WP8.3 – Strategic Report – C4. Offshore Wind + Oil and Gas - Atlantic

1 Introduction

This report examines the suitability for combination of two energy sectors: Offshore Wind (including floating and fixed) and Oil and Gas. In this combination, the distribution of the oil and gas production areas will drive the spatial location of wind farms, determining at the same time the type of combination concept:

- Type 1 MUS service platform (auxiliary): the electricity generated by the offshore wind sector would serve to supply the electricity needed by the platform (e.g., lighting) and the pumps for enhanced oil recovery (EOR) processes. Since the wind sector is integrated within the oil and gas production process, it becomes a supporting technology for hydrocarbon production enabling cost and/or emission reduction.
- Type 2 MUS multiple production platform: the proximity of the oil and gas platform to land makes feasible the connection of the wind turbines to the general onshore grid. In this case, the wind sector will be able to feed the electricity needs of the oil and gas industry (as above) as well as to export the electricity surplus. The oil and gas platform may also serve as a maintenance hub and supporting infrastructure for the offshore wind farm. However considering the far distances from shore of oil and gas platforms and the high grid connection costs, this appears as an unviable combination option.

The combination of both sectors has a number of advantages: optimisation of EOR processes; decrease of hydrocarbon production costs (financial and carbon emissions); improvement of the image of the oil industry; and, boosting the development of marine renewable energy. Although many oil and gas companies have shown little interest for diversification, this combination may attract investments from that sector, since it provides a series of direct economic benefits to them. The oil and gas company Statoil is developing a spar buoy floating wind turbine foundation called Hywind to explicitly power its oil and gas platforms.

Offshore floating wind technologies are reaching a demonstration phase. The Scottish government has permitted the installation of the first floating wind farm comprising 5 offshore 6MW turbines in the Buchan Deep. Scotland has a the Renewables Obligations price support mechanism set at a level of 3.5 Renewable Obligation Certificates providing a revenue of about £204/MWh (about €260/MWh,). Statoil has made the final investment decision for this $236 million wind farm which is due to be operational in 2017.

Due to recent advances in floating wind turbine foundations all the sectors considered in the combination have technologies that can operate at a commercial-scale. These advances in floating technologies can increase the opportunities for combination, since wind turbines are no longer limited to being deployed in shallow waters.

This Atlantic combination has a series of limitations. The principal oil and gas production areas in Europe are located in the North Sea, while the hydrocarbon resource availability in the Atlantic is limited spatially. Although the whole Atlantic basin has significant wind resources, the potential areas

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for sector combination would be limited to those areas in which some oil and gas production activity is performed or potential reserves may exist, for example the Irish Sea, the South coast of Ireland, or the “Atlantic frontier” in the North (for example west of the Shetland Islands and the Faroe Islands). The UK is currently the only Atlantic country with operating commercial offshore wind farms.

Despite limitations, the benefits of this combination can be of great interest for the oil and gas industry, potentially extending the lifecycle of existing platforms and enabling more efficiently designed future operations.

2 Products

	Producing sector	Products
Type 1 MUS	Oil and gas	• Fuels (industry, transportation) • Chemicals & Pharmaceuticals • Agricultural • Energy (heating, electricity)
	Producing sector	Products
Type 2 MUS	Oil and gas	• Fuels (industry, transportation) • Chemicals & Pharmaceuticals • Agricultural • Energy (heating, electricity)
	Offshore wind	• Energy (electricity)

Products derived from the oil and gas industry have a wide range of applications (petrochemical, pharmaceuticals, pesticides, etc.). However, energy is the principal product for both the oil and gas and the offshore wind industry. Despite the advances in renewable technologies, it is expected that the energy market will continue to have a significant demand for fossil fuels (onshore + offshore) especially for transport and heating for the next 30 years at least. Although the European Union and the G8 objectives to reduce greenhouse gas emissions by at least 80% below 1990 levels by 2050 will reduce demand for new oil and gas fields it will increase the demand for enhanced oil recovery in the short term.

3 Market Analysis

The oil and gas market is a global market, characterised by its high degree of internationalisation, liberalisation and geopolitical drivers. Thus, its products are subjected to global trade movements, and as such, their market depends on factors like international contracts of the operators or the status of the global supply and demand. By contrast, the electricity market is largely national with some contribution from other nations via interconnectors. The extension of the lifecycle of an already declining offshore oil and gas industry and the need to reduce greenhouse emissions may be important drivers for the development of the combination.

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4 Customers

As a highly internationalised industry, the oil and gas sector has customers at the global scale. However, the EU is a net importer of energy, with countries such as Germany, Italy, Spain or France in the global Top 10 of energy importers. Since this combination boosts European energy production, it should contribute to increase the energy self-sufficiency of European markets and countries.

