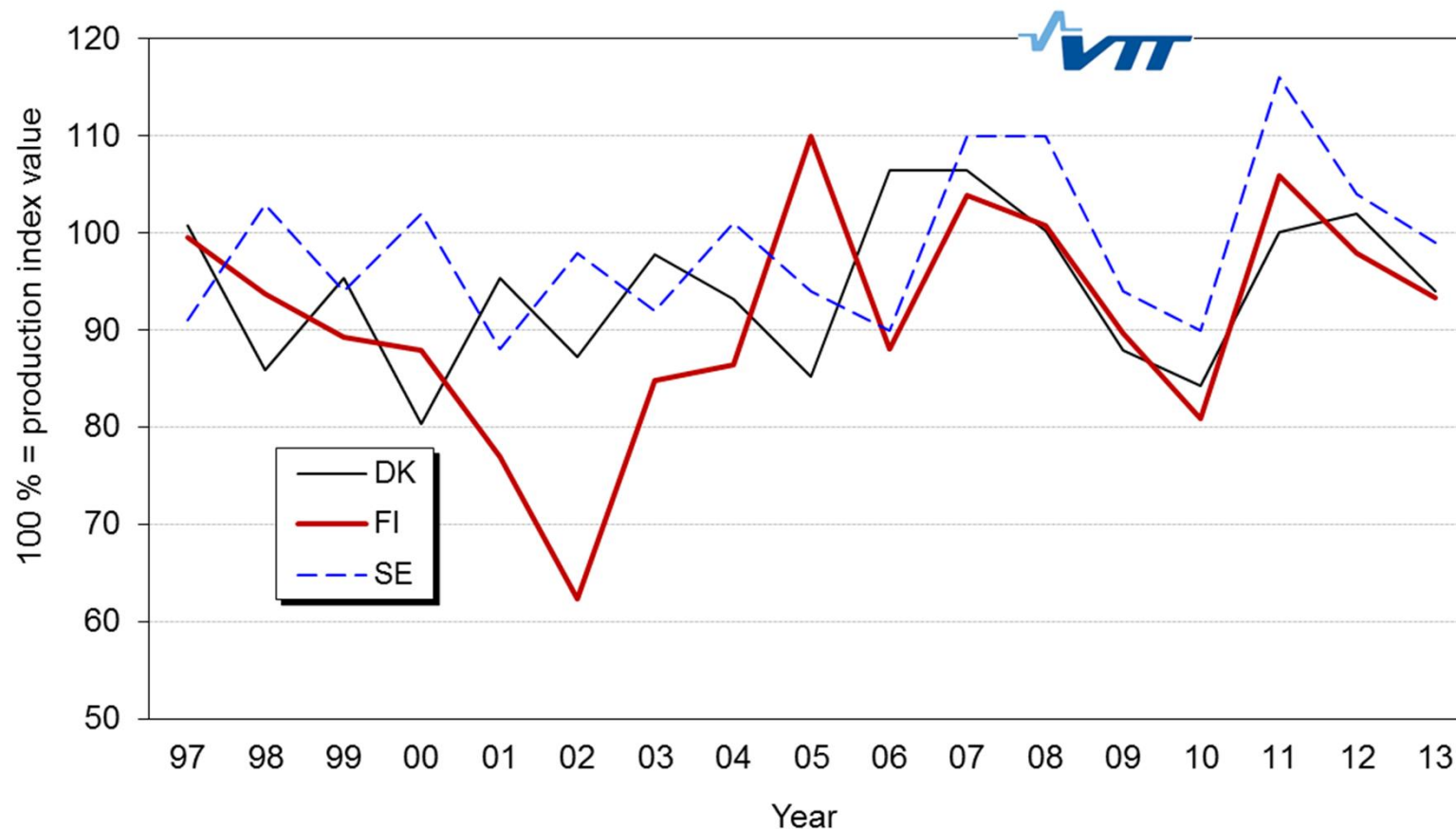
Source:  
Finnish Meteorological Institute

## Weather stations

- ① Kemi, Ajos
- ② Pietarsaari, Kallan
- ③ Pori, Tahkoluoto
- ④ Lemland, Nyhamn
- ⑤ Raasepori, Jussarö
- ⑥ Kotka, Haapasaari



