

StormGeo

Navigate tomorrow – today



// Power price outlook for SYS and Finland

Finnish Energy Day 15/6/23

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// Finland from high price to low price area

	2022	2023	2024
Consumption TWh	80	78	81
Hydro power	12	13	15
Wind/Solar	11	15	18
Nuclear	24	34	35
CHP	18	17	17
Other thermal	2	2	2
Net exchange	12	-2	-6
SYS €/MWh	136	69	63
Finland €/MWh	154	58	51

-Olkiluoto 3 and wind power expansion has turned Finland from net electricity import to export, and Finland is now a low price area

-Supply is increasing fast while demand is decreasing. Peak consumption first half of 2019 at around 88 TWh/year. Current consumption corresponds to approx. 77 TWh/year

-Finland is on the way to a very large production surplus and ditto low power prices if supply-side growth does not slow down and/or electricity consumption does not soon begin to increase significantly

-Based on Final Investments Decisions (FIDs) increased supply is certain the next few years, while demand development is uncertain

-Without fairly strong consumption growth going forward, Finland will mainly get the same price as SE1 the next few years. With low or no consumption growth, the price will be below 45 €/MWh in 2024 and below 40 €/MWh in 2025

Wind power in Finland under construction or with FID



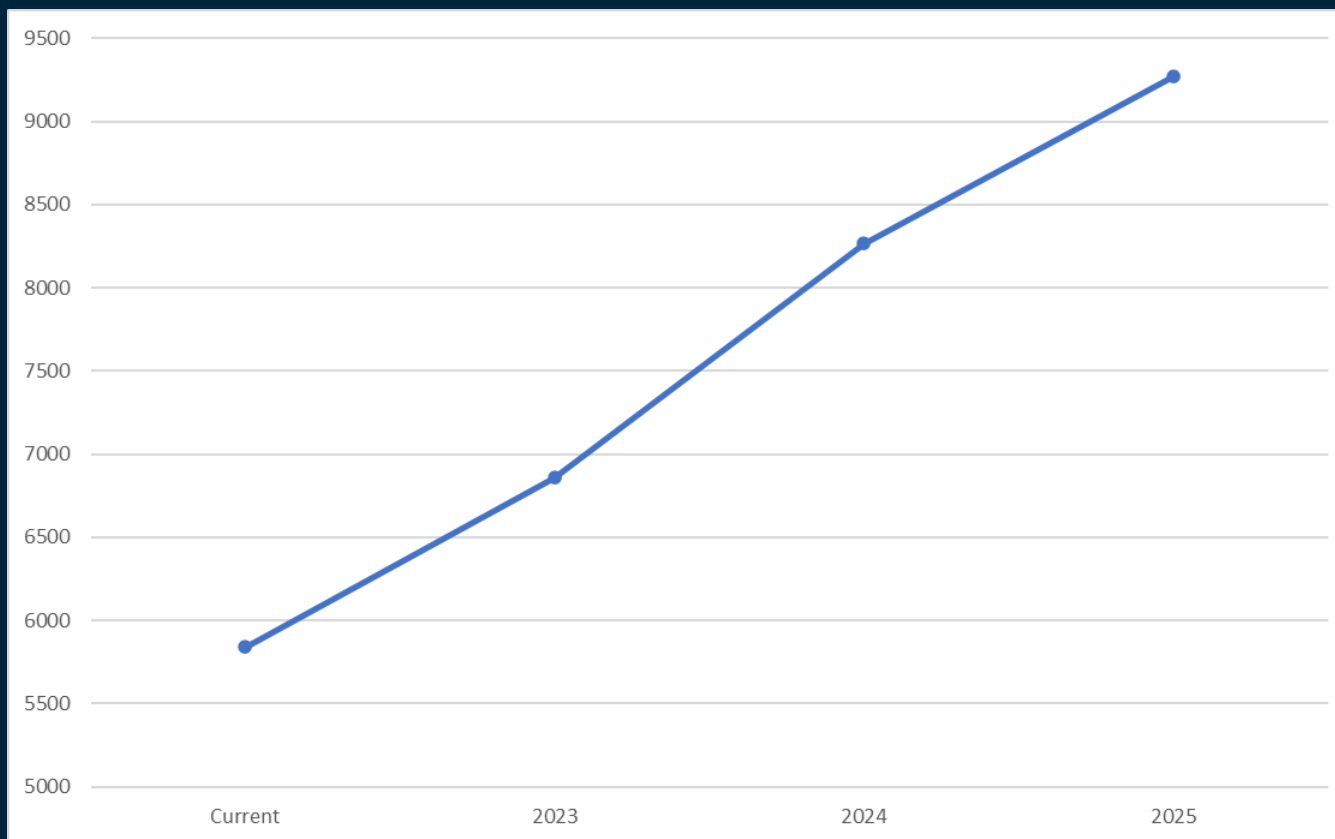
-latest FID taken March this year

- Finland getting close to a tipping point, meaning price expectations will decrease to match the SE1 price expectation very soon if FIDs doesn't slow down

