

Final Stakeholder Report – Deliverable D7.10

PROMOTioN – Progress on Meshed HVDC Offshore Transmission Networks

Mail info@promotion-offshore.net

Web www.promotion-offshore.net

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CONTACT

Sebastian Menze

Stiftung OFFSHORE-WINDENERGIE

Phone: + 49 4451 95 15 205

s.menze@offshore-stiftung.de

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APPROVALS

	Name	Company
Validated by:	Henrik Köhler	RWTH Aachen
Task leader:	Nicolaos Antonio Cutululis	DTU
WP Leader:	Sebastian Menze	SOW
	Marc Schmidt	TenneT

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LIST OF CONTRIBUTORS

Work Package and deliverable involve a large number of partners and contributors. The names of the partners, who contributed to the present deliverable, are presented in the following table.

PARTNER	NAME
SOW	Sebastian Menze, Jochen Körner

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1 SCOPE OF STAKEHOLDER INTERACTION AND OBJECTIVE

The scope of this report is limited to the means of stakeholder interaction in work package 7 – Regulation & Financing (in the following: WP7), while the dedicated work package 13 – Dissemination (in the following: WP13), led by the German Offshore Windenergy Foundation (in the following: SOW), is organising the stakeholder management and dialogue for the overall project. Since both, task 7.4 (stakeholder consultation in the scope of WP7) and WP13 are led by SOW, synergies are created and are used to benefit both the overall project dissemination activities as well as the visibility of WP7 within PROMOTiON.

The objective of stakeholder interaction, as already outlined in detail in the previous intermediate stakeholder report “D7.7”, is to receive feedback on the intermediate and final results of PROMOTiON’s WP7. Close contact with the stakeholders ensures a constant flow of information from the project towards these groups and back to the project, in order to refine the intermediate results and fulfil the overarching objective stated in the grant agreement, which is “to reach a common understanding of the investment barriers and to identify and discuss potential (acceptable) solutions”. WP7 did produce a variety of reports in the past, which not only covered the investigation of legal, economic and financial barriers (see deliverables **D7.1**, **D7.3** & **D7.5**) but also, more recently (April 2019), the reports on designing the target legal, economic and financial frameworks for meshed offshore HVDC grids. Following stakeholder consultations and delivery recommendations, these reports compile details on how to overcome barriers to hybrid and joint offshore grid infrastructure. Hybrid assets (i.e. infrastructure) are commonly understood as the linking of functions of interconnection as well as offshore wind evacuation and thus combining the function of generation and transmission.

The following figure defines the scope of this report:

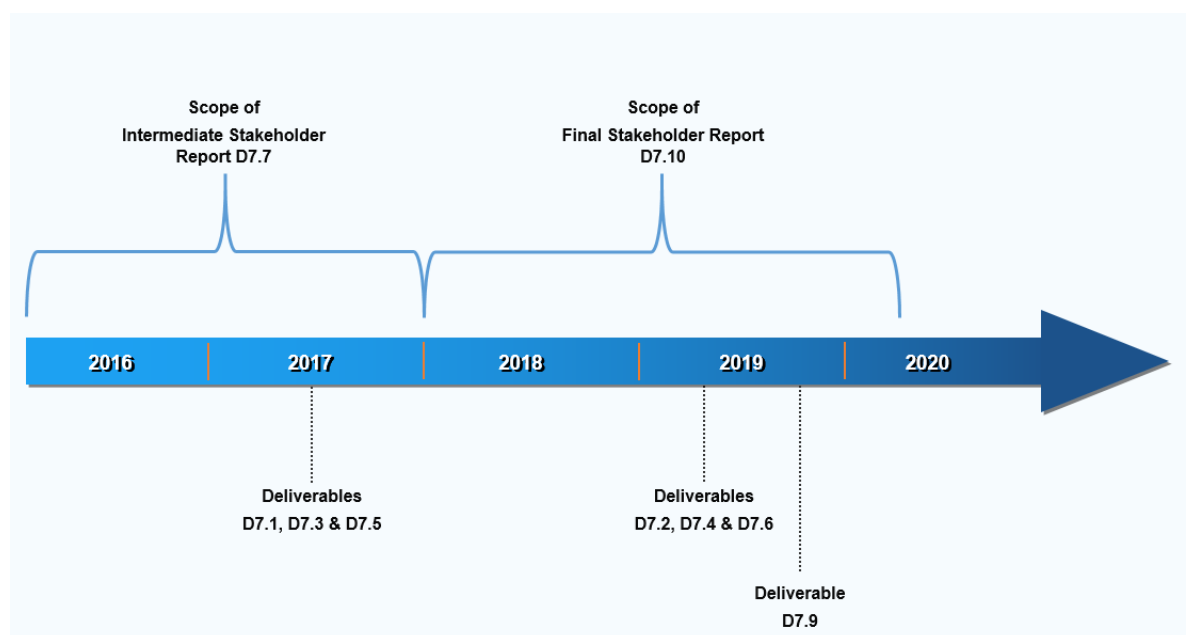


Figure 1: Scope of Final Stakeholder Report

The stakeholder interaction covered in this report therefore includes the period from January 2018 until March 2020. It must be noted that even though the stakeholder consultation process is formally concluded, project partners are still actively reaching out to the main target groups for implementing the recommendations of a regulatory framework for meshed offshore grids, namely the European Commission, TSO's, National Regulatory Authorities and member state ministries. It is expected that this will lead to not only further discussion on the subjects, but a better understanding of the research results, and subsequently to an agreement among stakeholders on the next steps to take towards implementation of the recommendations.



2 STAKEHOLDERS OF WP7 OF THE PROMOTION PROJECT

This report revisits the number of stakeholders mainly targeted by WP7 of PROMOTioN, as originally presented in report D7.7.

