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Wind Electricity Grid Development

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Regulatory barriers to Offshore Meshed Grid development.

Overview and good practices

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Key facts

- **Large expected growth of OW** with an increase of large OW projects built away from shores;
- Connection costs are estimated to represent **20 to 30%** of the total cost related to current nearshore OW;
- With an average load factor for wind energy of 40%, the network assets are only used **40% of the time;**
- **OMG becomes an interesting solution** and is consistent with European energy strategy;
- However, there is no **dedicated regulatory framework** to promote meshed solutions.

Review of key regulatory set-ups that interfere with OMG and drawing of recommendations for the Baltic Sea region

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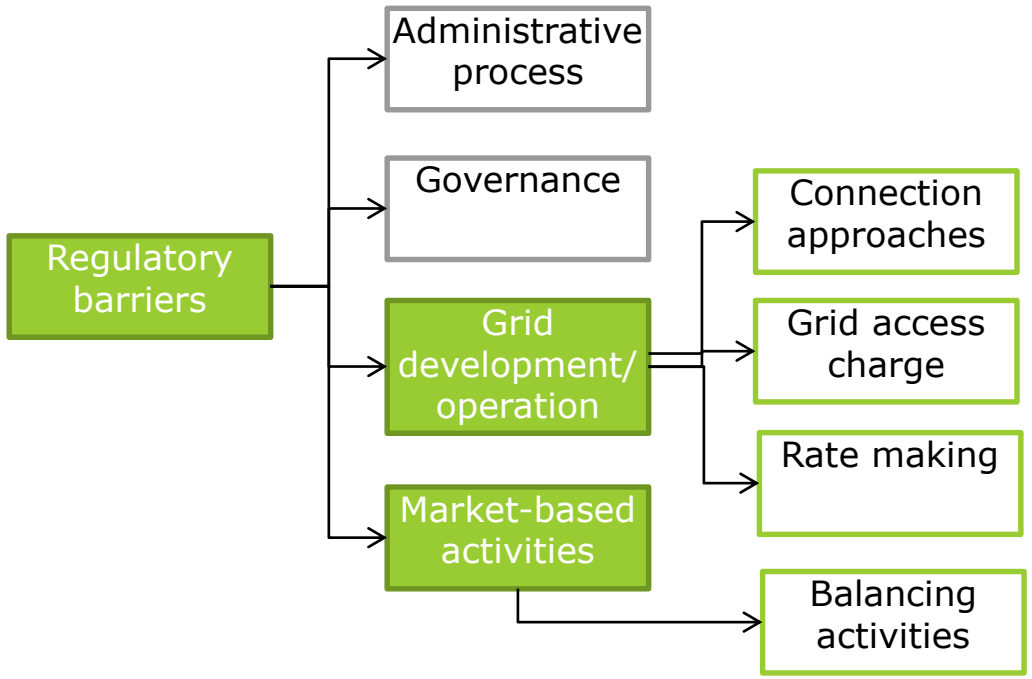
Identifying sticking points in regulatory set-ups at the TSO level



- Recent studies identify and analyse some **regulatory barriers** to wind development and hybrid offshore grid infrastructures (NSCOGI 2012; JRC 2015; PwC, 2016; PROMOTion 2017);
- Energy experts also identify room for improvement from the regulation authorities in the rate making;
- The regulatory challenge will be to **create a level playing** field through **harmonisation of rules** and in a **OW-friendly manner** for all involved TSOs to invest and operate the meshed grid.

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Connection approaches and cross-border investments– Unequal investment risks

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Overview & barriers

- Diversity of OWF connection approaches in the Baltic Sea countries;
- Uneven investment risk among OWD based on geographical and network ownership conditions;
- Cost allocation for a cross-border line made on bilateral basis based on the involved TSOs;
- Lacks multilateral cost sharing methods.

