

Where does the money come from? Financing challenges for a Meshed Offshore Grid

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Alexandra Armeni, Deutsche WindGuard

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1. The principle

- Today electricity is one of the most valuable commodities in the world, is a matter of life.
- For having electricity the grid is needed.
- If no new grid between 2020-2040 → + 43 bln €/year (ENTSO-E, 2018)
- Therefore, the EU and the national states need to enable investments in grid infrastructure.



Where does the money come from? Financing challenges for a Meshed Offshore Grid

2. Main barriers & concerns to investing in a MOG

- TSOs, industry and financing sector are willing to invest but
- the current legal and regulatory frameworks do not support investments in a MOG.
- Main TSOs' concerns:
 - Permitting issues
 - Public acceptance
 - Complexity due to different national regulatory frameworks
 - Timely adjusted return on equity (RoE)



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2. Main barriers & concerns to investing in a MOG

- Private investors' concerns:
 - TSO-monopoly
 - State-owned TSOs do not allow private equity injection
 - Regulatory clarity/ retroactive actions/regulatory consistency
 - Complexity due to different national regulatory frameworks
 - Lack of central EU planning and structure



3. Financial challenges

- Huge investment volume:
 - Only up to 2030 EUR 100 billion for offshore electricity grids within the North Sea Region is estimated by ENTSO-E. (ENTSO-E, 2014)
- Significant equity is needed but
- State-owned TSOs face government's budget constraints
- State-owned TSOs reluctant to dilute their ownership share
→ they do not allow private shareholders
- TSO balance sheet constraints: increasing debt financing
→ high gearing → lower credit rating
- If interest rates increase may the private investors seek for other more profitable investments in the market
→ limited financing potential for the TSOs



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4. Possible investment models

- North Sea Grid (NSG) TSO
- Possible structures for legal ownership of NSG TSO:
 - Not-for-profit
 - National TSOs
 - National TSOs & private investors
- Grid planning & co-ordination:
 - national TSOs and national authorities



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North Sea Grid (NSG) TSO

Responsibilities	1. NSG TSO
Grid planning & co-ordination	National TSOs and national authorities
Technical design	NSG TSO
Permitting	NSG TSO
Investment	NSG TSO
Construction	NSG TSO
Operation	NSG TSO
Maintenance	NSG TSO



North Sea Grid (NSG) TSO

➤ Advantages:

- One entity responsible for construction and operation of the MOG
 - less interfaces
 - achieve faster a common approach to the development of a MOG
- If NSG TSO is an enterprise with a reasonable RoE
 - private investors interested being shareholders
- If NSG TSO is a not-for-profit enterprise
 - cost for the society might be lower

➤ Disadvantages:

- If NSG TSO is an enterprise with a RoE
 - might be more costly for the society
- If NSG TSO is a not-for-profit
 - no business opportunity for private investors



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North Sea Grid (NSG) TSO

➤ Disadvantages:

- Will this model, where private investors are also shareholders in the NSG TSO, be applicable to countries where by law the sole shareholder of electricity grid (onshore and offshore) is the government?
- Great effort for the development of a uniform legal and regulatory framework and tariff structure is needed.



2. National TSOs

- Investment: Each TSO or operator (OFTO in UK) responsible for the offshore grid within their EEZ
- Grid planning & co-ordination: national TSOs and national authorities

Responsibilities	2. National TSOs
Grid planning & co-ordination	National TSOs and national authorities
Technical design	National TSOs
Permitting	National TSOs
Investment	National TSOs
Construction	National TSOs
Operation	National TSOs
Maintenance	National TSOs

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National TSOs

- Advantages:
 - Existing regulatory basis and structures already in place.
- Disadvantages:
 - Great effort for co-ordination and convergence of different regulations is needed.
 - Additional regulations for cross-border connections of OWFs
 - More time might be needed to achieve a common approach for the development of a MOG → possible financial loss for society and negative impact on the security of supply from the delay
 - Equity provision constraints



3rd party investor

- Separate operation from ownership
- Investment: tendering of transmission assets to 3rd parties who:
 - own,
 - build and
 - maintain the offshore grid assets
- Operation: NSG ISO (Independent System Operator) who:
 - operates the MOG,
 - defines the technical requirements and specifications for maintenance, repair, replacement and reconstruction.
- Grid planning & co-ordination: national TSOs or ISO and national authorities

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3rd party investor

- Possible structure for legal ownership of NSG ISO:
 - not-for-profit enterprise or
 - co-operation of national TSOs of the countries surrounding the North Sea
- 3rd party:
 - a concessionaire, SPV of private investors and/or TSOs
 - obliged to keep the technical requirements and specifications set by NSG ISO but
 - retain flexibility for technical design
 - Paid e.g. for availability of the asset



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3rd party investor

Responsibilities	3. 3rd party investor & NSG ISO
Grid planning & co-ordination	National TSOs/ NSG ISO and national authorities
Technical design	3rd party investor
Permitting	3rd party investor
Investment	3rd party investor
Construction	3rd party investor
Operation	NSG ISO
Maintenance	3rd party investor



3rd party investor

➤ Advantages:

- Equity provision is facilitated.
- Higher competition for construction and technical design of offshore assets → capital costs savings
- Create cost benchmarks → benefit for consumers
- Increase innovation → benefit for consumers
- At the same time more transmission assets can be built → faster processes to reach a common realisation of the MOG → benefit for consumers

➤ Disadvantages:

- Higher effort for communication and co-ordination with several entities might be needed.
- Not applicable to countries where by law the national TSO is appointed the owner (and operator) of the offshore grid.