- European Bodies (e.g. European Commission (EC), European Parliament, ENTSO-E, ACER, etc.),
- Policy Institutions (e.g. national ministries, national regulatory agencies etc.),
- Industry Stakeholders (e.g. national transmission system operators (TSO's), offshore wind project developers, etc.),
- Financing Bodies (investment banks, insurances, commercial banks, etc.),
- Academia & Consulting (universities, consulting agencies, etc.),
- Others (NGO's, industry associations, energy agencies, etc.).

The mailing list is a living document and consists of 917 contacts at the time writing this report. The contacts are regularly updated, at least 4 times per year, while new contacts are commonly added upon request by any project partner. Due to privacy and data protection requirements, PROMOTioN cannot disclose concrete contact details within this report.

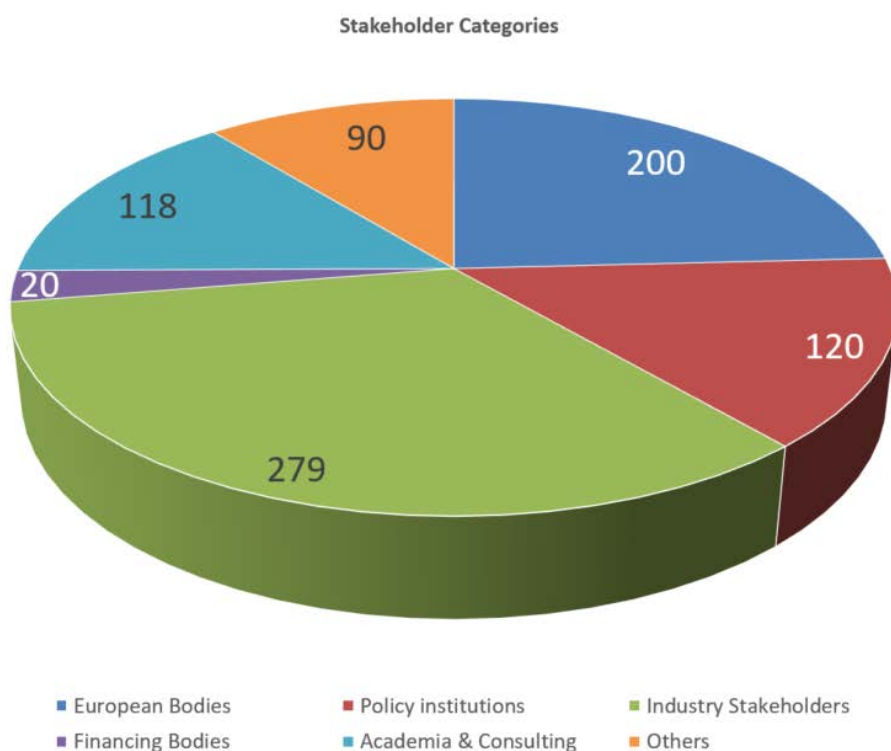


Figure 2: Breakdown of the total number of stakeholder contacts (917) into the corresponding categories

COOPERATION WITH INITIATIVES AND WORKING GROUPS

In addition to the already shown categorization of stakeholders, the “Northern Seas Energy Cooperation” as well as the “WindEurope Working Group Offshore” were identified as important stakeholder groups to PROMOTioN.

WindEurope Working Group Offshore Wind

WindEurope is hosting several working groups in order to draft policy recommendations based on the input of their members. As member of both PROMOTioN and of WindEurope, SOW is especially active in the WG Offshore Wind. The working group “promotes European offshore wind energy as a vital and strategic energy resource by, among other priorities, investigating barriers to drive down costs and advocating for investments in offshore electricity networks.”¹

Northern Seas Energy Cooperation, Support Group 2²

All of the Support Groups within the Northern Seas Energy Cooperation (NSEC) and their objectives are, at least to some extent, in accordance with PROMOTioN objectives. Nevertheless, specifically WP7 project partners identified Support Group 2 (SG 2) as the group with the biggest overlap in joint objectives, where entities can mutually benefit to the largest extent. PROMOTioN is specifically mentioned in the overview of relevant studies and projects in the description of the SG 2 work plan, which also defines the specific objectives of SG 2, which are:

- To remove regulatory barriers to the development of interconnectors and hybrid assets
- Development of project plans for concrete hybrid projects
- To enable a regionally optimised North Sea offshore grid and to reduce the risk of stranded or redundant grid assets
- To optimise useful linkages with the oil/gas industry³

In January 2020, the NSEC Support Groups have been restructured and a new work programme has been established⁴. SG 1 now deals with hybrid projects and joint infrastructure, similar to the previous SG 2. Germany is chairing the NSEC for 2020. The SG 1 (Hybrid and joint projects) has quite some overlap with PROMOTioN objectives of WP7. Its **work programme** states that “the Support Group will discuss elements of an EU regulatory framework for hybrid and joint projects that facilitates the implementation of such projects” and “work on general questions, such as options for potential offshore bidding zone configurations and other regulatory aspects and ways to overcome barriers to hybrid projects”.

¹ <https://windeurope.org/membership/benefits/>

² <https://ec.europa.eu/energy/en/topics/infrastructure/north-seas-energy-cooperation>

³ https://ec.europa.eu/energy/sites/ener/files/documents/20161219_support_group_2_drog_web_version_final.pdf

⁴ https://www.bmwi.de/Redaktion/DE/Downloads/M-O/north-seas-energy-cooperation-work-programme.pdf?__blob=publicationFile&v=4



3 MEANS OF STAKEHOLDER INTERACTION

WP7 partners engaged with stakeholders during several events and meetings. Amongst those meetings, a priority was the cooperation with the NSEC, SG 2, as well as the WindEurope Working Group Offshore Wind. Meetings have been attended for the purpose of close collaboration and visibility of PROMOTioN and WP7 among these groups.

