

Finland's first offshore wind farm is in the water – how to continue?

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Tahkoluoto offshore wind farm

The first offshore wind farm designed for challenging ice conditions.

- The sea gets frozen every winter – there is drifting and packed ice.

10 x 4,2 MW, hub height 90 meters, rotor diameter 130 m.

- Constructed in connection with 2,3 MW test turbine installed in 2010.

Production started in autumn 2017.

Estimated annual production 155 GWh.

Constructed with the aid of 20 million € investment subsidy + the feed-in tariff (83,5 €/MWh for 12 years).

Owner: Suomen Hyötytuuli



TAHKOLUOTO OFFSHORE WIND FARM, PORI, FINLAND

Production corresponds to the annual electricity consumption of 8 600 detached houses.

10 x 4 MW

Average power production 43% of the max. capacity

Estimated annual power production 155 GWh

Substation onshore

33 kV cable

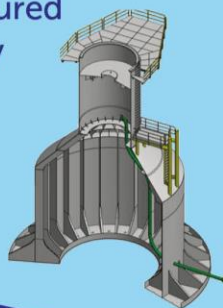


Rotor hub height approx. 90 m

Radar technology for monitoring bird life

Estimated direct effect on employment over 300 person-years

Gravity-based steel foundations manufactured locally



Rotor diameter \varnothing 130 m

Distance from shore 0,5 - 3 km

Water depth 8 - 15 m

Schedule

summer 2016
dredging and trenching, marine cable landing

spring 2016 - spring 2017
onshore cabling and substation

summer 2017
foundation assembly and marine cabling

summer 2017
turbine assembly

autumn 2017
commissioning



Pori

Offshore capacity and pipeline in Finland

Total offshore capacity is between 44 – 77 MW

- 27 MW on artificial islands – offshore or onshore or something else?

Offshore pipeline at the moment 3 100 MW

- Spatial plan approved for 800 MW

Only big players (utilities, large project developers)

Lack of political will has slowed down the interest towards offshore in Finland.

Further, a lot of good onshore sites are available.



There is huge offshore potential in Finland

Country	Constrained capacity [MW] - very high score areas (+40)		Constrained capacity [MW] - high score areas (35-39)	
	Capacity after hard constraints	Capacity after excl. protected areas	Capacity after hard constraints	Capacity after excl. protected areas
Denmark	1,607	201	44,345	21,430
Estonia	966	83	14,500	1,346
Finland	17,883	16,651	73,483	67,989
Germany	87	-	5,718	2,774
Latvia	-	-	5,839	2,542
Lithuania	-	-	1,830	107
Norway	-	-	-	-
Poland	-	-	4,698	2,003
Russia (Kaliningrad) + Leninggrad prov.	-	-	3,059	1,160
Sweden	203	-	22,441	14,507
Total (MW)	20,746	16,935	159,911	113,857

The future of offshore wind power in Finland I: Renewable energy targets for 2020 and 2030

2020 target: 38 % of energy consumption covered with renewables by 2020

- Target was reached already in 2015. Approximately 40 % of the energy consumption was covered with renewables in 2016.
- Current feed-in-tariff for wind power (2500 MVA) is fully constructed.

Energy and Climate strategy, updated on November 2016:

- 50 % of the energy consumption has to be covered with renewable energy by 2030.
- 55 % of energy consumption covered with domestic energy sources by 2030.
- 100 % renewable energy system in 2050?

The future of offshore wind power in Finland II

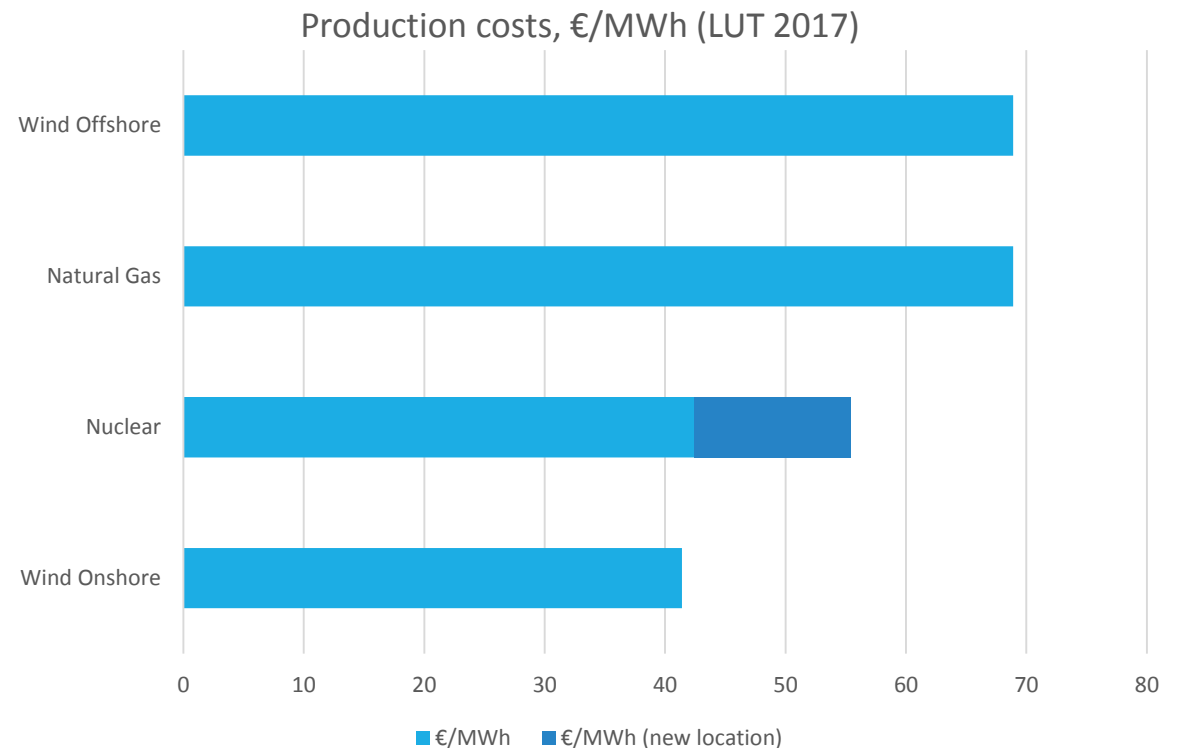
1,4 TWh of annual renewable electricity production is planned to be auctioned between 2018 - 2020

