European Commission

European MSP Platform

Sector Fiche:

Cables and Pipelines

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1 Basic Facts

Gross Value added	State of the sector	Presence across sea basins
N/A	Growing[1-2].	Dispersed throughout all sea basins[2-3].

Land-sea interaction	Temporal aspect	Lifetime of installations
Through their connection to onshore energy and communications terminals.	Non existent. Activity happening all throughout the year.	Between 20 to 50 years (for pipelines)[4-5] ; 40 to 50 years (for grid cables)[6] and a technical lifetime of 25 years for communication cables[7].

Interaction with other uses
Conflicts especially with extractive uses (i.e. marine aggregates, oil and gas extraction, fishing, etc.)[8].

[1] Chesnoy, J. (2016).
[2] Nies, S. (2011).
[3] *TeleGeography Submarine Cable Map (n.d).*
[4] DNV GL (n.d.).
[5] Balticconnector Transnational Pipeline (2016).
[6] Ecofys & RPS (2017).
[7] *TeleGeography (n.d).*
[8] See Section 4 of this sector fiche for further information.

2 Composition of the cables and pipelines sector

In this sector fiche, there will be an emphasis on communication and energy cables as well as oil and gas pipelines. Cable-laying or pipeline-laying vessels are excluded from this sector fiche analysis.

Offshore cables	Communication cables	Cables to carry telecommunication signals across stretches of ocean. Communications are an important part of our nowadays society and submarine cables have become key facilitators of modern life. Today, as little as 3% of global communications are carried through satellite links, which means that 97% of the world's communications are transported around the world via fiber optic submarine cables[9].
	Energy/power cables	Including high voltage alternating (HVAC) and direct (HVDC) current offshore cables which transport electricity at more than 150kV and 100kV respectively[7].
Offshore pipelines	Oil pipelines	Transportation pipelines for oil. In the EU, only a small fraction (20%) of total oil products import and transportation uses pipelines. 80% are transported by vehicles, ships and trains[10].
	Gas pipelines	Transportation pipelines for gas over large distances and under high pressure (over 80 bars). Each Member State has a distinct control and supervision system for handling daily operations of the gas transmission system[10].
	Disposal pipelines	Pipelines for the disposal of chemicals and wastewaters (marine wastewater outfalls).
	Freshwater connection pipelines	Connection pipelines for freshwater supply[11].

Figure 1: Composition of the cables and pipelines sector

3 Relationship between cables and pipelines and MSP

3.1 What are present spatial needs of the cables and pipelines sector?

Pipelines and cables are either locked in physically to a specific location between the field of collection and the point of delivery or seek to take the direct route between two connection points[12]. Re-allocation prior to their laying onto the seabed is possible, but difficult and costly, due to longer distances, need for more material as well as labour costs[13].

As for cables, with respect to offshore wind energy development and also applying to nearshore wave and tidal devices, the International Cable Protection Committee (ICPC) recommends that existing cables in shallower waters (up to a depth of 75m) are given a default 500m exclusion zone on either side. The actual distance will vary between Member States[14]: in the UK, the Marine Management Organisation recommends a 250m exclusion zone either side of existing cables[15]; in Denmark 200m exclusion zone either side is recommended[16]; in the Netherlands there is a maintenance zone of 500m[17]; whilst in Belgium there is a 250m protected area and a 50m reserved area on either side[18-19]. The exclusion zone increases to 750m on either side for telecommunication cables[14].

Similarly, energy cables might require space for their laying[12], bundling (by parallel routing)[17], energy transformation (at the transformer substation platform)[20], interconnection (at grid interconnector sites)[12] and cross connection (at cables crossing areas)[12]. In case of parallel routing, distances of 100 - 200m should be maintained after every second cable system depending on the geological site conditions[12]. As stated in the BSH (2014): "when placing bundling platforms a 500m distance from priority and reservation areas for shipping and all existing and approved uses should be maintained"[20].

[9] APEC (2012).
[10] Bjørnmose et al. (2009).
[11] See "The Turkish Republic of Northern Cyprus Water. Supply Project" as an example.
[12] Bjørnmose et al. (2009).
[13] APEC (2012).
[14] Communications Security, Reliability and Interoperability Council IV. (2014).
[15] UK MMO (2013).
[16] Order on Protection of Submarine Cables and Pipelines (1992).
[17] Government of the Netherlands (2015).
[18] Vanbavinckhove, G., Rumes, B., Pirlet, H. (2015).
[19] Maes et al. (2005).
[20] BSH (2014).

At the same time, when placing a transformer substation an area of 10000m2 must be secured[20] and it should be placed as close to the farm as possible so that the cables connecting to Renewable Energy Systems´ (RES) infrastructure system are as short as possible[20]. Generally, construction in Natura2000 areas/protected biotopes is not permitted, whilst noise mitigation measures should be taken on areas adjacent to protected zones[6].