The occasions on which WP7 partners have requested stakeholder comments on their interim and final papers are listed in chronological order.

26TH JANUARY 2018, SUPPORT GROUP 2 MEETING

On 26th January 2018, Ceciel Nieuwenhout (Groningen Center for Energy Law) presented her findings on “Legal framework and legal barriers to an offshore HVDC electricity grid in the North Sea” to the SG 2 of the NSEC in Brussels. Amongst the participants of the meeting were European TSOs, offshore wind project developers, member state ministry representatives, national regulatory authorities and representatives of the European Commission.

20TH FEBRUARY 2018, GRIDS MEET RENEWABLES CONFERENCE, BRUSSELS



Figure 3: (From right to left) Ceciel Nieuwenhout (Groningen Center for Energy Law), Carmen Wouters (formerly DNV GL) and Cornelis Plet (Project Coordinator PROMOTioN, DNV GL) at the PROMOTioN booth

The “Renewables Grid Initiative” and WindEurope jointly organised the event “**Grids meet Renewables**”, which took place on 20th February 2018 in Brussels. PROMOTioN contributed to the event with a booth at the “Best Practice Fair” and a **pitch presentation** on PROMOTioN itself by Cornelis Plet. Project partners from DNV GL, the Groningen Center for Energy Law and SOW attended

the conference. The objective here was not only to raise awareness for the project, but also to distribute the intermediate reports of WP7, namely **D7.1**, **D7.3** & **D7.5**. As stated in the introduction, these deliverables contain the findings on barriers towards a regulatory legal, economic and financing framework, which already underwent stakeholder consultation as compiled in the previous **stakeholder report D7.7**.

21ST MARCH 2018, SUPPORT GROUP 2 MEETING

On 21st March, Dr. Pradyumna Bhagwat (Florence School of Regulation) was invited to present intermediate findings on the “Economic framework for offshore grid planning” (**D7.3**) to the stakeholders of SG 2 of the Northern Seas Energy Cooperation. Amongst the participants of the meeting were European TSOs, offshore wind project developers, member state ministry representatives, national regulatory authorities and representatives of the European Commission.

15TH & 16TH MAY 2018, INNOGRID2020+ CONFERENCE, BRUSSELS

During the InnoGrid2020+ conference in Brussels, WP7 reports (**D7.1**, **D7.3** & **D7.5**) have been shared with the wider stakeholder community. PROMOTioN presented project insights at a booth while project partners from KTH & SOW engaged with stakeholders on different topics along the principles and findings of the reports.

6TH JUNE 2018, PROMOTION INTERMEDIATE CONFERENCE, AMSTERDAM, WP7 BREAK-OUT SESSION

On June 6, 2018, the midterm conference of PROMOTioN took place in Amsterdam. With over 150 participants the conference was very well attended, not only by the project partners but also by numerous representatives of TSOs, offshore wind turbine manufacturers, politicians and state agencies, operators and developers of offshore wind farms, associations, academia, as well as (technical) service providers and consultancies.



Figure 4: (Right to left) Giles Dickson, CEO WindEurope, Jan Hensmans, Belgian Economic Ministry and Christopher Jones, Hors Classe Adviser DG Energy, discuss the hurdles and opportunities for meshed offshore grid development.

Following an opening panel discussion, the conference proceedings were divided into two parallel workshops. Here, the project partners presented the interim results of the project regarding technical and regulatory issues.



Figure 5: Alexandra Armeni, Deutsche WindGuard, presents her findings on financing barriers to meshed offshore grids to the audience during a break-out session at the PROMOTioN intermediate conference.

The project partners responsible for "Regulation and Financing", from the University of Groningen, DNV GL, Florence School of Regulation and Deutsche WindGuard, described their preliminary findings on the legal, economic and financial challenges relating to a meshed HVDC offshore grid. First, proposals for the legal classification and general regulation of meshed offshore grids were discussed. Furthermore, a cost-benefit analysis (CBA) methodology which enables the comparison of different offshore grid topologies was presented. In addition, project results addressing the economic framework were reported, i.e. questions concerning the division of costs in multilateral, cross-border projects and the financing of offshore grids.

The perspective of the European Commission and the SG 2, which deals with the issue of offshore grids as part of the Northern Seas Energy Cooperation, was of prime importance in this context. The chairwoman of SG 2, Sue Harrisson from the British Department for Business, Energy & Industrial Strategy, and Nicole Versijp and Henriette Niesheim from the European Commission, explained the synergies between PROMOTioN and the activities of SG 2.

27TH SEPTEMBER 2018, WP7 WORKSHOP DURING WINDENERGY 2018 IN HAMBURG

Every two years, the WindEnergy conference organised by WindEurope and Hamburg Messe, marks a global rendezvous for the whole wind energy industry. On 27th September, WP7 partners invited stakeholders to take part in a workshop on the findings regarding legal & financing barriers as well as a socio-economic cost-benefit analysis (CBA) methodology. Alexandra Armeni (Deutsche WindGuard), Ceciel Nieuwenhout (Groningen Center for Energy Law) and Carmen Wouters (DNV GL)

presented their findings to a large stakeholder audience. Kicking off the event, the legal challenges to meshed offshore grids and potential solutions, such as a new legal definition for “hybrid assets”, were presented by Ceciël Nieuwenhout. Alexandra Armeni followed up by explaining different options for ownership and operation of a meshed offshore grid from a financing perspective. In the following, Carmen Wouters explained the challenges for comparing and evaluating project alternatives and the socio-economic CBA for offshore grids.