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CATO (Competitively Appointed Transmission Owner)

- Investment: CATOs appointed, through tenders, by the states surrounding the North Sea to be responsible for
 - the ownership
 - construction,
 - operation of offshore grid assets
 - maintenance of offshore grid assets
- System operation: NSG ISO responsible for dispatching, etc.
- Legal ownership: CATO could be private investors also in consortia with TSOs
- Grid planning & co-ordination: national TSOs and national authorities



Where does the money come from? Financing challenges for a Meshed Offshore Grid

CATO (Competitively Appointed Transmission Owner)

Responsibilities	4. CATO & NSG ISO
Grid planning & co-ordination	National TSOs/ NSG ISO and national authorities
Technical design	CATO
Permitting	CATO
Investment	CATO
Construction	CATO
Operation	CATO/ NSG ISO
Maintenance	CATO



CATO

➤ Advantages:

- Equity provision is facilitated.
- Higher competition for construction and technical design of offshore assets → capital costs savings
- Create cost benchmarks → benefit for consumers
- Increase innovation → benefit for consumers

➤ Disadvantages:

- Greater effort to co-ordinate planning and operation among the different CATOs
- Greater effort to align incentives and goals among the different CATOs
- More time to reach a common approach for the development of a MOG → negative impact on the security of supply and financial loss for the society
- Possibly greater efforts for dispatch of the entire transmission system
- Not applicable to countries where by law the electricity grid is state-owned.



5. Summary

- Financial challenges for a MOG in the North Sea mainly due to:
 - huge investment volume
 - cannot be covered only by debt side due to TSO balance sheet constraints
 - significant equity financing is needed but equity provision is often hindered due to
 - government budget constraints
 - legal restrictions on access to private equity
 - if interest rates increase → offshore grid investments in greater competition with more favourable investments in the market
→ limited financing potential for the sector



5. Summary

- Possible investment models to facilitate a MOG in the North Sea:

Responsibilities	1. NSG TSO	2. National TSOs	3. 3rd party investor & NSG ISO	4. CATO & NSG ISO
Grid planning & co-ordination	National TSOs and national authorities	National TSOs and national authorities	National TSOs/ NSG ISO and national authorities	National TSOs/ NSG ISO and national authorities
Technical design	NSG TSO	National TSOs	3rd party investor	CATO
Permitting	NSG TSO	National TSOs	3rd party investor	CATO
Investment	NSG TSO	National TSOs	3rd party investor	CATO
Construction	NSG TSO	National TSOs	3rd party investor	CATO
Operation	NSG TSO	National TSOs	NSG ISO	CATO/ NSG ISO
Maintenance	NSG TSO	National TSOs	3rd party investor	CATO

- In all investment models:
 - a common grid planning and co-ordination is needed,
 - significant effort for development of a uniform legal and regulatory framework and tariff system is required.

5. Summary

- NSG TSO, also with private shareholders, 3rd party investor and CATO
 - facilitate private equity provision but
 - under the existing legal frameworks might not be applicable
- 3rd party investor and CATO:
 - capital cost savings by increasing competition but
 - more co-ordination is needed among the different entities

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5. Summary

- Studies have shown positive CBA for co-ordinated offshore grid in the North Sea*
- CBCA defines level of compensation payments but
- lack of sufficient compensation mechanisms for the countries with no direct benefits
 - hinder MOG development in the North Sea
 - improvement of compensation mechanisms is needed
- Regional co-operation supported by strong political will is needed.

* PWC, Ecofys, Tractebel, “Benefits on a meshed offshore grid in the Northern Seas region”, 2014:
http://ec.europa.eu/energy/infrastructure/studies/doc/2014_nsog_report.pdf

3E; Deutsche WindGuard; CEPS; DNV GL; ECN; Imperial College Consultants, Final Report of the NorthSeaGrid project, 2015,

Pöyry, WindConnector study, 2017, <https://www.tennet.eu/news/detail/study-suggests-a-windconnector-linking-dutch-and-gb-electricity-markets-and-offshore-wind-farms-coul/>



APPENDIX

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PROMOTioN – Progress on Meshed HVDC Offshore Transmission Networks

MAIL info@promotion-offshore.net WEB www.promotion-offshore.net

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PROJECT COORDINATOR

DNV GL, Kema Nederland BV
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
Fon +31 26 3 56 9111
Web www.dnvgl.com/energy

CONTACT

Alexandra Armeni
a.armeni@windguard.de

PARTNERS

Kema Nederland BV, ABB AB, KU Leuven, KTH Royal Institute of Technology, EirGrid plc, SuperGrid Institute, Deutsche WindGuard GmbH, Mitsubishi Electric Europe B.V., Affärsverket Svenska kraftnät, Alstom Grid UK Ltd (Trading as GE Grid Solutions), University of Aberdeen, Réseau de Transport d'Électricité, Technische Universiteit Delft, Statoil ASA, TenneT TSO B.V., German OFFSHORE WIND ENERGY Foundation, Siemens AG, Danmarks Tekniske Universitet, Rheinisch-Westfälische Technische Hochschule Aachen, Universitat Politècnica de València, Forschungsgemeinschaft für Elektrische Anlagen und Stromwirtschaft e.V., Dong Energy Wind Power A/S, The Carbon Trust, Tractebel Engineering S.A., European University Institute, Iberdrola Renovables Energía, S.A., European Association of the Electricity Transmission & Distribution Equipment and Services Industry, University of Strathclyde, ADWEN Offshore, S.L., Prysmian, Rijksuniversiteit Groningen, MHI Vestas Offshore Wind AS, Energinet.dk, Scottish Hydro Electric Transmission plc