5 Competition

The following table shows the principal competitors to the concept. Additionally the potential competition between industries involved in the combination should be considered (i.e., floating vs, fixed wind devices). Floating devices have the capacity to be deployed in deeper water and to be moved to other locations if needed. Considering these advantages and the trend of oil and gas companies to explore deeper water locations for new hydrocarbon sources, floating turbines are more likely to be needed than the fixed bottom turbines.

Table 1: Competitors to Concept

Competitors	Key Differentiator	Rating (1-10). 10 is most competitive/desirable
Type 1 MUS- competitors to offshore wind as an energy source for oil and gas processes		
Gas turbine generating off gas being extracted	Normal practice but environmentally poor	10
Diesel power	Available but needs to be transported and reliable but environmentally poor	10
Tidal	Unproven and location dependent	1
Wave power	Unproven and location dependent	1
Solar power	Proven operation, capacity factor is very low, panels need to be mounted on structures, unlikely to achieve sufficient area of panels to meet demand	3
Power from onshore grid	Distance to connection is most important parameter. Depends on location and grid connection availability (economic viability decreases with distance to onshore grid node)	4
Type 2 MUS - assumes grid connection sufficient for import of electricity present		
Power purchased from onshore grid	Carbon footprint of such power depends on location. Renewables share of gross final energy consumption in 2014 from	8

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	Eurostats[1] indicates that carbon footprint of electricity is likely to vary: Ireland 8.6% UK (West coast) 7.0% France 14.3% Spain 16.2% Portugal 27.0%	
Power purchased from onshore renewable UK electricity production	Established industry, low carbon footprint	9
Power purchased from onshore oil and gas electricity production	Cheaper, fully developed, more accessible reserves.	7
Power purchased from unconventional oil and gas (fracking, shale gas).	Still not fully developed. Lower exploitation costs, more accessible onshore reserves.	2

6 Revenue

The following table summarises the most common support schemes that apply to this combination and the typical profile of investors. In both cases private investors predominate. However given the strategic importance of the energy market for national economies, these industries are eligible for a series of public support schemes.

INVESTORS		
Sector		Typical investor profile
Oil and gas		• Funding through own reserves • Equity funds • Bank loans/bonds
Offshore wind		• Utilities • Project finance • Capital ventures • Technology grants
SUPPORTING SCHEMES		
Type 1 MUS	Sector eligible	Supporting scheme
	Oil and Gas	• EU-Emission Trading System (EU-ETS) • Horizon 2020 Energy calls • Enhance Capital Allowance (UK) • Tax breaks for oil and gas production (UK)

[1]Eurostat, Renewable energy in the EU Share of renewables in energy consumption in the EU rose further to 16% in 2014 http://ec.europa.eu/eurostat/documents/2995521/7155577/8-10022016-AP-EN.pdf/38bf822f-8adf-4e54-b9c6-87b342ead339 last accessed February 2016

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	Sector eligible	Supporting scheme
Type 2 MUS	Oil and Gas	• EU-Emission Trading System (EU-ETS) • Horizon 2020 Energy calls • Enhance Capital Allowance (UK) • Tax breaks for oil and gas production (UK)
	Offshore wind	• Price support ○ Renewables obligation (being replaced by Contract for Difference-UK) ○ Feed-in-Tariffs (UK, Ireland, France) • Horizon 2020 Energy calls especially DemoWind

7 Strategic Roadmap

Both sectors considered in this combination can operate at the commercial-scale. In this case, the combination of both industries does not imply significant technical challenges, since the proximity to an oil and gas platform does not influence the procedure for the deployment of wind turbines. The environment particularly that of waves may limit the deployment of floating wind turbines as the cost to engineer them to cope might be prohibitive. Mainly, the commercial development of this combination is not influenced by technical aspects, but by factors related to the cost and availability of funds, interest from operators or consenting requirements.

8 Conclusion

A series of concluding remarks are given below:

- The combination of the offshore wind and the oil and gas industry may provide a series of advantages for the EU´s energy industry, for example: optimisation of hydrocarbon production procedures and decrease of production carbon emissions and costs; boosting the development of marine renewable energies.
- From a basin specific point of view there exists some limitations: wind resources are widely available across the basin, however oil and gas resources show a spatially limited distribution (Irish sea, southern coast of Ireland, northern "Atlantic frontier")
- The improvement of oil and gas operations and the further development of renewable energies should boost the European energy sector. Therefore it should contribute to improve the energetic self-sufficiency of the EU and to supply the demand of European importer countries.
- Competitors to the combination vary depending on the type of concept considered. In the case of Type 1 MUS concepts, traditional practices are the principal competitors to offshore wind as a supporting energy source for oil and gas production processes (gas turbines and diesel generators). For Type 2 MUS concepts, power from grid and onshore renewables emerge as the most significant competitors.
- Private investments dominate both sectors, however given the social and economic importance of the energy market for national interests, both sectors are eligible for a series a public support schemes.

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- All the sectors involved in the combination operate at the commercial scale. The development of the combination may be more influenced by investment and regulatory factors than by technical constraints

8 References

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