



Scatec
Scandinavian Advanced Technology

Efficient Offshore wind implementation

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Offshore wind

Europe from 1 GW to 10 GW in 10 years

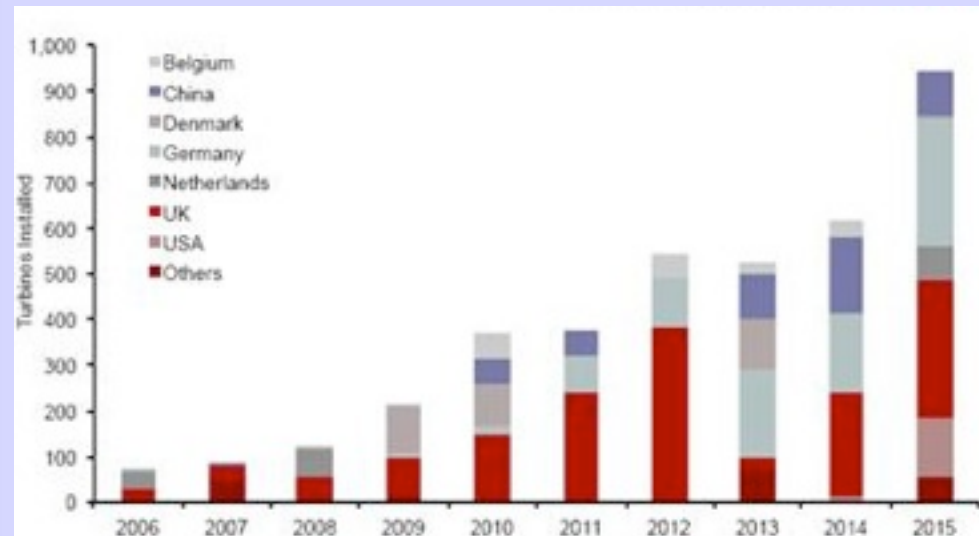
The Opportunity

- Offshore wind has great growth prospects
- UK, Dk & No have the best offshore wind resources
- UK & No have substantial offshore knowledge and industry base
- Subsea cable technology in S (ABB) and No (Nexan)

The Challenge

- How to provide energy security; reliable energy supply when there's no wind
- How to cost efficiently install offshore wind turbines

