The case for building out the North Sea grid – a business perspective

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About SeaStarAlliance
- Industrial collaboration on cost-reduction

A pan-European offshore wind industrial alliance to strengthen regional cooperation between EU institutions, Member States and the offshore wind industry. It’s industry-driven, aiming at:

- Cost Reduction
- Knowledge Management
- Grid Development

Includes political and regulatory advocacy

Who:

UK: [Offshore Wind Programme Board](#)
DE: [Stiftung OFFSHORE-WINDENERGIE](#)
DK: [Dansk Energi](#) (Danish Energy Association)
NL: [TKI Wind Op Zee](#)
Energy Union Package
- Achieving the 10% electricity interconnection target Making Europe's electricity grid fit for 2020

- The Northern seas offer a unique opportunity to supply a substantial amount of low-carbon, indigenous energy, produced close to some of the most energy intensive regions of Europe.

- The Commission actively supports and will further promote the work of this regional group and the development of an Action Plan.
DNO (DSO)
Utilities – production-investors
Traders – electricity
Energy Service Providers
Optical Fiber
Future energy mix in Denmark
How will we reach 50% wind in 2020

Wind production - share of electricity - 2020

- Electricity from wind 2014: 35.1%
- Horns Reef 3: 4.9%
- Onshore: 4.1%
- Nearcoast: 4.6%
- Kriegers Flak (after 2020): 7.3%

Source: Danish Energy Association
RES build out will continue, but electrification of the demand side is progressing slowly.
The Danish power system in March 2015

- WIND
- PV
- Decentralised CHPs
- Central CHPs
Power system with high share wind

- the “abnormal” is the “new normal”

Four questions to ask:

Who will consume more?
Who will produce?
Who will be fast?

CONCLUSION

Market framework that can and will handle the unusual situations:

- New or adjusted market design
- More integration
- Grid investments
- Grid availability
Viking Link
- currently in the feasibility stage –

National Grid Interconnector Holdings Limited, together with its development partner Energinet.dk, is developing an DK-UK interconnector. The project is called Viking Link, and is currently in the feasibility stage.

Seabed investigation under way.

An HVDC capacity within the range of 1,000MW to 1,400MW is being investigated.
Interconnections can contribute significantly to increasing the value of electricity and security of supply

The Danish case

**Build out of wind power and electrification of demand side**

- VikingLink 90%
- VikingLink 50%
- Electric boilers and large scale heat pumps
- Electric vehicles
- Individual heat pumps
- Electrification of rail

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Some issues to address/consider
Large scale offshore wind developed deeper into sea-and an evolution towards cross boarder grid projects

Mapping 53 farm-to-shore projects
Size of bubbles = capacity of connection

Need for a more harmonized and regional regulatory target model for the connection of offshore wind farms

Source: EUI Working Papers, RSCAS 2014/24
Which harmonized and integrated regulatory model?

- Network externalities – requirement for strong grid enforcement
- Cost and technologies uncertainties are stronger
- Economic of scale are stronger

Which regulatory framework for the connection of large offshore wind farms at deeper sea level and cross border?

Three main model:

- TSO model
- Generator model
- Third party model

Different national regulatory frameworks seems incompatible when applied to cross-border Projects

Need advanced coordinated planning
The core incentive regulation of TSOs in EU may not be aligned with the interests of society.

TSOs have an interest in maximizing revenue from bottlenecks.

while

Society have an interest in maximizing socioeconomic benefits.

Thus, the TSO could demand lower investments in interconnections than the socioeconomic optimum.

Kilde: Matti Supponen, 2012, EUI Working Papers
Bottlenecks an European problem

Figure 4: Critical/Congested network element clusters: Planning phase (D-1 and D-2 in 2011, and 2012)
Source: ENTSOE, Technical report, Bidding zone review process, January 2014

Figure 20: Simulation results: gross welfare benefits from cross-border trade and incremental gain per border – 2012 (million euros)

Source: ACER/CEER, Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2012, November 2013
There are incentives to block existing cross-border connections - the DK1-DE interconnector as an example
What is the effect of this reduction in transmission capacity from one country to another?

- The Danish and German TSOs conducted a study on the socio economic welfare of fewer reductions in transmission capacity.
- Denmark and Germany was in focus but the effect on a European scale was calculated.
- The method for fewer reductions was countertrading.
The study concludes that the current practice impedes European welfare

- Removing capacity reductions on the Danish-German interconnector has a significant European welfare gain.

- However, since Denmark and Germany seen combined have a negative socio economic welfare of removing the reduction, the reductions seem to persist.

- The result is welfare losses in a number of surrounding countries – in particular Sweden.
Some key elements for success - Recommendations

- **Political agreement and commitment** across member states
- "Treaties" at regional level to **ensure development of appropriate regulation** of assets – a **Harmonized and regional** regulatory Target model
- **Long term planning /coordination** to ensure investor confidence. Investments begin by allocating time to build up necessary knowledge on contracts, regulation etc.
- State / EU **co-funding to ensure low financial costs and for risk mitigation**
- **Map which type of risks potential investors are willing to take on** before determining set-up of a specific infrastructure project.
- **Independent TSOs with a core incentive regulation promoting investments maximizing socioeconomic benefits in the EU.**
- A **well-functioning market** such as the Nordic power exchange Nord Pool ensures a transparent and cost-efficient transfer of power from areas with high production and low demand to areas with low production and high demand.