As for pipelines, a default 500m exclusion / reserved zone on both sides exists[18-21]. Also inside the protected zone (1000m at both sides), no sand extraction may take place and no other pipelines may be placed[21].

3.2 Which anticipated future developments of the industry are relevant to MSP?

Rise in upgrade activities	Development of offshore sectors	New routes and explorations areas
Development of offshore sectors (renewable / oil & gas / aquaculture) & the need to connect to terrestrial infrastructures. Due to the increasing importance of offshore wind turbines, there is a growing demand for submarine power cables for the transport of energy to the mainland. As such, the share of power cables will increase due to the installation of offshore wind turbines[22].	Development of offshore sectors (renewable / oil & gas / aquaculture) & the need to connect to terrestrial infrastructures. Due to the increasing importance of offshore wind turbines, there is a growing demand for submarine power cables for the transport of energy to the mainland. As such, the share of power cables will increase due to the installation of offshore wind turbines[23].	Polar Regions are being selected for new submarine cable builds[24]. Low latency cables are planned to connect the UK to Japan by installing a cable across the Arctic Circle above Canada through the North West passage. The cost of installing such a cable is estimated at £700Million to £1Billion as laying cables in polar regions requires unique technical aspects, especially at landing points[25].

Technology advances in cables	Increase in Hybrocarbon imports	Decommissioning
More projects are being proposed that require longer, deeper, and higher-capacity cables[26]. In addition, Europe is setting out to create an additional direct current grid structure for the future HVDC underground cables can safely transport high power loads over long distances with minimal losses. In addition to this transport efficiency, fewer cables are required to carry the required capacity, hence allowing narrower trenches[27].	The European Union's hydrocarbon energy supply depends heavily on imports. Dependence on hydrocarbon imports will remain not only important, but will increase[28-29]. In this scenario context, oil and gas pipelines ought to increase too[30], especially for gas pipelines as "natural gas remains a fundamental part of the transition to a low carbon economy"[31].	From 2017 to 2025, decommissioning is set to occur on 349 fields across the North Sea. Infrastructure scheduled for decommissioning includes: more than 200 platforms - complete or partial removal; around 2,500 wells; close to 268km of pipelines[32] and in excess of 3,000km of abandoned cables[33]. Removal is desirable as old cables and pipelines can impede other uses of the seabed, such as sand extraction or installation of wind turbines[33]. At the same time, decommissioned oil and gas platform could also be used for CO_2 storage. If it takes place at sea, then extra pipelines might need to be installed.

[21] Verfaillie, E., Van Lancker, V., Maes, F. (2005).
[22] Boston Consulting Group. (n.d).
[23] Vanbavinckhove, G., Rumes, B., Pirlet, H. (2015).
[24] Hsu, J. (2016).
[25] KIS-ORCA (n.d).
[26] Navigant Research (2015).
[27] *Europacable* (2011)
[28] Bjørnmose et al. (2009).
[29] Cambridge Econometrics (2016).
[30] GlobalData. (2016).
[31] IOGP (2016).
[32] Oil & Gas UK. (2017).
[33] Government of the Netherlands. (2015).

4 Interaction with other sectors

Marine aggregates	Offshore wind	Fishing
• No conflicts unless at the extraction site where no cables can be laid[34]. • In order to promote synergies with sand extraction, laying routes could be determined, based on the availability of extractable sand (i.e. routes through areas where extractable sand has been depleted or where sand extraction is less attractive)[35].	• Synergies when developing wind farm clusters and offshore energy grids[36]. • Conflicts may exist when laying cables around RES installations and a proximity agreement might be needed if inside the exclusion zone of the installation[37].	• Potential faults and disruptions caused by fishing entanglements[38]. A potential solution would be to establish cable corridors. • The migration of fishing into deeper waters has obliged the submarine cable industry to develop techniques for protection of its systems also in deeper waters.

Oil and gas	Aquaculture	Tourism and recreation
• No conflicts unless at the extraction site and exclusion zones of oil and gas extraction areas[39].	• Compatibles under certain conditions[40].	• Temporary beach closure due to the installation and burial of submarine cables segments on beaches.