Owner / Developer	Name	County	Cap. Fac	GWh	FLH	ic (MW)	num_tur	MW	Turbine type	Commissioned	Date of FID
BlackRock/Winda	Hallakangas, Kyyjärvi	Central Finland	39%	155	3 390	46	8	5,7	Nordex N163-5.7	02/23	10/21
BlackRock/Winda	Hautakangas, Kinnula	Central Finland	39%	155	3 390	46	8	5,7	Nordex N163-5.7	02/23	10/21
wpd Finland Oy	Nuolivaara	Lapland	34%	291	3 000	97	17	5,7	Nordex N163/5.7	04/23	09/21
Winda	Läntisneva, Kalajoki	Northern Ostrobothnia	39%	273	3 425	80	14	5,7	Nordex N163-5.7	04/23	09/21
BlackRock/Winda	Haapalaminkangas,†	Central Finland	38%	96	3 370	29	5	5,7	Nordex N163-5.7	04/23	10/21
Suomen Hyötytuuli Oy	Perho, Alajoki-Peuralin	South Ostrobothnia an	39%	280	3 449	84	14	6,0	Siemens Gamesa SG 5.	04/23	09/21
Ilmatar Energy	Palma	Somero	34%	52	3 000	17	4	4,3	2-5MW	06/23	N.a.
Ålandsbanken /YIT	Pyhäjärvi, Murtomäki	Pohjois-Pohjanmaa	38%	300	3 333	90	15	6,0	Vestas V162-6.0 MW	08/23	05/21
Ilmatar Energy	Möksy and Louhukangas	Southern Ostrobothnia	39%	800	3 418	216	36	6,0	Vestas V162-6.0 MW	08/23	05/21
Falck Renewables	Karstula, Koiramäki	Keski-Suomi	37%	96	3 250	30	5	5,9	Nordex N163 5.9	09/23	06/22
Falck Renewables	Karstula, Mustalammi	Keski-Suomi	37%	96	3 250	30	5	5,9	Nordex N163 5.9	09/23	06/22
Low Carbon / Enersens	Vöyri, Mörknässkogen	Pohjanma	38%	100	3 333	30	5	6,0	Vestas V162-6.0 MW	10/23	08/21
ABO Wind OY	Pajuperänkangas	Northern Ostrobothnia	39%	300	3 450	87	14	6,2	Nordex N163-6.2 MW	11/23	12/21
Suomen Hyötytuuli Oy	Pori ja Eurajoki, Oosins	Satakunta	37%	298	3 200	93	15	6,2	Vestas V162-6.2MW	12/23	04/22
Energiequelle	Hyrnsalmi, Lumivaara	Kainuu	39%	155	3 400	46	8	5,7	Nordex N163-5.7	12/23	05/21
ABO Wind OY	Hyrnsalmi, Illevaara	Kainuu	39%	102	3 400	30	5	6,0	Vestas V162-6.0MW	01/24	
Ilmatar Energy	Kristiinankaupunki, Vä	Pohjanmaa	37%	181	3 250	56	9	6,2	Vestas V162-6.2	03/24	06/22