Forecast offshore wind



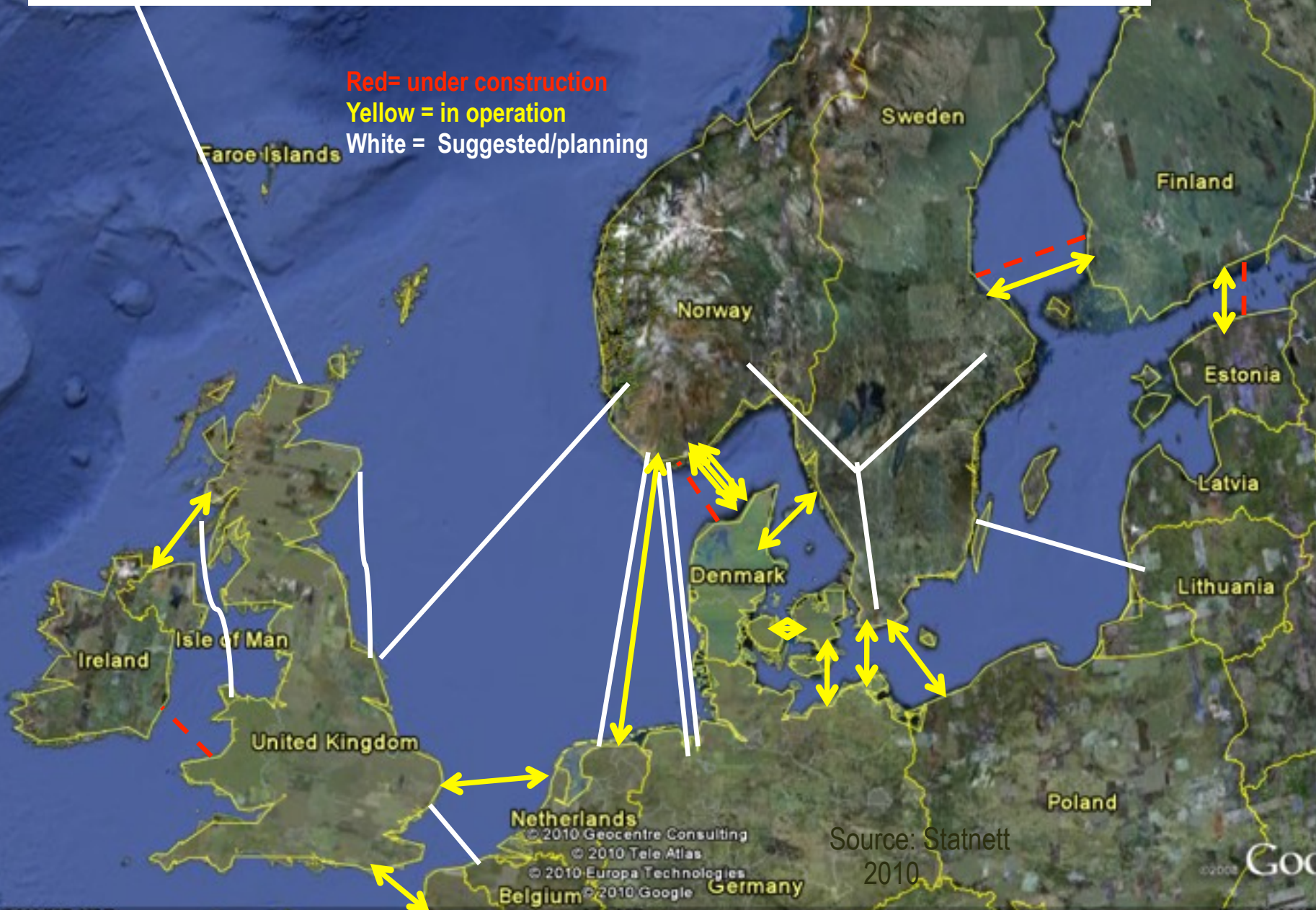
- 3,000 turbines due for installation over next 5 years
- Major investment being seen in new turbine production facilities, with some new plants in the UK

