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1 CABLES AND PIPELINES

1.1 DESCRIPTION

The Belgian part of the North Sea (BPNS) is dissected by various cables and pipelines. Both electricity and telecommunication cables can be considered as 'cables'. At the moment there are no electricity cables on the BPNS. This is likely to change however, as the potential location of wind energy parks in the BPNS would require cables to transport the energy onshore. There are only gas pipelines and no oil pipelines on the BPNS.

The total length of all telecommunication cables and gas pipelines together (BPNS related) is approximately **1077 km**. The length of the telecommunication cables is **914 km** and the length of the gas pipelines is **163 km**.

There are **27 telecommunication cables**, of which only 16 are being used. The total length of the used cables is 718 km, whilst the cables in disuse have a length of 196 km.

There are **3 gas pipelines**; the Interconnector (between Bacton on the southern coast of the United Kingdom and Zeebrugge), the Zeepipe (between the Sleipner area on the Norwegian continental shelf and the Distrigaz terminal in Zeebrugge) and Norfra or Franpipe (between the Draupner E platform on the Norwegian continental shelf and Dunkirk on the northern coast of France). At this moment, Belgium only imports methane gas through offshore pipelines from Norway (Zeepipe) and the United Kingdom (Interconnector). Statoil manages and controls the Norwegian pipelines, while the Federal Public Service Economy, SMEs, Self-employed and Energy is responsible for the regulations. Fluxys is the Belgian operator. Through Zeepipe and Interconnector 2.5 million tons of gas was imported in 2003

Submarine cables (Drew et al. 1996)

There are two kinds of submarine telecommunication cables: *coaxial* (or analogue) cables and *fibre optic cables.* The coaxial cables were laid between 1950 and 1988. Only one is still in use on the BPNS: UK-Netherlands 9. The diameter of those cables ranges from 40 to 100 mm. In the 1980's, the fibre optic cable was introduced. The heart of this cable is a set of tiny glass fibres, with each fibre about the thickness of a human hair. Lasers shoot pulses of light through the glass fibres of the cables. One cable can contain between six and twenty-four glass fibres. The diameter ranges typically between 20 to 50 mm. The disadvantage of this kind of cables is the fragility of glass compared to copper. Beam trawl or dredging activities striking a fibre cable can easily render it useless without actually parting it.

Before the installation of a cable, a *route survey* takes place, examining bathymetry, slopes, sediment types and other activities or obstacles (e.g. pipelines, old cables or material discarded on the bottom). Specialized ships lay the cables. In areas where a lot of activities take place, cables are usually buried in the seabed, to protect them. In many coastal areas, the burial depth ranges between 0.6 to 0.9 m. Cable ships with ploughs usually bury the cables as they are laid.

Moving sediment and especially bedform dynamics may cause exposure of the cables. In the North Sea there are strong currents that can create sand waves up to 10 m high. Sections of cables may become exposed, suspended between the tops of mounds of sand. This causes a great risk of cable damage.

By 2003, more than US$ 56 billion will be invested in the fibre-optic undersea market, with about 1000000 route km in place (Coffen-Smout et al. 2000).

Pipelines (Pille 1999; Maes et al. 2000; http://www.statoil.com; http://www.interconnector.com).

Zeepipe is in operation since 1 October 1993 and has a length of 814 kilometres. Zeepipe is operated by Statoil and carries roughly 13 billion cubic metres of gas per year, with a daily capacity of 41 million cubic metres. The Sleipner A-Zeebrugge pipeline is a 40-inch pipeline. Any residual liquids and particles are stripped out at the Zeebrugge terminal, where the gas is also metered and pressure regulated for onward delivery for consumption, mainly in France and other southern European countries.