Conservation	Pipelines and cables	Shipping and ports
• Potential whale entanglements with submarine telecommunication cables[41] and potential conflicts between trans-Atlantic and trans-Pacific cables and new extraterritorial marine protected areas[42]. • Potential environmental implications: disturbance of the seabed organisms, re-suspension of contaminants, noise, electromagnetic fields (EMF), thermal radiation and introduction of artificial hard substrate[43]. However, studies[44-45] show that EMF effects are negligible. • Synergies whilst the co-use of sensors on submarine cables (data for monitoring global change, tsunamis, earthquakes, etc.).	• Damage or disturbance to existing cables and pipelines[46]. • Crossing protection measures when cables cross other cables and pipelines as there may be a need to provide crossing protection to avoid abrasion, reduce the slope of the crossing or thermal problems[47]. • Restriction of siting options for other cables and pipelines[48].	• Cables (and safety corridors) and pipelines may restrict shipping anchorage in certain areas[49]. • There can be temporary effects associated with the presence of vessels during installation, although it is acknowledged this would be a temporary effect[50]. • Once laid, shipping, cables and pipelines may co-exist in space[50].

5 Recommendations for MSP processes in support of the sector

More trans-national level MSP coordination

Due to the trans-national character of the sector, more coordination and cooperation between national authorities should be required to increase the existing opportunities for further harmonization over regulations, licensing requirements and data sharing across countries[51].

Integrated offshore energy grid

The cables sector could foresee promoting interconnection, offshore meshed grids and coordinated designs as a first steps towards an integrated offshore energy grid, specially for the more ambitious RES scenarios[52-53].

Parallel routing

As maximum bundling as possible by parallel routing. To promote efficient use of space, electricity cables, telecommunications cables and pipelines should be bundled to the fullest extent possible[54].

Enhance sector synergies

Despite synergies with other maritime uses and the Cables and Pipelines Sector exist, these should be further enhanced (e.g. use of the submarine 3D topographic mapping and surveying data for environmental conservation, archaeological purposes, etc.).

[34] Veidemane, K., Ruskule, A., Sprukta, S. (2017).
[35] Government of the Netherlands. (2015).
[36] Roggenkamp, M. (2015).
[37] See ESCA Guideline No.6.
[38] APEC (2012).
[39] Ecofys & RSP. (2017).
[40] Veidemane, K., Ruskule, A., Sprukta, S. (2017).
[41] Wood & Carter. (2008).
[42] See The BBNJ initiative.
[43] Urātane et al. (2017).
[44] Europacable (2011).
[45] Vanbavinckhove, G., Rumes, B., Pirlet, H. (2015).
[46] Ecofys & RPS. (2017).
[47] Ibid.
[48] Ibid.
[49] Urtaāne et al. (2017).
[50] Veidemane, K., Ruskule, A., Sprukta, S. (2017).
[51] Navarrete, M. (2015).
[52] Gazendam, J. (2015).
[53] EU Comm. (2014).
[54] See ESCA Guideline No.6.

6 Resources[55]

6.1 Legal framework

Organisation	Title	Link	Short explanation
IMO	United Nations Convention of the Law of the Sea (UNCLOS)	http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm	UNCLOS defines rights and responsibilities of states to use the sea. Sector´s essential terms are included here: • UNCLOS, Article 79(4): for archipelagic waters, establishes conditions for cables or pipelines entering these zones. • UNCLOS, Articles 21, 58, 71, 79, 87, 112-115 and 297(1): for outside of the territorial sea, the core legal principles applying to international cables. • UNCLOS also imposes obligations to safeguard and protect submarine cables outside of their territorial seas. • UNCLOS allows naval forces to investigate and take appropriate action against vessels likely to damage submarine cables, either intentionally or by negligence.
IMO	The International Convention for the Protection of Submarine Cables (1884)	https://cil.nus.edu.sg/wp-content/uploads/formidable/18/1884-Convention-for-the-Protection-of-Submarine-Telegraph-Cables.pdf	The treaty that provides the detailed procedures necessary to implement those terms. See: Article 5 special lights and day shapes displayed by cable ships; minimum distances ships are required to be from cable ships; Article 6 minimum distance ships are required to be from cable buoys; Article 7 procedures for sacrificed anchor and gear claims; Article 8 competency of national courts for infractions; Article 10 procedures for boarding vessels suspected of injuring cables and obtaining evidence of infractions; Article 311(2) of UNCLOS recognizes the continued use of these provisions, which are compatible with and supplement UNCLOS.
EU	Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations	https://euoag.jrc.ec.europa.eu/files/attachments/osd_final_eu_directive_2013_30_eu1.pdf	For licensing purposes.

[55] The information provided under this section is non-exhaustive. The intention is to provide the reader with basic information on the sector.