Ilmatar Energy	Somero, Somero	Varsinais-Suomi	37%	49	3 250	15	4	3,8	Vestas V150-3.8	03/24	06/22
Ilmatar Energy	Karvia, Jäkäläkangas	Satakunta	37%	98	3 250	30	5	6,0	Vestas V162-6.0	03/24	06/22
Ilmatar Energy	Isojoki, Isokeidas	Etelä-Pohjanmaa	37%	101	3 250	31	5	6,2	Vestas V162-6.2	03/24	06/22
Fortum, Helen	Närpiö, Pjelaax-Böle anc	Pohjanmaa	34%	1150	3 026	380	56	6,8	Nordex N163/6.8	06/24	12/21
Enefit Green(Eesti Ener Tolpanvaara		Northern Ostrobothnia	37%	250	3 268	77	13	5,5	Nordex N163/5.9	06/24	12/21
Neoen (80%) / Prokon 2 Närpio, Björkliden		Pohjanmaa	37%	131	3 250	40	7	5,8	Nordex N163-5.8	06/24	06/22
Kympivoima, Oulun Er Lestijärvi		Keski-Pohjanmaa	34%	1350	2 964	455	69	6,6	Siemens Gamesa SG 6.	12/24	11/21
OX2 / Ålandsbanken & Pieksämäki, Niinimäen		Etelä-Savo	37%	472	3 250	145	22	6,6	Nordex N163-6.6	12/24	06/22
Helen & Ålandsbanken Oulainen, Karahka		Pohjois-Pohjanmaa	37%	488	3 250	150	25	6,0	Nordex 25 N163-6.0	12/24	09/22
Valorem / AIP Infrastru Kurikka, Matkussari		Etelä-Pohjanma	36%	474	3 190	149	27	5,5	Nordex N163 5.5 MW	01/25	03/23
Energiequelle	Kristiinankaupunki, Mi	Pohjanmaa	38%	339	3 250	106	16	6,6	Siemens-Gamesa SG 6.	01/25	01/23
Neoen (80%) & Prokon Uusikaarlepyy, Storböt		Keski-Pohjanmaa	38%	341	3 250	105	17		Vestas	01/25	
Helen Oy / Ålandsbanki Kurikka, Kalistanneva		Etelä-Pohjanma	36%	526	3 190	165	30	5,5	Nordex N163-5.5	01/25	04/22
Exilion	li, Isokangas	Pohjois-Pohjanmaa	37%	95	3 167	30	5	5,9	Nordex N163/5.X	01/25	
Exilion	li, Palokangas	Pohjois-Pohjanmaa	37%	225	3 169	71	12	5,9	Nordex N163/5.X	01/25	
Neoen (80%) & Prokon Hyrnsalmi, Lumivaara		Kainuu	39%	180	3 400	53	9	5,9	Nordex N163 5,9 MW	03/25	
S-voima / Gigawatti Eurajoki & Luvia		Satakunta	37%	262	3 250	81	13	6,2	Vestas V162-6.2 MW	03/25	12/22
Suomen Hyötytuuli Siikajoki, Karhukangas		Pohjois-Pohjanmaa	33%	700	2 881	243	38	6,4	Vestas V162-6.4	06/25	12/22