# Wind resource variability in Nordic countries



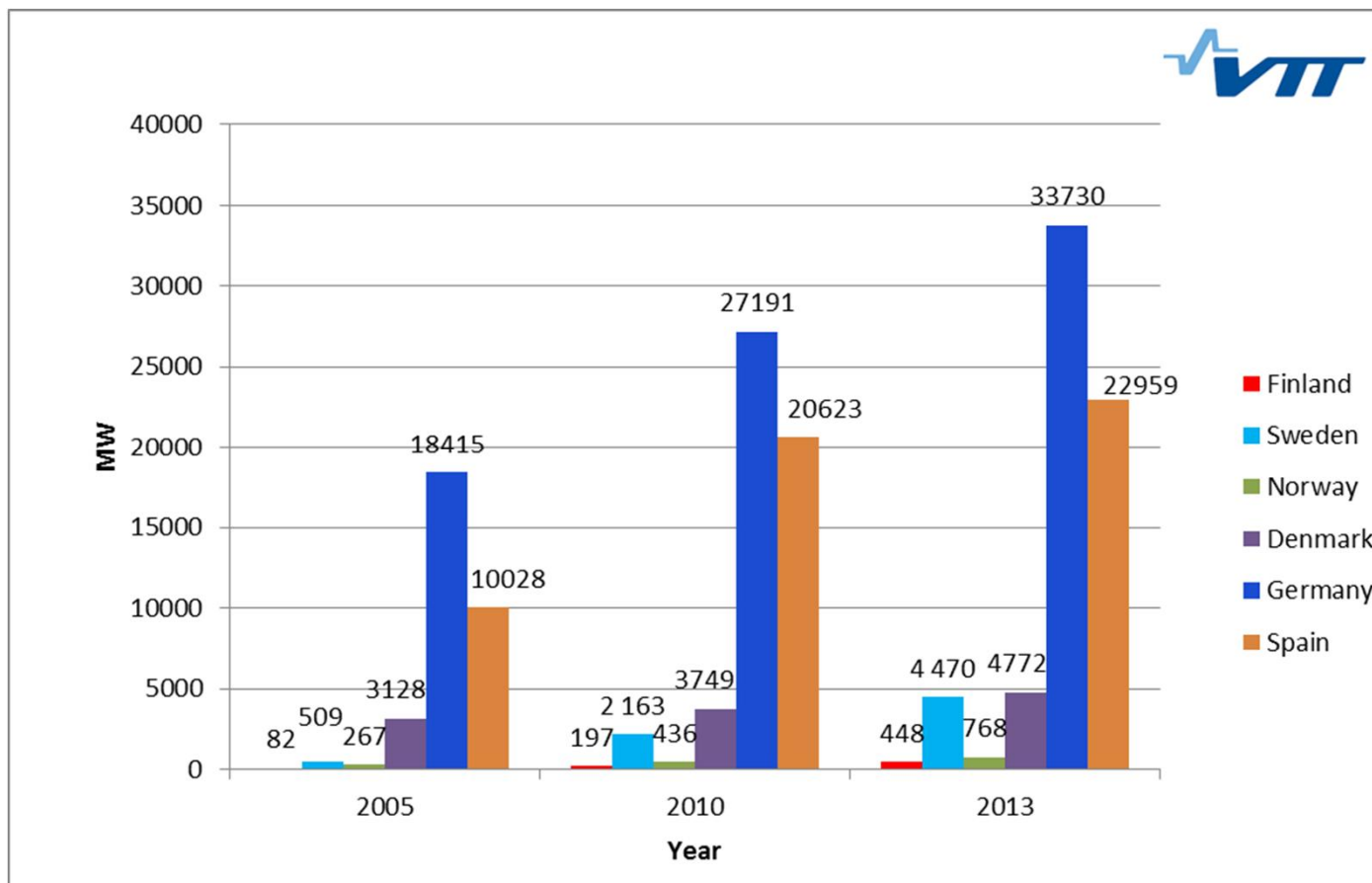
Wind resource variations in Finland, Sweden and Denmark. Production index, yearly.