Figure 6: Carmen Wouters, DNV GL, presents the findings on a CBA methodology for meshed offshore grids to stakeholders.

15TH OCTOBER 2018, SUPPORT GROUP 2 MEETING

On 15th October, Alexandra Armeni (Deutsche WindGuard) was invited to present her most recent research findings on “Governance Models” for meshed offshore grids. Amongst the participants of the meeting were European TSOs, offshore wind project developers, member state ministry representatives, national regulatory authorities and representatives of the European Commission.

6TH NOVEMBER 2018, WINDEUROPE WORKING GROUP OFFSHORE WIND MEETING

On 6th November, Sebastian Menze (SOW) updated the WindEurope WG Offshore Wind on current project findings, specifically of WP7 of PROMOTioN. The present industry stakeholders were invited to engage in follow up discussions on the different subjects with the responsible project partners to allow for a more thorough assessment of the respective project findings.

26TH NOVEMBER 2018, SUPPORT GROUP 2 MEETING

During the SG 2 meeting on 26th November 2018, PROMOTioN contributed presentations on general regulatory issues regarding meshed offshore grids, balancing mechanisms, as well as a continuation of the discussion regarding possible ownership and system operation governance models, as

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introduced to the SG 2 on 15th October by Alexandra Armeni. Amongst the participants of the meeting were European TSOs, offshore wind project developers, member state ministry representatives, national regulatory authorities and representatives of the European Commission.

27TH NOVEMBER 2018, WORKING SESSION ON PROMOTION WITH SUPPORT GROUP 2

The day after the Support Group 2 meeting, PROMOTioN partners invited interested members of SG 2 to dive deeper into the discussions with experts from the project. The main objective of this workshop was to consider stakeholder feedback towards the development of the “Policy Recommendations” in deliverable D7.9, which marked the final output of WP7. During the meeting, questions regarding regulation, governance and support schemes for a meshed offshore grid were discussed. The feedback is directly reflected in the recommendations mentioned above. Aside from PROMOTioN partners, national TSO’s (Energinet.dk, TenneT TSO, National Grid), national regulators (Ofgem, CREG), member state ministry representatives (Danish Ministry of Energy, Utilities and Climate; Department for Business, Energy & Industrial Strategy UK, Belgian Economic Ministry) as well as WindEurope and Roland Berger took part in the meeting.

13TH FEBRUARY 2019, CONNECTING SEAS CONFERENCE, HAMBURG

The joint Interreg sister project “NorthSEE” and “Baltic LINes” conference focused on Maritime Spatial Planning (MSP) in the North Sea and Baltic Sea regions and presented the findings and results elaborated in the projects. Ceciel Nieuwenhout, Groningen Center for Energy Law, presented PROMOTioN and her views on the legal barriers towards meshed offshore grids in a session on “Future Scenarios”.



Figure 7: Ceciel Nieuwenhout during the “Connecting Seas” conference in Hamburg

14TH MAY 2019 – PROMOTION REFERENCE GROUP MEETING

On a regular basis, PROMOTioN partners invited a closed assembly of stakeholders to “Reference Group meetings”. These stakeholders are a selected group of external experts with the idea to mirror



project findings against external opinions. Amongst the participants were representatives of the European Commission, national regulators and TSOs as well as consultancy companies. PROMOTioN hosted the Reference Group meeting on 14th May 2019 alongside the “InnoGrid2020+” conference in Brussels. The feedback received is compiled in chapter 4.



Figure 8: Alexandra Armeni, Deutsche WindGuard, presents the policy recommendations for overcoming financing barriers to meshed offshore grids to stakeholders of the Reference Group.

16TH MAY 2019 – WINDEUROPE WORKING GROUP OFFSHORE WIND

On 16th May, Andreas Wagner (SOW) joined the WG Offshore Wind meeting at WindEurope. The presentation embraced a broad overview on current findings in WP7 to stakeholders. An invitation was extended to join a web-cast conference with PROMOTioN WP7 partners, who further elaborated and expanded on the content.

26TH MAY – WP7 WEBINAR

After finalisation of the reports on the legal (D7.2), economic (D7.4) and financing frameworks (D7.6) for meshed offshore grids, the findings were presented to stakeholders during a webinar. Around 40 stakeholders joined the presentation by project partners.

WP7 WEBINAR – QUESTIONNAIRE TO NATIONAL REGULATORY AUTHORITIES ON CBA METHODOLOGY

The project partner DNV GL presented findings on the CBA methodology (D7.11) to representatives of national regulatory authorities during a webinar held in June 2019. A questionnaire with 14 questions was handed out, the feedback to these questions is presented in the Annex of this report.

26TH NOVEMBER 2019 – WP7 WORKSHOP DURING OFFSHORE WIND ENERGY 2019, COPENHAGEN

During the Offshore Wind Energy 2019 in Copenhagen, PROMOTioN hosted a workshop on “Regulation and financing of a meshed offshore grid”. After a general introduction by Cornelis Plet (DNV GL), Ceciel Nieuwenhout (Groningen Center for Energy Law), Pradyumna Bhagwat (Florence school of Regulation) and Alexandra Armeni (Deutsche WindGuard) presented the recommendations on the legal, economic and financing framework for meshed offshore grids. John Moore (TenneT TSO B.V.) followed up with a presentation of how the recommendations can be tied together in the “Deployment Plan for future European Offshore Grid” and gave an outlook on the next steps. Around 30 stakeholders attended this meeting, which was accompanied by a PROMOTioN booth at the “Innovation Park” in the exhibition area of the Offshore WindEnergy conference and exhibition 2019.



Figure 9: Ceciel Nieuwenhout (Groningen Center for Energy Law) presents the recommendations for the legal framework for meshed offshore grids.