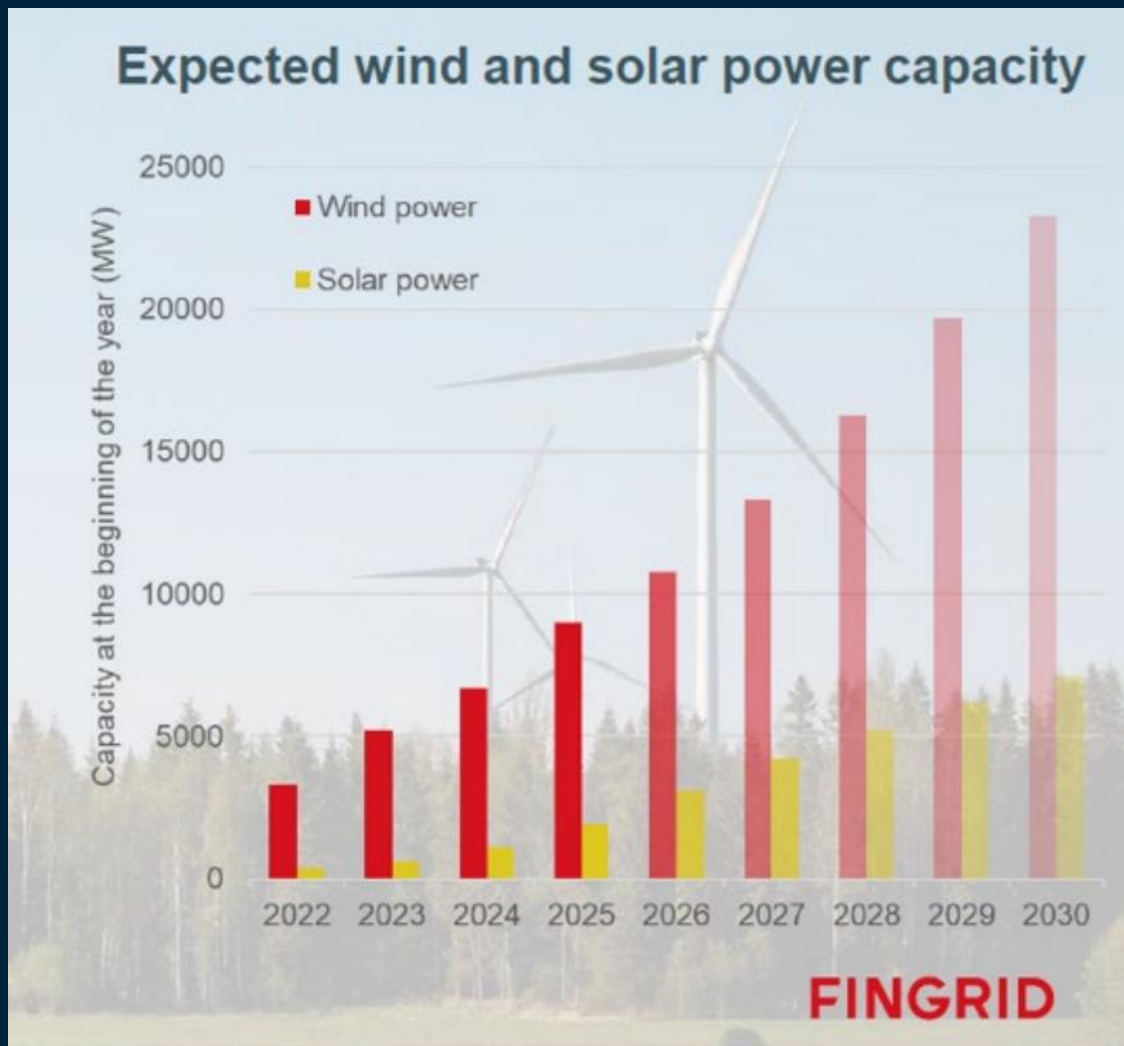
Sum to be installed by end of 2025 10958 GWh 3429 MW

// Installed wind power in Finland end of year MW



-and, we have not forgotten solar power. After 2025, we expect that more will be invested in solar power than wind power.

// What if Fingrid is right about wind and solar power build out?



- 75 TWh new wind and solar power in the period 2022-2030, i.e. around 83 TWh wind/solar production in 2030 (remember current consumption around 77 TWh/year). Our wind/solar power production forecast for 2030 is 37 TWh.
- The Fingrid expectation is only possible with extremely strong growth in electricity consumption in Finland. Such a strong growth can, in our opinion, only be realized if Finland has the lowest electricity price in Europe, and low enough to attract large investments in green hydrogen production, new battery factories, new data storages etc.