Connection type	Countries
Super shallow	DK; DE; FI; PL
Shallow(ish)	DK; FI; DE
Deep	EE; LA; LI; SW

Good practices

- Harmonisation is needed to avoid distortions;
- In case connection costs are shared (shallowish – deep), OWD should contribute to network investment based on economics principles
- The new CBCA developed by Entso-e gives guideline for hybrid architecture investments and multilateral projects, principally to better couple financial burden to expected benefits and to capture the indirect benefits expected from meshed grids

  However, adds a layer of complexity
- Super shallow approach is preferable

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Grid access charge – Distorts investment decision and impacts OW generation cost

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Overview & barriers

Diversity of access charge **levels** and **structures** (capacity vs. energy component) that creates a distortions for OWD.

- Homogenisation in the level of the volume charge is reached at the European level. ACER preconises an access charge of 0 and 0,5 EUR/MWh.
- But the measure is limited due to country-specific exemptions (DK, SW, FI) and freedom is given to the definition of a potential capacity charge and other price signals.

	G-charge share	Locational signal	Tariff structure	
			Capacity-based	Volume-based
DK	3%	no	0%	100%
EE	0%	no	0%	100%
FI	19%	no	17%	83%
DE	0%	no	84%	16%
LA	0%	no	69%	31%
LI	0%	no	66%	34%
PL	0%	no	45%	55%
SW	36%	yes	74%	26%

Good practices

- **Harmonisation** in all cost components of the access charge;
- **Removal of exemptions** on the energy component;
- Economic efficiency criteria stands for cost-reflectiveness between access charge and grid capital cost or congestion (MW) and network utilisation (MWh)
- Capacity component represents a higher burden for low load factor generation results in **higher levelised cost** of energy for a wind turbine (as compared to baseload…).
- Socialisation of non energy-based charges is preferable

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Rate making – uneven incentive framework and financial risk

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Overview & barriers

- Regulatory regimes follow national energy strategies resulting in uneven development incentives and financial risk.
- Current dominant regimes are articulated:
  - CAPEX recovery;
  - Producive efficiency on OPEX (least-cost objective)
  - Basic performance targets (security of supply and quality of electricity)

Good practices

- Coherent incentive framework at the meshed grid level.
- Strike a balance between risk minimization in a very limited information setting associated with innovative investments in multiplayers a context in:
  - Addressing new financial risk;
  - Supporting innovation;
  - Coupling the benefits of the meshed grid to profit making in developing new performance indicators;
  - Reducing information asymmetry and exchange knowledge.

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Balancing activities –A regulatory framework in evolution

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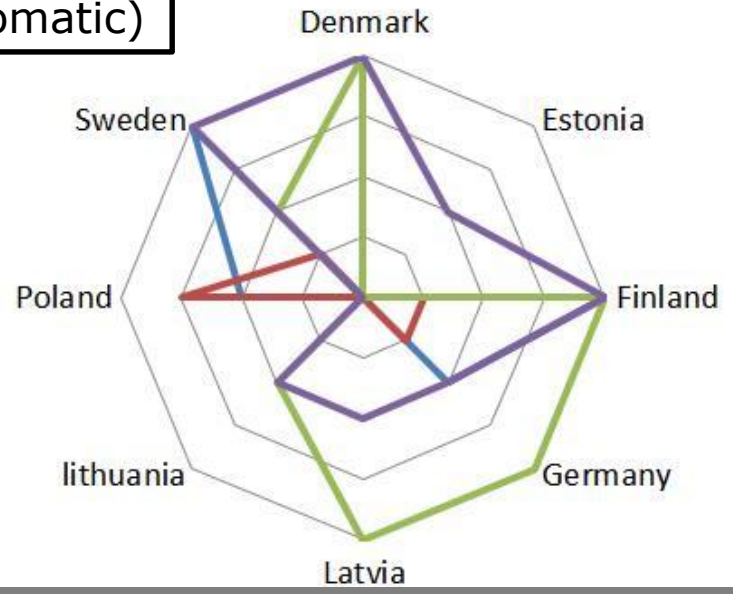
Overview & barriers

- Myriad of balancing market designs for reserve capacity and ancillary services;
- No common set of methodology exists to determine the optimal level of capacity reservation either on the balancing market or on an interconnector.

