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

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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
3. Update on Tahkoluoto demo project

Tahkoluoto Offshore Wind Farm, Pori, Finland

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

**Average power production:**
- 10 x 4 MW
- 43% of the max. capacity

**Estimated annual power production:**
- 155 GWh

- **Substation onshore:**
  - 33 kV cable

- **Rotor hub height:**
  - approx. 90 m

- **Rotor diameter:**
  - Ø 130 m

- **Distance from shore:**
  - 0.5 - 3 km

- **Water depth:**
  - 8 - 15 m

- **Radar technology for monitoring bird life**

- **Estimated direct effect on employment:**
  - over 300 person-years

**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

[www.hyotytuuli.fi/en](http://www.hyotytuuli.fi/en)
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

<table>
<thead>
<tr>
<th>Country</th>
<th>Constrained capacity (MW)</th>
<th>Constrained capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- very high score areas (+40)</td>
<td>- high score areas (35-39)</td>
</tr>
<tr>
<td></td>
<td>Capacity after hard constraints</td>
<td>Capacity after excl. protected areas</td>
</tr>
<tr>
<td>Denmark</td>
<td>1,607</td>
<td>201</td>
</tr>
<tr>
<td>Estonia</td>
<td>966</td>
<td>83</td>
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<td>Finland</td>
<td>17,883</td>
<td>16,651</td>
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<tr>
<td>Germany</td>
<td>87</td>
<td>-</td>
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<td>Latvia</td>
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<td>Lithuania</td>
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<td>Norway</td>
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<tr>
<td>Poland</td>
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<td>-</td>
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<tr>
<td>Russia (Kaliningrad) + Leningrad prov.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sweden</td>
<td>203</td>
<td>-</td>
</tr>
<tr>
<td>Total (MW)</td>
<td>20,746</td>
<td>16,935</td>
</tr>
</tbody>
</table>

Source: Basrec-report, 2012
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

### Energy Sources
- **Solar**: Add = 89, Enough = 6, Don’t know = 32, Reduce = 8, Netto = 87
- **Wind**: Add = 74, Enough = 15, Don’t know = 2, Reduce = 9, Netto = 65
- **Bioenergy**: Add = 66, Enough = 22, Don’t know = 5, Reduce = 8, Netto = 58
- **Hydro**: Add = 60, Enough = 32, Don’t know = 2, Reduce = 6, Netto = 54
- **Natural gas**: Add = 35, Enough = 31, Don’t know = 10, Reduce = 23, Netto = 12
- **Nuclear**: Add = 37, Enough = 26, Don’t know = 7, Reduce = 29, Netto = 8
- **Peat**: Add = 21, Enough = 26, Don’t know = 8, Reduce = 46, Netto = -25
- **Imports**: Add = 4, Enough = 24, Don’t know = 10, Reduce = 62, Netto = -58
- **Oil**: Add = 1, Enough = 22, Don’t know = 3, Reduce = 74, Netto = -73
- **Coal**: Add = 2, Enough = 9, Don’t know = 5, Reduce = 85, Netto = -83
Thank you for the attention!

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