// StormGeo Nena price forecast for Finland if Fingrid is right about wind and solar power build out

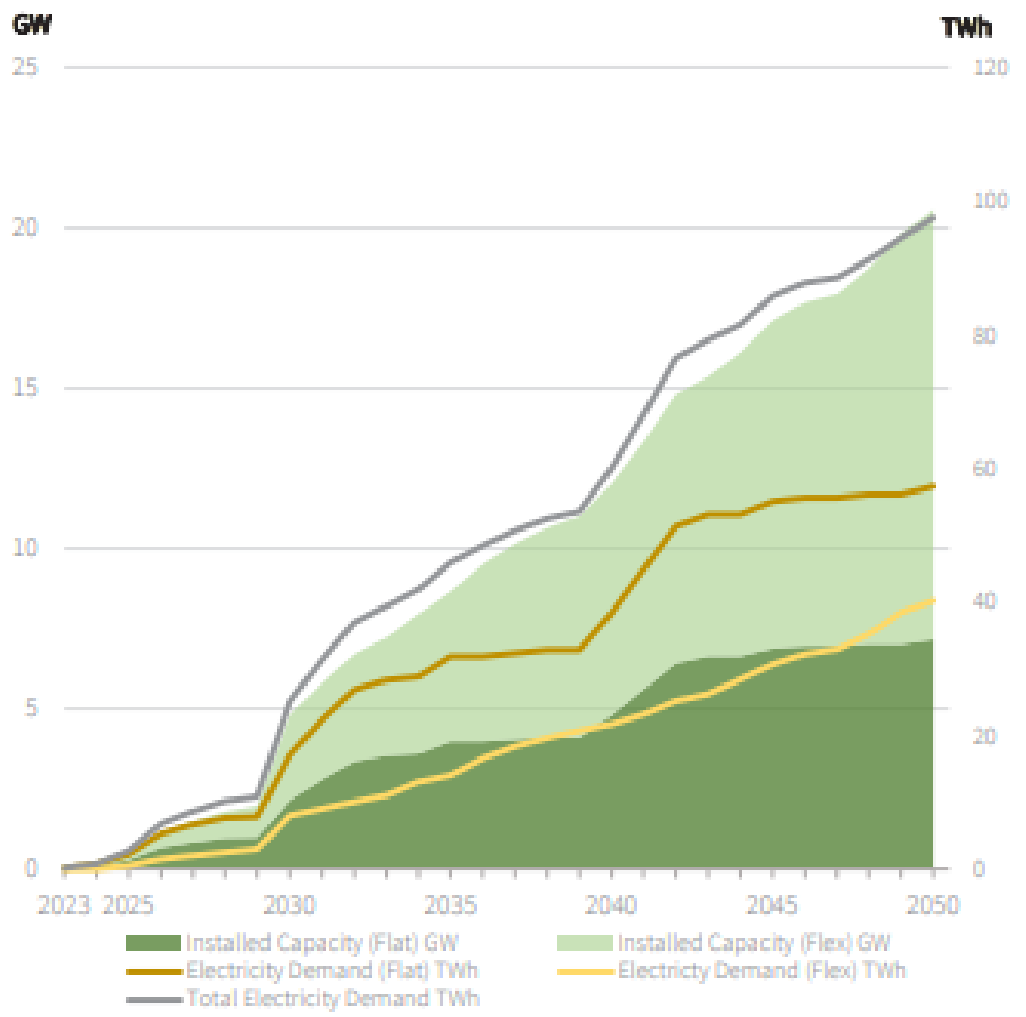
€/MWh	2023	2024	2025	2026	2027	2028	2029	2030
FI	45	31	26	23	19	18	17	17

- The investors in wind and solar power will incur big losses, as power prices will be very low compared to the Long Run Marginal Cost (LRMC) for wind and solar power. LRMC wind and solar power is expected to be above 30 €/MWh in 2030
- We deem the Fingrid expectation to be unrealistic



Green hydrogen/Power-to-X main driver to long term consumption growth in Finland and other Nordic countries

Hydrogen Growth Capacity And Electricity



-Growth is dependent on profitability which in turn requires relatively low power prices