- Technology neutral auctions –wind onshore and offshore, PV, CHP, tidal and wave energy. Role of hydropower?
- Closer to 2020 it will be evaluated, if the auctions will be continued

Offshore is allowed to participate, but it cannot beat onshore wind.

But the costs of offshore are coming down – also in Finland

- The LCOE can be estimated better after the Tahkoluoto project has been in production for full year/some years.



How to continue offshore construction in Finland?

The single offshore turbine has already demonstrated that

- the turbine “can survive” and operate well in the frozen sea.
- the capacity factor is remarkably higher than in onshore turbines of the same age – even though the distance from the shore is modest.

The Tahkoluoto offshore wind farm operated well during the winter 2017 – 2018.

Currently no new offshore-specific support scheme planned.

What would be needed is

- a steady investment environment – several auction rounds
- developed supply chain starting from vessels, harbour infrastructure, etc.

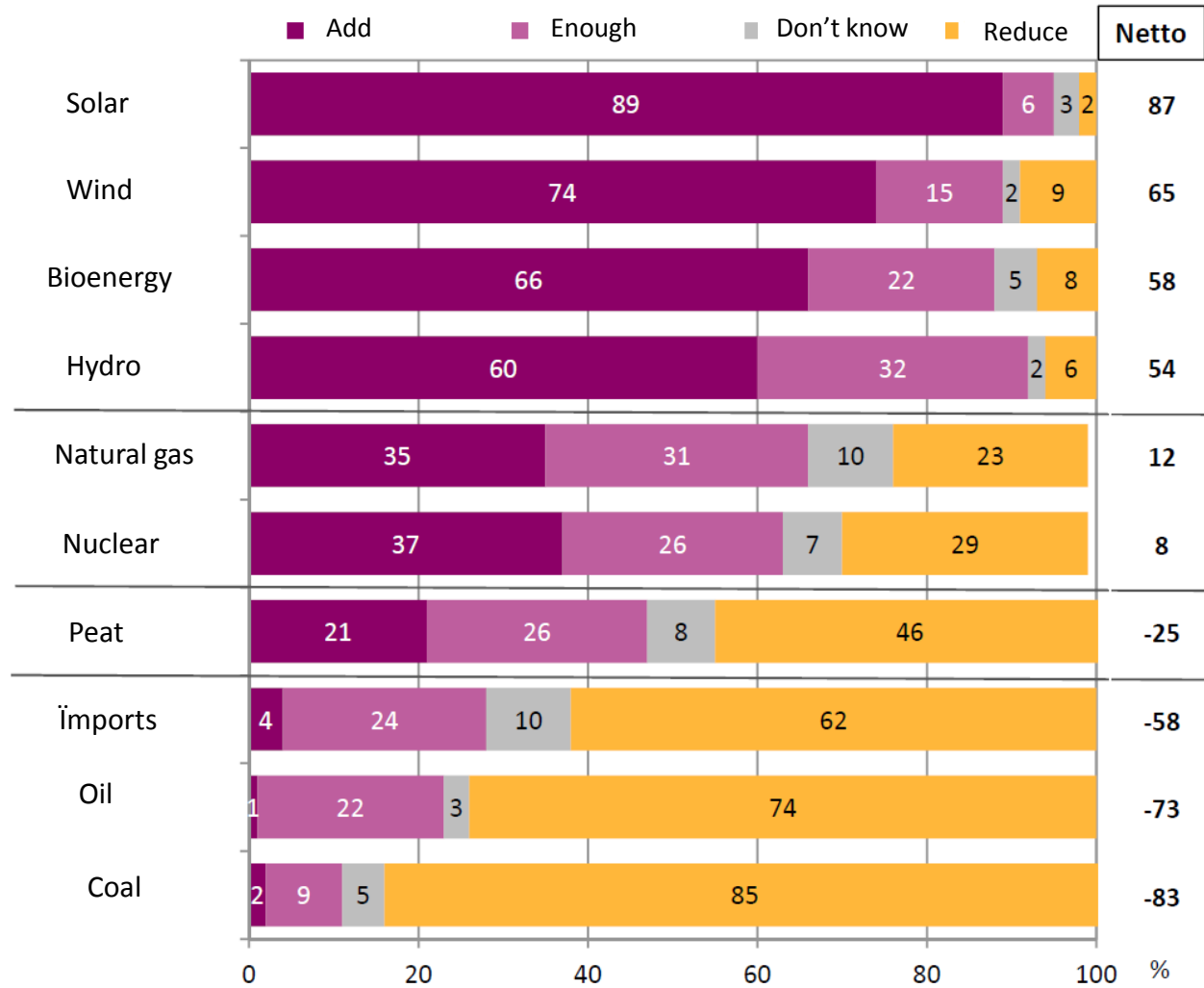
Co-operation in the Baltic sea region as the best option?

Personal view: offshore wind power will be constructed in large scale in Baltic Sea in the 2020s.

Energy attitudes – study: What energy production should Finland have more, what less?

n=1000

Net value is calculated by reducing "needs to be reduced" % -share of "needs to be added" % -share



Thank you for the attention!



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