Wind index of Finland is production weighted average

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



# Wind Power capacity development in Finland and Europe



Cumulative total capacity in Europe at the end of 2013: 121 474 MW

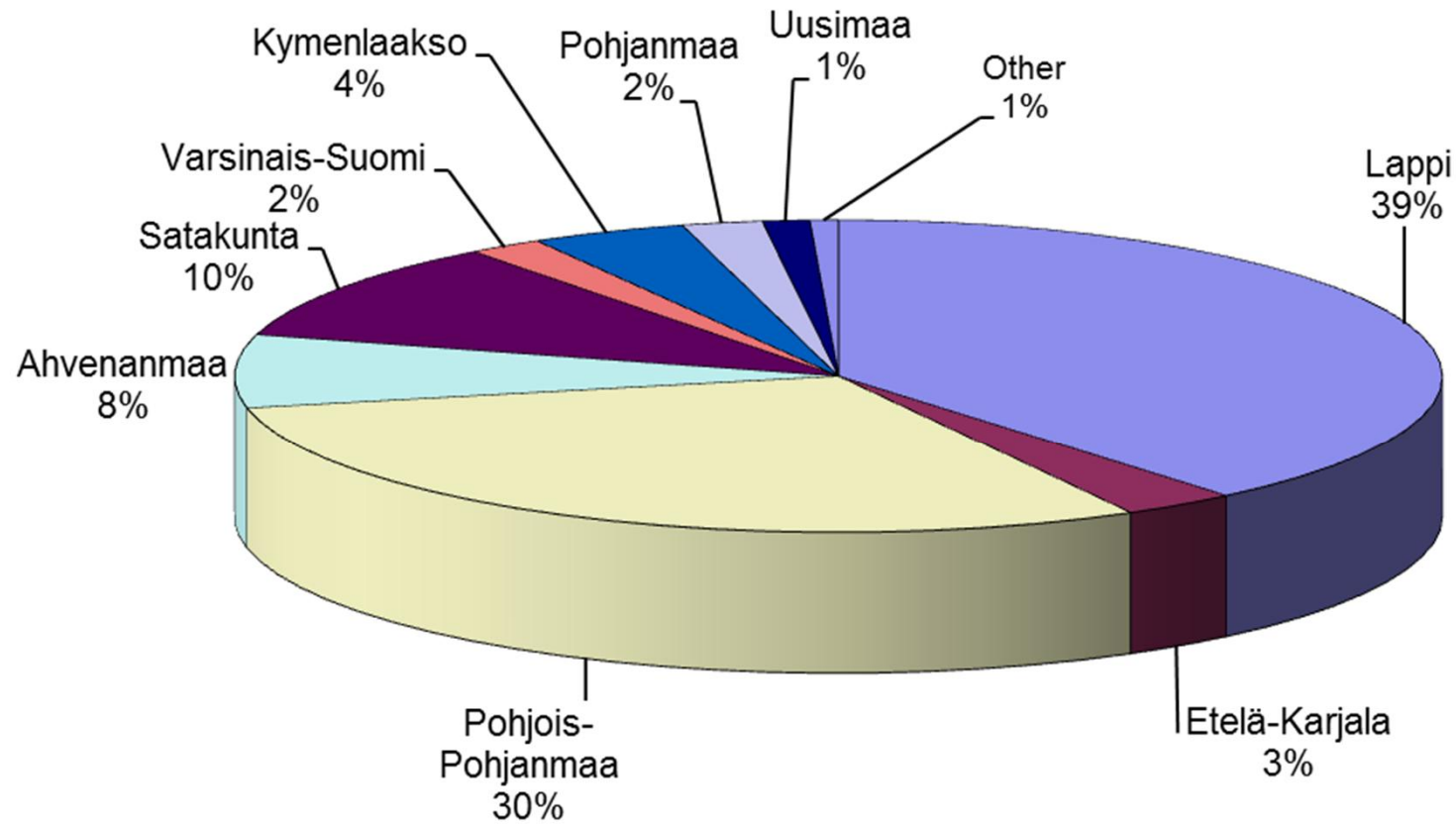
Cumulative global capacity at the end of 2013: 318 137 MW

Source:

GLOBAL WIND STATISTICS 2013

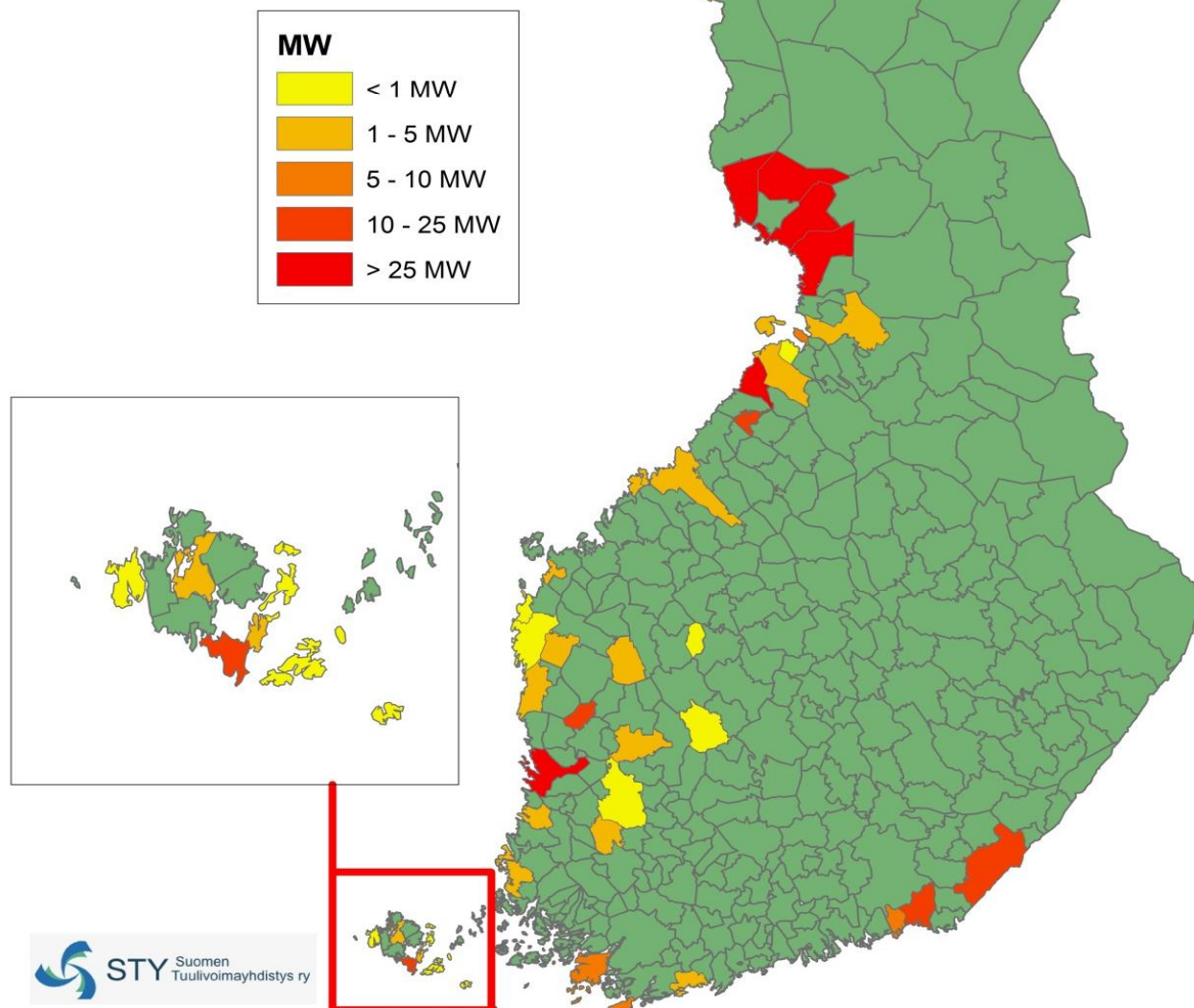
EWEA

# Regional distribution of wind energy production in Finland

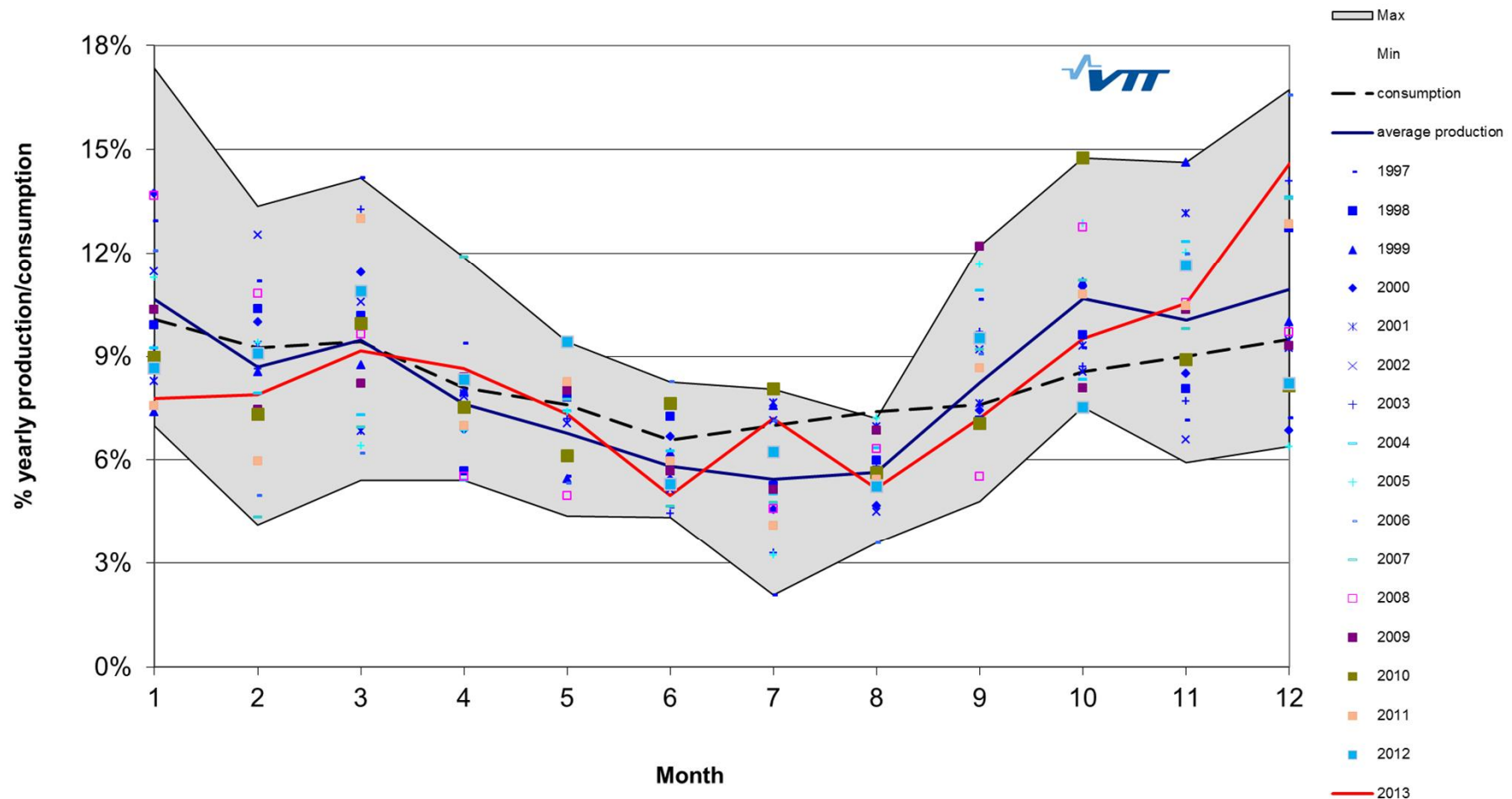


## Regional distribution of wind energy capacity in Finland in 2013

Municipality	MW	%
Pori	73,6	16,0 %
Raahe	47,7	10,4 %
Ii	41,0	8,9 %
Simo	36,0	7,8 %
Kemi	35,0	7,6 %
Tervola	30,0	6,5 %
Tornio	28,8	6,3 %
Honkajoki	21,6	4,7 %
Lappeenranta	21,0	4,6 %
Hamina	20,0	4,4 %
Lemland	16,2	3,5 %
Merijärvi	13,8	3,0 %
Oulunsalo	9,0	2,0 %
Hanko	8,0	1,7 %
Kimitoön	6,0	1,3 %
Kotka	5,7	1,2 %
Oulu	4,0	0,9 %
Huittinen	3,7	0,8 %
Vaasa	3,6	0,8 %
Kristinestad	3,0	0,7 %
Muonio	3,0	0,7 %
Uusikaupunki	2,6	0,6 %
Teuva	2,5	0,5 %
Ingå	2,0	0,4 %
Kokkola	2,0	0,4 %
Siikajoki	1,8	0,4 %
Finström	1,6	0,3 %
Hailuoto	1,6	0,3 %
Ikaalinen	1,6	0,3 %
Enontekiö	1,5	0,3 %
Eurajoki	1,3	0,3 %
Lumparland	1,2	0,3 %
Larsmo	1,0	0,2 %
Jalasjärvi	1,0	0,2 %
Närpes	0,8	0,2 %
Eckerö	0,7	0,2 %
Lumijoki	0,7	0,1 %
Sottunga	0,7	0,1 %
Föglö	0,6	0,1 %
Töysä	0,6	0,1 %
Ruovesi	0,6	0,1 %
Kökar	0,5	0,1 %
Vårdö	0,5	0,1 %
Sastamala	0,5	0,1 %
Korsnäs	0,4	0,1 %
Ilmajoki	0,3	0,1 %
Summa	459,0	100,0 %