// SYS and Finland scenario based price forecast

Q3-23

Real year	Inflow	Prec (dev)	Temp (dev)	Wind	dev from norm 1999-2020								Probability distribution		
					Consumption	Exch	Hydro	Entrymag	Exitmag	Entry HPR	Exit HPR	Sys price	Finland	Even	
1996	40.9	-18.3	-1.3	17.0	79.6	-9.2	41	64%	65%	-13	-24	77	64	4.0%	
1997	52.0	-7.8	1.0	16.1	77.2	-10.1	41	65%	74%	-11	-10	74	61	4.0%	
1998	58.9	5.9	-1.6	18.5	79.6	-12.3	44	66%	77%	-13	-3	48	40	4.0%	
1999	45.5	-14.1	0.4	15.8	77.2	-10.6	42	66%	69%	-12	-19	70	56	4.0%	
2000	54.5	-8.1	-1.3	16.8	79.3	-11.7	44	65%	73%	-11	-16	59	46	4.0%	
2001	64.1	7.5	0.0	16.7	78.0	-12.7	46	65%	80%	-10	-1	38	29	4.0%	
2002	44.3	-21.9	1.0	14.6	76.9	-10.1	42	65%	67%	-10	-24	72	58	4.0%	
2003	50.6	-0.9	0.8	16.1	77.2	-10.7	41	65%	72%	-16	-9	70	60	4.0%	
2004	62.3	7.6	-0.4	18.3	78.0	-11.9	43	65%	81%	-10	3	55	46	4.0%	
2005	58.9	7.5	0.4	18.7	77.0	-11.5	41	65%	79%	-16	0	61	52	4.0%	
2006	46.2	-9.8	1.8	15.0	76.0	-8.9	39	65%	70%	-17	-16	81	68	4.0%	
2007	60.0	10.4	-0.7	20.7	78.5	-12.3	41	65%	80%	-15	2	48	39	4.0%	
2008	43.2	-16.5	-0.7	15.6	78.9	-9.6	42	64%	66%	-14	-23	78	64	4.0%	
2009	64.2	18.7	0.0	20.0	77.7	-12.1	42	65%	83%	-18	7	47	41	4.0%	
2010	54.0	-1.0	0.3	17.3	78.0	-11.9	43	65%	74%	-13	-8	57	46	4.0%	
2011	75.9	26.0	0.5	17.9	77.3	-12.8	46	67%	90%	-11	17	33	28	4.0%	
2012	56.6	6.7	-0.8	17.8	78.8	-11.9	43	65%	75%	-12	-1	56	47	4.0%	
2013	49.4	-11.4	0.0	16.6	77.9	-11.2	43	65%	71%	-12	-17	66	53	4.0%	
2014	47.5	-14.9	1.3	15.2	77.0	-9.8	41	64%	70%	-14	-19	78	65	4.0%	
2015	57.2	7.4	-0.4	18.0	77.9	-11.7	43	64%	76%	-16	-4	58	49	4.0%	
2016	59.3	2.3	0.4	16.5	77.1	-12.0	44	65%	77%	-11	-4	53	43	4.0%	
2017	57.4	4.7	-0.8	16.8	78.5	-11.7	44	65%	75%	-16	-7	58	47	4.0%	
2018	61.6	15.5	1.7	19.0	76.6	-9.6	38	65%	84%	-17	10	69	63	4.0%	
2019	56.6	3.9	-0.1	17.8	78.0	-11.1	41	65%	78%	-13	-1	64	55	4.0%	
2020	52.4	-7.7	0.1	18.5	77.1	-12.2	42	67%	75%	-10	-10	50	38	4.0%	
Probability distribution:	TWh	TWh	°C		TWh	TWh	TWh			TWh	TWh	61.0 50.3 €/MWh			
Even	54.9	-0.3	0.1		77.8	-11.2	42	65%	75%	-13	-7				



Price forecast based on coal, nat gas, EUAs and Conti power markets closing prices 12/6.