6.2 Actors

Name	Link	Short explanation
European Subsea Cables Association (ESCA)	http://www.escaeu.org/	A forum of national and international companies which own, operate or service submarine cables in European and surrounding waters. Its aim is the promotion of marine safety and the safeguarding of submarine cables from man-made and natural hazards.
European network of transmission system operators for electricity (ENTSO-E)	https://www.entsoe.eu/Pages/default.aspx	ENTSO-E, the European Network of Transmission System Operators, represents 43 electricity Transmission system operators (TSOs) from 36 countries across Europe. ENTSO-E members share the objective of setting up the internal energy market and ensuring its optimal functioning, and of supporting the ambitious European energy and climate agenda.
Europacable	www.europacable.com	Europacable represents the largest cable makers in the world, as well as highly specialized small- and medium sized businesses from across Europe.

6.3 Initiatives

Name	Link	Short explanation
Baltic InterGrid	http://www.baltic-integrid.eu/index.php/home.html	The aim is to optimize transnational coordination of offshore wind energy infrastructure in the Baltic Sea
Baltic LINes	http://www.vasab.org/index.php/balticlines-eu/about	Baltic LINes seeks to increase transnational coherence of shipping routes and energy corridors in Maritime Spatial Plans in the Baltic Sea
NorthSEE	http://www.northsearegion.eu/northsee/	Coordination between countries infrastructure development from point of view of MSP (Maritime Spatial Planning)
Renewables Grid Initiative (RGI)	https://renewables-grid.eu/	RGI is a unique collaboration of NGOs and TSOs from across Europe. We promote transparent, environmentally sensitive grid development to enable steady growth of renewable energy and the energy transition.

6.4 Selected literature

Author	Title	Link	Short explanation
ESCA Guideline No.6	The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters.	http://www.escaeu.org/download/?Id=123&source=guidelines	Establishes guidelines to place offshore cables near renewable energy installations.
BSH- Bundesamt für Seeschifffahrt und Hydrographie / Federal Maritime and Hydrographic Agency	Spatial Offshore Grid Plan for the German Exclusive Economic Zone of the Baltic Sea and nontechnical Summary of the Environmental Report 2013.	http://www.bsh.de/en/Marine_uses/BFO/Spatial_Offshore_Grid_Plan_for_the_German_Exclusive_Economic_Zone_of_the_Baltic_Sea_2013.pdf	The Spatial Offshore Grid Plan takes a sectoral planning approach and is closely linked to the Maritime Spatial Plan for the German EEZ in the North and Baltic Sea. The coordination with other spatially significant types of planning and measures as well as an examination of reasonable alternatives to subsea cable routes, corridors or sites is given serious consideration.
Government of the Netherlands	Policy Document on the North Sea 2016-2021 (printversie): Including the Netherlands' Maritime Spatial Plan appendix 2 to the National Water Plan 2016-2021.	http://www.vasab.org/index.php/documents/doc_download/1275-baltic-lines-report-on-shipping-in-the-baltic-sea	The Central Government's North Sea policy sets frameworks for the spatial use of the North Sea in relation to the marine ecosystem. This document summarizes the Netherlands long term vision (2050) and incorporates a maritime spatial plan which complies with the new EU Directive on Maritime Spatial Planning (Directive 2014/89/EU of July 2014).
Urtāne I., Kedo K., Vološina M., Ruskule A., Ustups D., Āboltiņš R., Aigars J., Sprukta S., Konsap A., Aps R., Kopti M., Kotta J., Kull A., Rosenhall E., Schmidtbauer Crona J., Selnes T.	Towards Coherent Cross-Border Maritime Spatial Planning in the Central Baltic Sea – Case Study Report From the Baltic SCOPE Project.	http://www.balticscope.eu/content/uploads/2017/03/BalticScope_CB_report_WWW-fin.pdf	In the Baltic SCOPE project, Maritime Spatial Planning authorities and Regional Sea Organisations in the Baltic Sea Area came together for the first time to find the planning solutions to transboundary issues and improve the Maritime Spatial Planning processes.
Veidemane,K., Ruskule, A., Sprukta, S.	Development of a Maritime Spatial Plan: The Latvian Recipe.	http://www.balticscope.eu/content/uploads/2015/07/LV-recipe_EN_web.pdf	A draft for the maritime spatial plan for the Republic of Latvia. It describes the methodology used in it to include the internal and territorial waters and Exclusive Economic Zone in the Maritime Spatial Planning. The draft had some key considerations considering the use of the marine space: how to maintain traditional maritime use and at the same time preserve the ecological conditions at least at the current level.

7 List of acronyms

Acronym	Full title
EMF	Electro Magnetic Field
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ICPC	International Cable Protection Committee
MSP	Marine Spatial Planning
NGOs	Non-Governmental Organizations
NSCOGI	The North Seas Countries' Offshore Grid Initiative (NSCOGI)
RES	Renewable Energy Systems
TSOs	Transmission System Operators

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ESCA Guideline No.6. *The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters.* 43pp.	http://www.escaeu.org/download/?Id=123&source=guidelines
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