MEETINGS WITH MEMBER STATE MINISTRIES

The policy recommendations as part of the report **D7.9 “Regulatory and Financing principles for a Meshed HVDC Offshore Grid”** were subject to visits to member state ministries on 16th December 2019 (meeting with Dutch Ministry for Economy and Climate), 21st January 2020 (meeting with German Ministry of Economic Affairs and Energy) and 27th January 2020 (meeting with Danish Ministry of Climate, Energy and Utilities). During these physical meetings, PROMOTioN partners from DNV GL, TenneT, Groningen Center for Energy Law, Deutsche WindGuard, TU Delft and SOW discussed questions around the subject of bidding zone configuration, hybrid asset regulation as well as considerations regarding the financial framework for meshed offshore grids.

13TH MARCH 2020, MEETING WITH EUROPEAN COMMISSION, DG ENERGY, B1&B2

Planned as a physical meeting, project partners from DNV GL, TenneT, Groningen Center for Energy Law, Deutsche WindGuard, TU Delft and SOW introduced the WP7 findings to representatives of units B1 (Networks & Regional Initiatives) and B2 (Wholesale markets; electricity & gas) of DG Energy. Due to the implications regarding the Coronavirus, the meeting took place as a web-conference. Topics that were discussed embraced hybrid asset regulation and bidding zone configuration, as well as a variety of technical subjects related to other work packages of PROMOTioN.



4 STAKEHOLDER FEEDBACK

This chapter summarises the feedback on the interim and final reports of WP7. Even though the external feedback on the interim and concluding reports regarding the legal, economic and financing framework (D7.2, D7.4 and D7.6) has been limited, the views of stakeholders during meetings and bilateral discussions with partners from Groningen Center for Energy Law, Florence School of Regulation and Deutsche WindGuard were taken into consideration when drafting the final deliverable D7.9 “Regulatory and Financing principles for a Meshed HVDC Offshore Grid”. This report marks the end of three years of research into the requirements of the legal, economic and financial frameworks that could facilitate the cost-effective construction and governance of a meshed offshore grid. As an outcome, 32 policy recommendations have been noted as cornerstones for future discussions on the subject of overcoming regulatory barriers towards meshed offshore grid development.

The following feedback has been received during the meetings held in the scope of stakeholder consultation presented in Chapter 3. Feedback is grouped by stakeholder category.

OFFSHORE WIND PROJECT DEVELOPERS

The Offshore Wind Project Developers are concerned about the implications of a central planning approach towards the European power consumer. From their perspective, the meshed offshore grid solution would be a means on the way to joint European grid infrastructure, but not the final solution. The focus should be on consumer benefits. The interfaces between TSOs and the developers are perceived to cause delays and inefficiencies. Regarding the issue of priority dispatch, it was noted that the focus should be on the market first. Renewable energies would succeed in any market-based scenario because of the zero-cost margin. Therefore, the discussion should be evolved around the market and not central planning. When it comes to grid connection cost, the developers advocated for treating new and existing generation equally and take into account a tender for infrastructure (e.g. open door procedure). Grid cost could be shared between the involved parties. The developers stated, that they cannot be active in the re-dispatch market because they would need to get paid for re-dispatch. The developers clearly support a market approach to re-dispatch for competitive reasons. The lowest levelized cost of energy (LCOE) for offshore wind could be achieved if the developers were allowed some flexibility in sizing, i.e. number of turbines, of wind parks. It is their opinion, that developers could construct more turbines in a planned wind park than under the terms of a central planning approach. An example was given that in case of a 1-1.5 GW project, optimization would lead to an overall decrease of cost for the overall project and bringing in up to 10 more turbines would reduce the LCOE.

MEMBER STATE MINISTRY

During several meetings with the Dutch Economic Ministry (Ministerie van Economische Zaken en Klimaat), German Federal Ministry of Economics and Energy (BMWi) and the Danish Ministry of Climate, Energy and Utilities (cf. Chapter 3), the discussion was focused on the legal and financial barriers towards meshed offshore grids and how to overcome them. The recommendations provided by WP7 partners have been discussed, specifically around the subject of hybrid assets. There has been a lot of appreciation voiced regarding the policy recommendations of WP7, specifically the hybrid



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assets regulation. It is seen as very helpful to have a variety of instruments at hand and point out the specific problems that exist for each individual one.

TSO

According to a TSO feedback, there is a clear need to link the functions of interconnection and offshore wind evacuation. That is why the TSOs did not consider tenders for fit-for-purpose infrastructure. During a Reference Group meeting in May 2019 (cf. Chapter 3), a TSO formulated the wish to clarify the role of hybrid assets in an amendment to the respective directive. At the same time, it was well acknowledged that there is a need for a new legal framework, while concurrently implementing new projects on existing ones. The essential point was made that frameworks need to allow for an organic growth of the grid.

ENTSO-E

ENTSO-E gave their formal feedback on the CBA methodology developed by DNV GL and presented in **D7.11**. This is summarised in the Annex of this report.

EUROPEAN COMMISSION

Representatives of the European Commission (EC) stated that there will be a compensation in case of the curtailment of renewable energies. At the time of the meeting (early 2018), there was no mature basis seen for including this compensation concept in EU law. Priority dispatch is not seen as an issue, but rather the payment in case of re-dispatch. The discussion on who would own or operate a grid is not yet mature enough to amend any existing directives, but may be implemented in a new directive to come.