-Finland is a low price area in all hydrological scenarios for Q3

-The Finland price fluctuates between the price in SE1 and SE3

// SYS and Finland scenario based price forecast



Q4-23

Real year	Inflow	Prec (dev)	Temp (dev)	Wind	dev from norm 1995-14								Probability distribution		
					Consumption	Exch	Hydro	Entrymag	Exitmag	Entry HPR	Exit HPR	Sys price	Finland	Even	
1996	34.9	-1.0	-1.4	24.2	106.4	-7.9	54	64%	49%	-24	-24	85	73	4.0%	
1997	27.9	-23.5	-1.4	22.0	107.1	-8.6	58	74%	50%	-10	-36	84	70	4.0%	
1998	31.3	-8.8	-1.7	25.2	108.3	-11.6	58	77%	56%	-3	-15	66	53	4.0%	
1999	37.2	5.7	-0.4	27.9	103.8	-9.3	50	69%	59%	-19	-8	79	69	4.0%	
2000	46.9	13.2	2.1	23.5	98.3	-11.5	53	73%	68%	-16	-3	65	57	4.0%	
2001	41.5	-0.2	-0.8	26.3	105.1	-12.5	56	79%	68%	-1	-2	56	45	4.0%	
2002	14.2	-34.7	-4.1	21.3	112.4	6.5	45	67%	43%	-24	-47	149	131	4.0%	
2003	27.1	-12.8	-0.7	24.0	104.7	-8.3	54	72%	51%	-9	-20	85	71	4.0%	
2004	37.3	5.1	0.0	25.5	104.1	-12.2	56	81%	66%	3	7	60	50	4.0%	
2005	42.4	-6.0	0.4	25.1	102.3	-11.6	54	79%	70%	0	-5	65	54	4.0%	
2006	56.6	38.1	2.5	28.5	97.8	-12.0	49	70%	77%	-16	27	54	48	4.0%	
2007	30.5	-7.3	0.3	24.4	103.1	-11.7	56	80%	60%	2	-6	64	53	4.0%	
2008	35.1	3.5	0.5	26.4	102.7	-9.8	51	66%	53%	-23	-16	77	67	4.0%	
2009	29.9	-17.2	-1.6	22.7	106.4	-11.8	60	83%	60%	7	-15	65	53	4.0%	
2010	27.3	-30.3	-4.2	24.1	112.7	-8.0	59	74%	49%	-8	-42	86	71	4.0%	
2011	46.1	10.8	1.7	28.7	99.0	-15.3	53	90%	85%	17	30	12	3	4.0%	
2012	35.6	-3.1	-1.8	23.3	107.1	-11.5	60	75%	56%	-1	-9	66	54	4.0%	
2013	39.8	20.2	1.3	29.0	100.5	-11.0	49	70%	64%	-17	9	70	61	4.0%	
2014	42.8	11.1	0.8	24.9	101.6	-10.2	52	70%	62%	-19	-7	75	66	4.0%	
2015	43.2	7.2	1.6	27.3	99.6	-11.3	50	76%	71%	-4	9	68	58	4.0%	
2016	27.3	-9.0	-0.1	26.2	104.3	-9.6	53	77%	57%	-4	-10	79	67	4.0%	
2017	38.8	16.6	0.2	26.8	103.3	-12.1	54	75%	63%	-7	10	59	50	4.0%	
2018	40.7	-12.7	0.5	24.8	102.0	-12.7	56	84%	72%	10	-4	56	43	4.0%	
2019	30.5	1.9	0.3	21.7	103.4	-11.5	59	78%	55%	-1	-3	66	56	4.0%	
2020	34.9	-1.0	-1.4	24.2	106.4	-9.9	56	75%	58%	-10	-12	77	67	4.0%	
Probability distribution:	TWh	TWh	°C		TWh	TWh	TWh			TWh	TWh				
Even	36.0	-1.4	-0.3		104.1	-10.2	54	75%	61%	-7	-8	70.7	59.5	€/MWh	

-The Finland price continue to fluctuate between the price in SE1 and SE3. Analyses indicate slightly more frequent coupling to SE3 compared to Q3