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

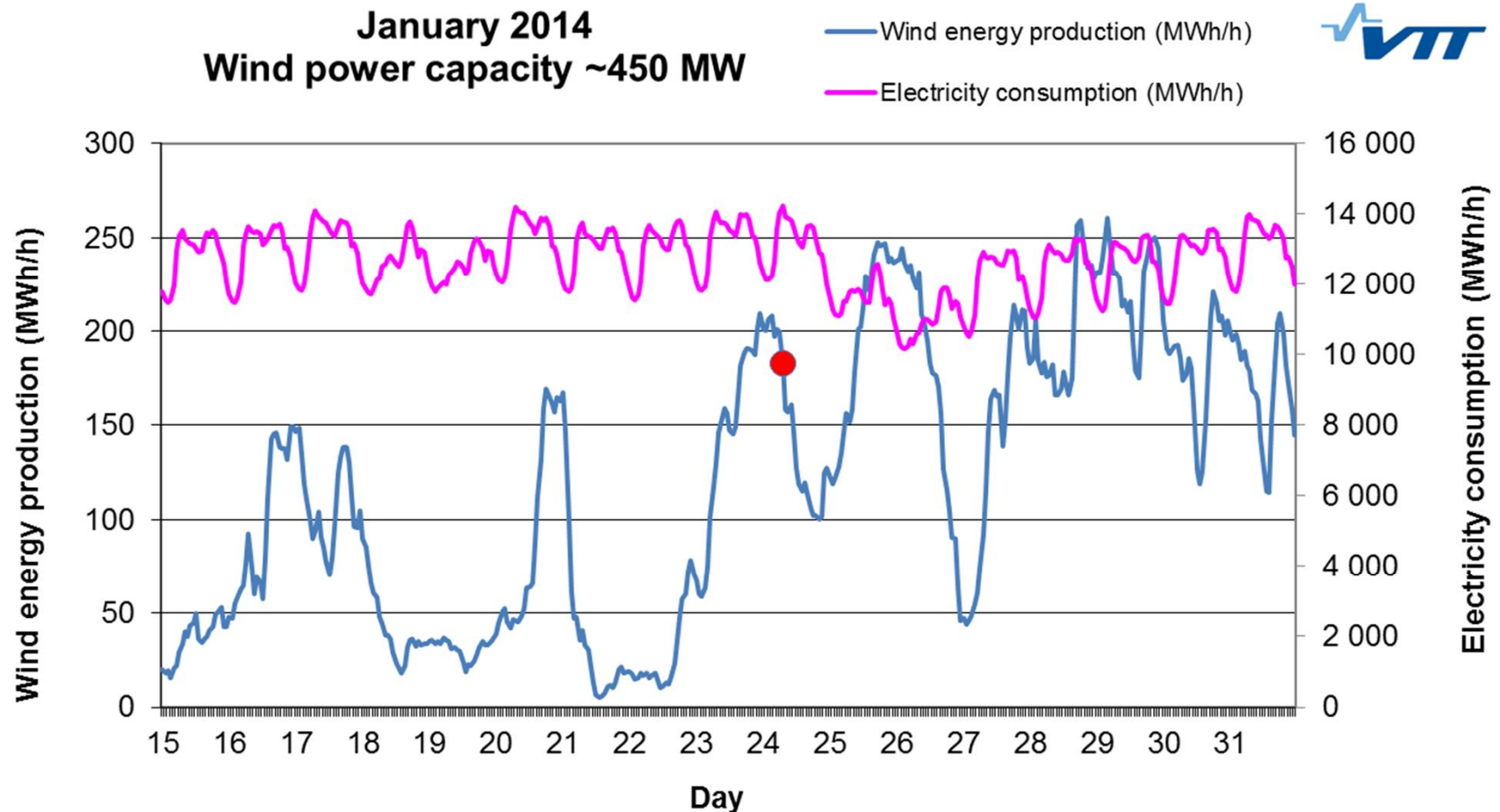


Consumption is average of years 1999-2013

Source for consumption:  
Finnish Energy Industries statistics



# The hourly time series of wind power production and electricity consumption during the time of peak load in winter 2013-14



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]
<b>1993-94</b>	11.2.94 at 20-21	0.5	<b>13 %</b>	4.0
<b>1994-95</b>	31.1.95 at 20-21	1.4	<b>36 %</b>	3.8
<b>1995-96</b>	9.2.96 at 20-21	0.0	<b>1 %</b>	5.3
<b>1996-97</b>	19.12.96 at 08-09	1.7	<b>35 %</b>	4.8
<b>1997-98</b>	2.2.98 at 08-09	1.1	<b>16 %</b>	6.5
<b>1998-99</b>	29.1.99 at 08-09	3.4	<b>20 %</b>	17.4
<b>1999-2000</b>	25.1.00 at 08-09	9.1	<b>26 %</b>	35.4
<b>2000-01</b>	5.2.01 at 08-09	1.5	<b>4 %</b>	35.4
<b>2001-02</b>	2.1.02 at 16-17	3.9	<b>14 %</b>	28.3
<b>2002-03</b>	3.1.03 at 17-18	0.9	<b>4 %</b>	24.3
<b>2003-04</b>	11.2.04 at 18-19	7.1	<b>19 %</b>	36.6
<b>2004-05</b>	28.1.05 at 18-19	11.6	<b>14 %</b>	80.6
<b>2005-06</b>	20.1.06 at 08-09	15.3	<b>20 %</b>	76.6
<b>2006-07</b>	8.2.07 at 07-08	3.3	<b>4 %</b>	83.6