During an online meeting in March 2020, the representatives of the EC voiced a high appreciation of the research results of WP7. From their perspective, the bigger picture needs to be kept in view. There will be more and more electrification and more demand, however, most of the consumers do not like to see powerplants close to residential areas. Therefore, offshore wind energy could provide a great solution. Hybrid assets are considered as a potential solution and would provide a certain value by using the double function of trade and offshore wind evacuation at the same time and are therefore deemed necessary. Nevertheless, interconnectors will also continue to play an important role and add flexibility to the market. It will all depend on the degree of future grid expansion as well as the type of grid expansion. It is acknowledged, that the main push towards hybrid assets would be to include them in the ten-year-network-development-plan (TYNDP), in order to have an incentive for TSOs for their development. Small bidding zone configurations are seen as the optimal way; however, they pose some risk for developers regarding price volatility.

INDUSTRY ASSOCIATIONS & CONSULTANTS

During a presentation at the workshop at the Offshore Wind Energy 2019 in Copenhagen (cf. chapter 3), concerns were voiced regarding the balancing market analysis as part of the economic regulatory framework. The analysis was perceived as rather outdated and the delivered recommendations were coming at a stage where discussions were already two years behind considering the preparation of balancing guidelines in 2015 and 2016. The criticism was taken into account by the responsible project partner.

A very important element was pointed out to be missing, namely the procurement rules of balancing products as well as the need to separate capacity procurement from energy bids activation, allowing variable renewable energies to also participate and provide balancing energy products.



During a Reference Group meeting in May 2019 (cf. chapter 3), a consultancy company representative pointed to the fact that TSOs might insist on operating large wind power hubs and called for a potential collaboration between TSOs in this matter. Changes in law would occur naturally, once the “low hanging fruits”, i.e. offshore wind farms close to shore, are covered and the need arises to go further offshore.

NATIONAL REGULATORY AUTHORITY

Representatives of a national regulatory authority (NRA) commented on the discussion of congestion revenues: the European market will experience more and more renewable energy capacities, which are variable, depending on weather conditions. That means there will be cases of different electricity prices, which means there will be congestion revenues. Decommissioning was seen to be something to be implemented in international as well as European law, using the experiences from the oil and gas sector and adopting a strategy, which relies on subsidiary principles. This way, a fast implementation could be achieved.

NRAs gave their formal feedback on the CBA methodology developed by DNV GL and presented in **D7.11**. This is summarised in the Annex of this report.

FUTHER FEEDBACK

Within the proceedings of a SG 2 meeting on 26 January 2018, it was stated that “there is a clear scope for cooperation with this project’s work stream on legal and regulatory matters. PROMOTioN presented its preliminary findings on a regulatory framework for a cross border offshore electricity grid. Key barriers were discussed: legal classification of hybrid projects, cross border grid responsibility, remuneration, grid connection cost, priority dispatch and -access, cost allocation, locational planning and RES support schemes.”

During a panel discussion at the PROMOTioN intermediate conference in Amsterdam in summer 2018 (cf. chapter 3) the following statements were made with regards to the research field of WP7:

- **Giles Dickson**, CEO of the European wind energy association **WindEurope**, highlighted the considerable regulatory hurdles still impeding the development of meshed offshore grids today. Above all, investors would need incentives to prepare future wind farms and the associated infrastructure for meshed offshore grids.
- **Christopher Jones**, Advisor to the European Commission's **Directorate-General for Energy**, underlined the importance of PROMOTioN as the largest non-nuclear EU research project. He regarded the establishment of a cross-border offshore grid as a “hundred-billion-euro opportunity through 2050” – provided the currently existing technological and regulatory risks are overcome.
- **Ben Voorhorst**, President of the European Network of Transmission System Operators **ENTSO-E**, illustrated the advantages of a meshed offshore grid by comparing it to the existing onshore grid. New legal provisions and security mechanisms were required in order to, systematically, create a highly interconnected cross-border HVDC grid.



5 CONCLUSION

The feedback presented in Chapter 4 shows a high appreciation towards the research objectives and results of PROMOTioN's WP7 and its value for guiding the future discussions on regulatory frameworks for meshed offshore grid infrastructure. This becomes especially evident in the following direct quotes of high-ranking industry representatives regarding the final deliverable D7.9:

Tim Meyerjürgens, COO at TenneT, stresses:

“The development of a cross-border HVDC grid is one of the most promising opportunities for a sustainable energy future in Europe. TenneT is cooperating closely with other TSOs to develop the idea of a meshed and efficient offshore grid in the North Sea, which requires the creation of a common regulatory framework. PROMOTioN's research shows the way to make this happen.”

Similarly, **Ditlev Engel, CEO of DNV GL Energy**, states:

“The development of a reliable transnational European offshore transmission grid is a key enabler for a successful, cost effective and timely energy transition. This project delivered a great framework with regulatory and financial guidelines for national governments to speed up collaboration on the joint development of energy infrastructure such as offshore transmission grids. And that is really needed to accommodate the rise of renewables and meet our goals in the Paris Agreement.”

At the same time, the feedback that has already been received and the feedback yet to come are essential to advancing the discussion on a joint EU regulatory framework, which is acceptable to all member states. During the meetings described in Chapter 3 of this report, there was much recognition from stakeholders for the work done, which was evident both in bilateral discussions between the partners as well as during workshop format discussions.

The process of stakeholder consultation and engagement in PROMOTioN now formally lasted over a period of roughly four years, while the main outputs of WP7 still need to be further presented and discussed with national ministries, European TSOs and Offshore Wind Project Developers, National Regulatory Authorities and the European Commission. Although WP7 was officially concluded by the end of 2019, the project partners are still **highly motivated** to discuss the results of their work and research with the above-mentioned stakeholders beyond the duration of the WP.

Further planned stakeholder consultation and meetings are planned throughout the month of May 2020 and have already been scheduled to take place e.g. in London with the British BEIS (Department for Business, Energy & Industrial Strategy) as well as the Scottish Ministry for Energy, Connectivity and the Islands.