// SYS and Finland scenario based price forecast



Q1-24

Real year	Inflow	Prec (dev)	Temp (dev)	Wind	dev from norm 1995-14								Probability distribution		
					Consumption	Exch	Hydro	Entrymag	Exitmag	Entry HPR	Exit HPR	Sys price	Finland	Even	
1997	19.5	17.1	0.1	29.6	114.4	-10.2	58	49%	19%	-24	-2	102	95	4.0%	
1998	24.4	18.0	0.5	31.2	113.6	-6.6	54	50%	27%	-36	-10	115	109	4.0%	
1999	15.6	5.1	-0.6	27.8	116.4	-11.7	64	56%	17%	-15	-12	89	82	4.0%	
2000	18.7	17.8	1.1	31.5	111.2	-12.5	57	59%	28%	-8	15	80	74	4.0%	
2001	14.7	-16.2	-1.5	25.1	118.2	-11.6	68	68%	26%	-3	-26	91	81	4.0%	
2002	21.6	16.4	1.1	27.8	112.1	-13.0	62	68%	36%	-2	14	65	59	4.0%	
2003	12.7	-8.9	-0.8	26.9	117.0	4.7	49	43%	14%	-47	-43	158	149	4.0%	
2004	16.7	-14.2	-0.4	22.9	113.9	-6.7	62	51%	16%	-20	-34	114	104	4.0%	
2005	20.5	2.9	-0.3	30.9	113.8	-13.2	60	66%	34%	7	12	58	50	4.0%	
2006	13.1	-18.7	-2.7	23.0	120.5	-9.7	70	70%	25%	-5	-32	103	92	4.0%	
2007	23.7	7.3	1.5	25.3	112.1	-14.0	65	76%	43%	27	30	31	24	4.0%	
2008	18.0	20.8	1.9	32.0	109.7	-12.9	56	60%	30%	-6	21	68	62	4.0%	
2009	13.8	-7.5	-0.4	26.4	116.0	-8.9	63	53%	14%	-16	-23	106	97	4.0%	
2010	9.7	-22.7	-3.7	22.5	122.5	-3.7	66	60%	15%	-15	-41	125	115	4.0%	
2011	10.5	2.2	-1.4	24.2	115.3	-0.5	54	49%	14%	-42	-31	141	133	4.0%	
2012	28.9	4.9	0.6	26.1	113.0	-14.1	65	84%	56%	30	31	25	17	4.0%	
2013	10.5	-25.5	-3.2	23.3	120.9	-6.8	67	56%	11%	-9	-39	114	103	4.0%	
2014	24.2	2.8	1.8	26.4	110.5	-13.3	62	63%	34%	9	12	53	45	4.0%	
2015	22.9	17.1	2.1	34.7	109.8	-12.6	53	62%	38%	-7	19	78	72	4.0%	
2016	17.9	-9.8	-0.2	28.6	114.7	-12.5	63	71%	35%	9	-2	80	71	4.0%	
2017	21.3	-2.2	1.0	28.9	112.6	-10.5	59	57%	27%	-10	-9	100	92	4.0%	
2018	9.1	-17.3	-1.9	24.4	119.1	-12.3	70	63%	14%	10	-16	83	72	4.0%	
2019	20.6	5.8	0.7	26.6	113.0	-12.2	63	72%	38%	-4	1	83	76	4.0%	
2020	29.2	38.2	3.3	37.4	106.6	-13.8	49	55%	40%	-3	47	36	32	4.0%	
2021	18.8	17.8	1.1	26.7	112.2	-10.7	61	58%	24%	-12	6	100	94	4.0%	
Probability distribution:	TWh	TWh	°C		TWh	TWh	TWh			TWh	TWh				
Even	18.3	2.0	0.0		114.4	-10.0	61	61%	27%	-8	-5	88.0	80.0	€/MWh	

-The Finland price continue to fluctuate between the price in SE1 and SE3.

Olkiluoto 3 to start yearly maintenance March 1st 2024, and Finland will mainly couple with SE3 during the maintenance period.

// Thank you for listening!

Finnish Energy Day 15/6/23

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