Source: The World Offshore Wind Report 2011 – 2015 Douglas- Westwood



Norwegian hydro electric capacity as battery

Red= under construction
Yellow = in operation
White = Suggested/planning

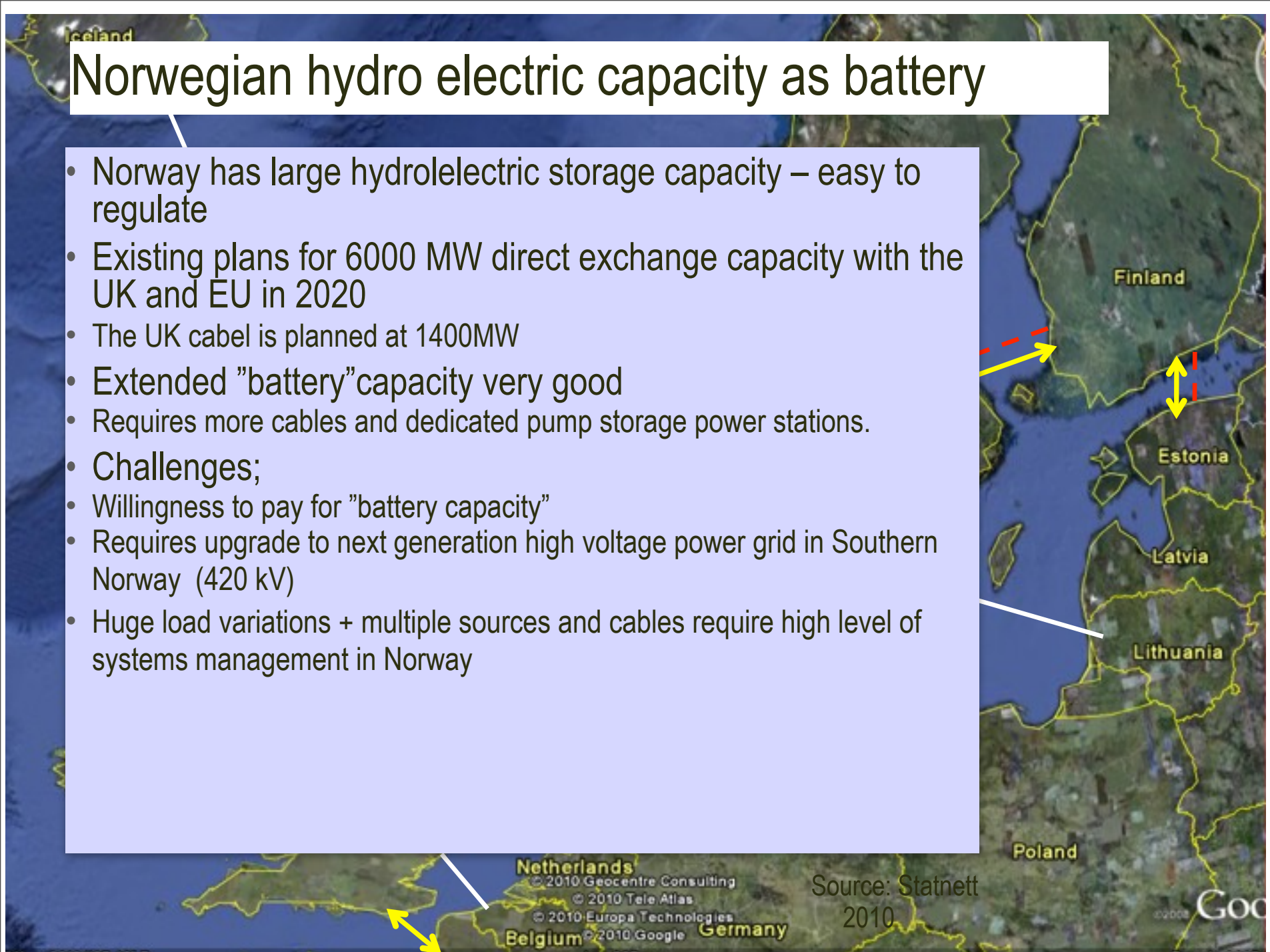


Source: Statnett
2010

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Norwegian hydro electric capacity as battery

- Norway has large hydroelectric storage capacity – easy to regulate
- Existing plans for 6000 MW direct exchange capacity with the UK and EU in 2020
- The UK cable is planned at 1400MW
- Extended "battery" capacity very good
- Requires more cables and dedicated pump storage power stations.
- Challenges;
- Willingness to pay for "battery capacity"
- Requires upgrade to next generation high voltage power grid in Southern Norway (420 kV)
- Huge load variations + multiple sources and cables require high level of systems management in Norway





NorWind
INSTALLER

The Technology is available

- Focus on design and installation of offshore wind foundations
- Main shareholder in Owec Tower – sub sea structure for depth <math><100\text{ m}</math>
 - Pilots installed in Beatrice Field, UK sector
- Installed 6 jackets at Alpha Ventus
 - Pre-piled jackets (first in the World)
 - 45 km offshore coast of Germany
 - 5 MW turbines
 - Depths of 26 - 32 meters



Alpha Ventus off the coast of Germany – September 09

5 MW turbines – 45 km offshore, 30 meters depth



Alpha Ventus off the coast of Germany – September 09

5 MW turbines – 45 km offshore, 30 meters depth



Current concept

- Significant operational limitations due to weather dependency
- Available tonnage either large and expensive or small and inefficient
- Logistical challenges result in low capacity and increased complexity

NorWind Installer has designed and intends to

Alpha Ventus learnt us that dedicated vessels are needed

... have designed a dedicated installation vessel that meets objectives

Main advantages are:

- Cutting installation cost by 50 %
- Designed for all-year operation
- 1 vessel will replace the 11 different vessels used for Alpha Ventus