<b>2007-08</b>	4.1.08 at 17-18	47.9	<b>46 %</b>	104.4
<b>2008-09</b>	16.1.09 at 9-10	12.3	<b>9 %</b>	139.8
<b>2009-10</b>	28.1.10 at 8-9	81.2	<b>57 %</b>	142.8
<b>2010-11</b>	18.2.11 at 9-10	4.8	<b>2 %</b>	193.3
<b>2011-12</b>	3.2.2012 at 18-19	35.9	<b>17 %</b>	211.8
<b>2012-13</b>	18.1.2013 at 9-10	52.2	<b>17 %</b>	301.1
<b>2013-14</b>	24.1.2014 at 8:00	183.2	<b>41 %</b>	448.9

**Average of all years: 20 %**  
**Average of 10 years when wind power capacity >75MW: 23 %**

Source:  
 Finnish Energy Industries statistics  
 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 % (0-79 %)	46 % (5-70 %)	32 % (4-71 %)	30 % (4-71 %)
2011	28 % (0-84 %)	4 % (2-5 %)	8 % (1-25 %)	12 % (1-56 %)
2012	25% (0-81 %)	16% (10-23 %)	16% (3-32 %)	15% (3-37 %)
2013	25% (0-80 %)	22% (17-27 %)	14% (3-41 %)	13% (1-45 %)

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

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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) and Finnish Meteorological Institute (FMI), who are gratefully acknowledged. If there are any mistakes in the data please contact Ville Turkia.





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