The Norfra pipeline (Franpipe) has a diameter of 42-inch and is 840 kilometres long. It is a high-pressure natural gas pipeline that runs from the Draupner E platform on the Norwegian continental shelf to Dunkirk on the northern coast of France. The line is operational since 1998 and transports 40 million cubic metres of gas per day and has a capacity of 15 billion cubic metres per year. Before the installation, pre-sweep activities for seabed leveling took place. Afterwards pre-trenching of stiff clay at the crossing of the Westhinder shipping lane was undertaken. The pipeline was laid by a aybarge and finally protected with at least 1 m of gravel laid on top of it. The final pipeline level is 0.70 m below the seabed.

Figure I.2.1a: The pipelines Zeepipe and Norpipe (Franpipe) in the North Sea (http://www.statoil.com)

Interconnector is a 235 kilometres gas pipeline between Bacton on the South coast of England and Zeebrugge, transporting gas from the Leman gas field on the Britisch continental shelf. Interconnector became operational in October 1998. The Interconnector pipeline is bi-directional and can be configured for either UK export (forward flow) or UK import (reverse flow). Interconnector operates in swing with a reverse flow (capacity of 8.5 billion cubic metres/year) in winter and a forward flow in summer (capacity of 20 billion cubic metres/year). It is expected that the UK will become a net importer of gas and the reverse flow will rise up to 16.5 billion cubic metres per year in December 2006 and 23.5 billion cubic metres per year after December 2006. The pipeline has a diameter of 40 inches and is made of carbon steel. A layer of asphalt enamel provides corrosion protection to the external surface of the offshore pipeline. In addition, as a backup, cathodic protection is provided by aluminium 'bracelet' anodes clamped around the pipe. A concrete weight coating is added to keep the pipeline stable on the seabed.

Figure I.2.1b: The pipeline Interconnector in the North Sea (http://www.interconnector.com)

1.2 SUB-USES AND DESCRIPTION

For the placement of cables and pipelines, trenches are dug. The cables and pipelines are put in the trenches and are then covered. The digging of trenches is undertaken by either jetting (a jet trencher digs the trench with jets of water) or ploughing. Jet trenchers are also used for digging trenches for pipelines.

1.3 LEGISLATIVE FRAMEWORK

(updated by Cliquet A.)

1.3.1 Spatial delimitation

Legislation

An authorization is needed for the placement of cables and pipelines; the pipeline trajectory has to be approved by the King.

International legislation and Belgian implementation:

(Wagner 1995; Cliquet et al. 2004; Maes and Cliquet 2005)

- International Convention for the Protection of Submarine Cables, 14 March 1884 (Cable Convention).
    - Implementation in Belgium:
        - Law of 18 April 1888 on the approval of the International Convention For The Protection of Submarine Cables, *BS* 21 April 1888.
        - Law of 18 April 1885 on the punishments for the provisions of the International Convention for The Protection of Submarine Cables, *BS* 21 April 1888.

- United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982.
    - Implementation in Belgium:
        - Law of 18 June 1998 on the approval of the Convention on the Law of the Sea of 10 December 1982 and the Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 of 28 July 1994, *BS* 16 September 1999.

- Convention between Belgium and Norway on the transport of gas by pipeline from the Norway continental shelf and other areas to Belgium, Oslo, 14 April 1988.
    - Implementation in Belgium:
        - Law of 19 September 1991 on the approval of the Convention between Belgium and Norway on the transport of gas by pipeline from the Norway continental shelf and other areas to Belgium and the exchange of letters on the interpretation of article 2, § 2 on the Convention, *BS* 20 September 1993.

- Convention between Belgium and Norway on the "Norfra" gas pipeline on the Belgian continental shelf, Brussels, 20 December 1996.
    - Implementation in Belgium:
        - Law of 13 May 2003 on the approval of the Convention between Belgium and Norway on the "Norfra" gas pipeline on the Belgian continental shelf, *BS* 29 October 2003.

- Convention between the government of Belgium and the government of the United Kingdom of Great-Britain and Northern Ireland on the transport of gas by pipeline between Belgium and the United Kingdom, Brussels, 10 December 1997.
    - Implementation in Belgium:
        - Law of 26 June 2000 on the approval of the Convention between the government of Belgium and the government of the United Kingdom of Great-Britain and Northern Ireland on the transport of gas by pipeline between Belgium and the United Kingdom, *BS* 12 September 2002.