It needs to be noted that stakeholder engagement has been an integral part of the overall process of WP7. Aside from the fantastic research done in this WP, the WP benefited from both feedback and research being interlocked in a continuous flow of information throughout the course of this project.



6 ANNEX

ENTSO-E ANSWERS TO QUESTIONNAIRE:

Q1: What is, from your perspective, the purpose of a European CBA methodology?

A European CBA methodology should define a robust and consistent methodology to assess the contribution of projects across Europe on a consistent basis. It should thus deliver a guideline to achieve a uniform assessment process for transmission projects across Europe, i.e. a uniform application of the guideline ensures that all projects (including storage and transmission projects) and promoters (either TSO or third party) are treated and assessed in the same way.

Besides consistency, a European CBA methodology shall deliver an exhaustive list of benefit indicators – monetised and, if not possible or reasonable, non-monetised. In such a way, the full range of costs and benefits can be represented, highlighting the characteristics of a project and providing sufficient information to decision makers.

Q2: What is, from your perspective, the need for a meshed offshore grid? Why?

We refer to the TYNDP14, where the 2012 NSCOGI Grid study, TYNDP14 results and the EC's study have been compared, concluding that:

- The Northern Seas Offshore Grid Infrastructure (not “meshed offshore grid”) will be composed of
 - o Various technologies (AC and DC)
 - o Various designs:
 - Point-to-point interconnections (ICs)
 - Radial offshore wind connections (single or via hubs)
 - Hybrid projects (combination of offshore wind connection and IC)
 - Multiterminal offshore platforms combining interconnections.
- Modular and stepwise offshore grid development with choices based on case-by-case decisions, evaluating technical and economic parameters.
- Compact hybrid offshore design could be envisaged in cases where scheduling and technology required for ICs & wind connections match (DC/AC/voltage level, ...)

The “why” is answered by reference to the studies mentioned above.

Q3: Having in mind the variety of users and usage of the CBA, would you choose a multi-criteria or one figure (full monetisation) approach?

The assessment of costs and benefits should be undertaken using a combined cost-benefit and multi-criteria approach within which both qualitative assessments and quantified, monetised assessments are included. In this way, the full range of costs and benefits can be represented, highlighting the characteristics of a project and providing sufficient information to decision makers.

Such an approach recognises that a fully monetized approach is not practically feasible in this context, as many benefits cannot be economically quantified in an objective manner. Examples of such benefits



include system security and environmental impacts. Multicriteria analysis however can account for each of these including the compilation of a costbenefit analysis of those elements that can be monetized, while recognising that other elements also exist that cannot be quantified.

Q4: Is the CBA methodology for meshed offshore grids as proposed in this document (D7.11) easy to understand and apply? If not, how can we improve?

In general, the methodology is well understandable. However, the document would benefit from being shortened to the core elements leaving out the repetitions of several abstracts.

Q5: Is the method of calculating the indicators easy to understand? If not, how can we improve?

In general, it is well understandable.

Q6: Do you think the set of proposed indicators gives sufficient information about the project costs and benefits? Please justify your answer.

It is well acknowledged that the PROMOTioN assessment is based on the 2nd ENTSO-E guideline for CBA for grid development projects from which the most important indicators can be extracted. The inclusion of additional SoS indicators is also well acknowledged, as also ENTSO-E is continuously improving the CBA guideline. With regard to these improvements, we would suggest to also consider the not-yet-approved 3rd ENTSO-E CBA guideline that is under consultation from 28.10.2019 to 09.12.2019.

Q7: What is, from your perspective, an appropriate geographical scope of a meshed offshore grid project? To what extent should the onshore grid be taken into account in the evaluation process and why?

The geographical scope of potential offshore grid infrastructure, including above mentioned (iii.) hybrid projects or (iv.) multi-terminal offshore platforms combining interconnections (thereby forming “meshes”) depends on the location of offshore wind power plants. Identification of generation locations is subject to maritime spatial planning, which is done by governmental institutions and evolves over time.

Potential needs for new interconnections depend on the development of the countries’ generation portfolios including all fuel types. The development of the countries’ generation portfolios is subject to political decisions / market development and related generation companies’ decisions.

Both statements were pointed out in the 2012 NSCOGI Grid study and are still valid. This means that offshore grid infrastructure looks different in different studies, as generation portfolios and thus study assumptions continuously evolve.

In general, the geographical scope of the analysis should include the ENTSO-E Region at minimum, including its closest neighbours. It has been shown that the impact of the perimeter on both the market simulations and the loadflow simulations should not be underestimated. Therefore, each reduction of the perimeter must be seen as a simplification to the study and should if possible be reduced to a minimum.

Q8: What is, from your perspective, an appropriate scope of technologies and sectors to be considered in alternative offshore grid projects? (eg storage, Power-to-gas)



What is meant by “alternative offshore grid projects”? Assuming this refers to the idea of energy islands, then P2X, (gas, hydrogen) are good options.

Which offshore grid technology is preferable (DC vs AC)? The interaction with other sections should be integrated in a system-wide modelling approach and not be considered specifically in the offshore domain.

Q9: Does the cost indicator as presented in this methodology provide all relevant cost information? If not, what other cost would you like to include?

CAPEX costs could also be given as one aggregated number composed by the mentioned cost categories, since a detailed cost breakdown is not needed to perform a complete CBA.

Q10: Is, from your perspective, the method of comparing alternative grid configurations to a reference case appropriate in the context of meshed offshore grids? If not, how could we improve?

This depends on the respective study: in general, the comparison of different configuration can of course deliver useful information.

Q11: Is the approach to dealing with uncertainty appropriate? How could we improve?

No answer provided.

Q12: What is, from your perspective, the relevance of market design for different configurations of meshed offshore grids?