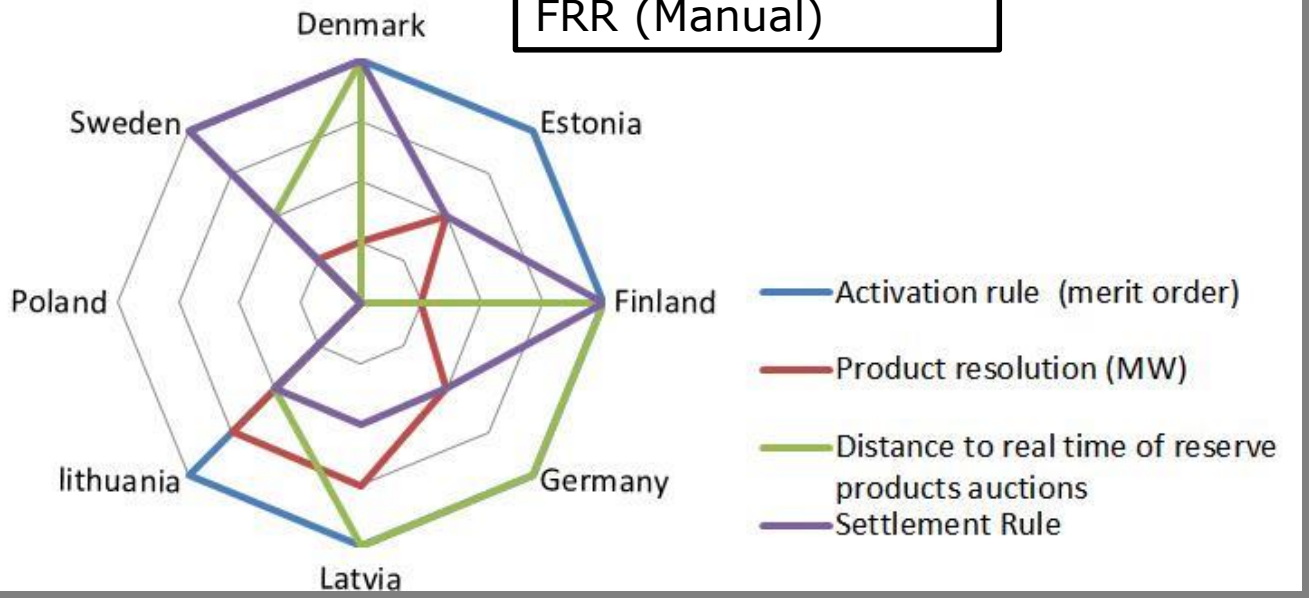
Good practices

- Initiatives to introduce minimum standards and harmonise approaches to system operation and cross border balancing through network codes and Commission Regulation
- European Network Codes for joint calculation of available cross-border capacity

FRR (automatic)



FRR (Manual)



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Key messages to take away

- **Connection cost approaches – OWD – TSO / TSO-TSO**
  - Super shallow methodology seems to be more appropriate for meshed grid
  - Need to define where the interconnection asset starts and where the OWF stops

- **Access charge – Different approaches**
  - Insufficient harmonisation in grid access charge level, structure and in locational signals creates distortions and uneven risks
  - Homogenisation in the level of the volume charge is reached at the European level by ACER but still insufficient

- **Rate making – Boom investment period highly market by innovation**
  - Dominant regulatory regimes are poorly suited to incentivise TSOs to invest in hybrid infrastructures
  - Uneven incentive framework and financial risks

- **Market-based activities - Balancing**
  - Should facilitate OW operators participation in balancing
  - Recent efforts from Entso-e and the EC give a supportive regulatory framework for more harmonisation but still some way to go

A lot of progresses made to harmonise market-based / ST coordination activities but there is still a lot of room for improvement to create a level playing field to invest and share financial risks evenly

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