National legislation

(Cliquet et al. 2004 ; Maes and Cliquet 2005) :

- Law of 13 June 1969 on the exploration and exploitation of non-living resources of the territorial sea and the continental shelf, BS 8 October 1969; amended by the Law of 20 January 1999 on the protection of the marine environment in the marine areas under Belgian jurisdiction, *BS* 12 March 1999; Law of 22 April 1999 on the Belgian exclusive economic zone in the North Sea, *BS* 10 July 1999.

- Law of 20 January 1999 on the protection of the marine environment in the marine areas under Belgian jurisdiction, *BS* 12 March 1999; as amended.

- Royal Decree of 12 March 2002 on provisions for the laying of electricity cables that enter the territorial sea or national territory or that are placed or used for the exploration of the continental shelf, the exploitation of mineral resources and other non-living resources thereof or for activities of artificial islands, installations or structures under Belgian jurisdiction, *BS* 9 May 2002.

- Royal decree of 7 September 2003 concerning the procedure of permit and authorization of certain activities in the marine areas under Belgian jurisdiction, *BS* 17 September 2003, err. BS 25 September 2003 .

- Royal decree of 9 September 2003 concerning the rules of the environmental impact assessment in application of the law of 20 January 1999 on the protection of the marine environment in the marine areas under Belgian jurisdiction, *BS* 17 September 2003.

1.3.2 Type and intensity

No prelimary legislative restrictions on type or intensity of cables or pipelines exist. However a permit and an environmental impact assessment is required for excavation of trenches and raising of the seabed (art. 25) according to article 28 of the Law of 20 January 1999 on the Protection of the Marine Environment in the Marine Areas under Belgian jurisdiction. For the installation of cables and pipelines a permit must be granted and the direction must be approved by the competent minister (art. 4, Continental Shelf Law and Royal Decree of 12 March 2002 on provisions for the installation of electricity cables that enter the territorial sea or national territory or that are placed or used for the exploration of the continental shelf, the exploitation of mineral resources and other non-living resources thereof or for activities of artificial islands, installations or structures under Belgian jurisdiction).

1.4 EXISTING SITUATION

1.4.1 Spatial delimitation

(Map I.1.2a)

Source

- Federal Public Service Economy, SMEs, Self-employed and Energy
- Ministry of the Flemish Community, Hydrographic Service

Reliability margin

The cables and pipelines that are in use are known. The ones in disuse are not followed up upon.

Future perspectives

Future cables and pipelines have to be placed as close as possible to existing installations. Electricity cables for the future wind energy parks are planned.

1.4.2 Type and intensity

(Map I.1.2b)

Intensity per unit area

1077 km cables and pipelines per 3600 km² (total surface of BPNS) = 300 m per 1 km²

1.5 INTERACTION

1.5.1 Suitability for user

Details – if applicable – can be found in the chapter that is specifically dedicated to "Suitability"

1.5.2 Impact on other users

Details – if applicable – can be found in the chapter that is specifically dedicated to "Interaction among users"

Spatial conflict

There is a spatial conflict between the cables and pipelines and:

- shipping routes
- military exercise areas
- Oostende dumping zone
- future electricity cable
- old industrial dumpsite
- dredged zones
- aggregate extraction zones
- nature protection
- fisheries

There are safety distances for both the cables and the pipelines that have to be respected. Those distances are not legal yet, but they are complied with as a matter of practice (Schotte 2003 pers.comm.).

Safety distances

Distance from the cables:

- *protected zone*: inside a zone of **250 m** at both sides of a cable:
  - no anchor may be dropped;
  - no activity that can be a risk for the cable, except the construction of another cable, may take place
  - exception: interventions by the owner of the cable for exploitation needs.
- *reserved zone*: inside a zone of **50 m** at both sides of a cable:
  - no installation, cable or pipeline may be constructed.