The market design is highly relevant. Especially in combination with offshore, differently designed renewable support schemes have a high impact on the SEW and can give incentives for decision makers. Moreover, special regulatory schemes that prioritize RES infeed (e.g. unlimited infeed policies) can give additional useful information within this specific study. It is not clear why the Promotion CBA needs virtual bidding zones. To our opinion, this should be defined more general.

Q13: Do you think the proposed Security of Supply indicators give enough coverage for offshore grids?

No answer provided.

Q14: Please add your additional suggestions for improvement below.

On the general understanding of a CBA methodology: As defined in the ENTSO-E guideline, a CBA guideline should deliver methodologies on achieving each indicator (benefit, costs and residual impacts), as a solid basis for assessing different types of projects. Thus, the specifics of the different kind of projects, including meshed offshore grids, can be assessed based on this general CBA guideline. The detailed definition of different study specific references (e.g. reference grids as used within the PROMOTioN project) is not seen as part of the CBA guideline itself.

On Scenarios:



- Although, of course, the scenarios have a major impact on the final CBA results, their detailed definition should not be treated within the CBA methodology, which should remain scenario independent.
- In section 4-3 it is stated that “The ENTSO-E methodology provides guidelines for the development of scenarios for the European power systems, including the development of generation capacity [...] and demand.”, which is not correct. The 2nd ENTSO-E CBA delivers only an overview of the importance of scenarios. The scenarios themselves are defined within the TYNDP process.

On the statement: “The current CBA methodologies [2nd ENTSO-E Guideline] are insufficient and limited in scope for the evaluation of complex systems, such as offshore grids.”

- In our opinion, this statement is not correct but might be justified by the different views on how to apply the CBA methodology for “complex systems”. From our point of view, the PROMOTioN CBA can be seen as a specific application of the ENTSO-E CBA, as it is based on the same set of indicators. The only difference is the application and definition of the reference grid.
- It is stated several times that the ENTSO-E CBA guideline only allows the assessment of single projects, which is not correct: through the multiple TOOT/PINT approach, the ENTSO-E CBA guideline also allows to assess more complex structures/clusters of projects.
- The statement “The residual value could be set at zero when working with annuitized investment” is unclear. They claim that this assumption was made in the 2nd guideline, which is not the case. The authors should further specify what they mean with an annuitized investment. To our understanding, this statement should also hold for a lump sum investment.

NRA ANSWERS TO QUESTIONNAIRE:

Q1: What is, from your perspective, the purpose of a European CBA methodology?

In general: Consciously measure and weigh cost and benefits and compare alternatives. In the European context: Decrease the risk of companies manipulating CBA's, allow for fairer comparisons between different CBAs, determine the global benefits for the society on a regional European level of major future investments and allow the comparison of alternative investments.

Q2: What is, from your perspective, the need for a meshed offshore grid? Why?

There is a need if this is the best option for society. Also, there is a need for better coordination of the European electricity market for technical and economic benefit.

Q3: Having in mind the variety of users and usage of the CBA, would you choose a multi-criteria or one figure (full monetisation) approach?

Two NRAs mentioned a one-figure approach to fit best, as there is an easier comparison and weighting. Two NRAs named a multi-criteria approach would be feasible, but requires standardization.

Q4: Is the CBA methodology for meshed offshore grids as proposed in this document (D7.11) easy to understand and apply? If not, how can we improve?

Two NRAs stated that generally there is a good understanding of the document, while leaving room for interpretation. Specific guidelines would be required though to conduct a proper CBA. One found



the method very theoretical and also mentioned that a full nodal approach or zonal with real internal decongestion cost is necessary. One NRA asked to focus more on explaining the chosen methodology first."

Q5: Is the method of calculating the indicators easy to understand? If not, how can we improve?

Three of 5 NRAs confirmed that the calculation of indicators is easy to understand, while two did not. The need for specific guidelines was voiced (KPIs, tools).

Q6: Do you think the set of proposed indicators gives sufficient information about the project costs and benefits? Please justify your answer.

Yes, maybe add real internal decongestion costs and costs onshore grid; find proper cost ranges to be adapted to CBAs for a trustworthy assessment.

Q7: What is, from your perspective, an appropriate geographical scope of a meshed offshore grid project? To what extent should the onshore grid be taken into account in the evaluation process and why?

North Sea and surrounding countries - No restrictions on number of countries; onshore needs to be taken into account (depending on impact)

Q8: What is, from your perspective, an appropriate scope of technologies and sectors to be considered in alternative offshore grid projects? (eg storage, Power-to-gas)

All relevant existing technologies and sectors

Q9: Does the cost indicator as presented in this methodology provide all relevant cost information? If not, what other cost would you like to include?

Pretty much so: add significant ecological effects, decommissioning cost in Netherlands, real internal decongestion costs, onshore grid reinforcement cost and cost of changing regulation.

Q10: Is, from your perspective, the method of comparing alternative grid configurations to a reference case appropriate in the context of meshed offshore grids? If not, how could we improve?

Yes - limited capabilities in calculation of alternative grid configurations.

Q11: Is the approach to dealing with uncertainty appropriate? How could we improve?

Not very clear - sensitivity analysis as part of the KPI calculations, risk assessment part of comparison.

Q12: What is, from your perspective, the relevance of market design for different configurations of meshed offshore grids?

Should be neutral, no barriers, full nodal or zonal with decongestion cost, highly relevant.



Q13: Do you think the proposed Security of supply indicators give enough coverage for offshore grids?

Yes, watch for double counting, according to regulation in the Clean Energy Package.

Q14: Please add your additional suggestions for improvement below.

Handling uncertainty and residual impact and goal of SCBA are unclear. Taking individual countries' requirements into account.