- exceptions:
  - ~ uni-polar electricity cables protected with the same safety switch
  - ~ arrival and departure points of cables near installations (wind turbines, transformer platform, etc.)
  - ~ cables that have been repaired
  - ~ crossing of cables and gas pipelines
  - ~ maintenance dredging works in the seaways

Distances from the pipelines:

- *protected zone*: inside a zone of **1000 m** at both sides of the pipelines:
  - no sand extraction may take place;
  - no other pipelines may be placed.
- *reserved zone*: inside a zone of **500 m** at both sides of the pipelines:
  - no other installations may be placed, unless they have to cross the pipeline.
  - exception: maintenance dredging works and interventions by the owner of the cable for exploitation needs.

1.5.3 Impact on environment

Details – if applicable – can be found in the chapter that is specifically dedicated to "Interaction between users and the environment".

On the Thornton Bank outside the territorial sea, C-Power N.V. intends to build a wind energy park of 50 turbines, capable of producing 2 MW. In the non-technical summary of this wind energy park (http://www.mumm.ac.be/Downloads/NTS-C-POWER_NL.pdf) the following is mentioned about the impact of the electricity cables on the environment during its construction:

"The sediment quality is influenced temporary during the realization of the cables. The agitation and re-suspension of sediments as a consequence of the placement of the cables will have a small impact on the sediment quality, because of the permanent sediment dynamics in the Belgian coastal waters and because of the limited yard (both considering the mixed sea-floor surface and considering the execution time). The possible small enrichment of the sediments with pollutants in the water column has a small effect because of the small impact of the placement of the cables on the water quality.

During the realization of the cables there is a temporary effect on the water quality, because of a local increase of turbidity in the water column. The placement of the cables will cause the sediments on the sea floor to move. It is a small effect, however, because of the high background movement of sediment in Belgian coastal waters and the limited yard (both considering the mixed sea-floor surface and considering the execution time).

Other significant effects on the water quality are a small increase of pollutants (organic, inorganic, heavy metals), a small disturbing of the O_2 ,C, N and P balance and a small increased BOD (biological oxygen demand)/COD (chemical oxygen demand) factor because of the re-circulation of the sediments. Again it is a small effect because of the limited yard (both considering the mixed sea-floor surface and considering the execution time).

There are also temporary effects on the fauna and flora during the realization of the cables.

Benthos: due to the large re-colonisation potential of the benthos and the small yard (both considering the mixed sea-floor surface and considering the execution time), the damage of the benthos by sedimentation of suspended materials will be small.

Fish: the disturbing and the frightening of fish, by noise, change of substrate and reduced light penetration is small because of the large possibilities of fish to diverge and the limited yard.

Birds: the disturbing of the birds, by noise and the disturbing of nourishment source is small because of the large possibilities of birds to flee and the limited yard.

Flora: the disturbing of the flora by an increased re-suspension of particles is small because of the high mobility factor of the phytoplankton and its large re-colonisation potential and because of the limited yard.

Due to the placement of the cables there is a small temporary increase of noise, which has a small impact offshore because of the limited yard (considering the vessels, the surface and the execution time). Because of the long distance to the coastline the increase of noise doesn't have an impact onshore.

Roughly it can be stated that the temporary impact of the realization of the cables is small, because of the following reasons: (i) the limited duration in time of the placement of the cables, (ii) the limited number of vessels, compared to the permanent shipping traffic offshore Oostende and Zeebrugge, (iii) the total surface of the mixed sea-floor because of the placement of the cables is estimated to be maximally 100.000 m² (jetting), being less than 0,5 % of the total surface of the windmill park.

The temporary increase in turbidity during the activities has a small impact, because of the permanently high background values of the sediment dynamics in the Belgian coastal waters. There is almost no permanent impact of the cables during the realization of the placement."

It is likely that the already existing cables and pipelines on the BPNS have a similar impact on the environment.

Biological

Impact on benthos:

Small

One year after the cable has been laid: no significant changes in zoobenthos species composition, abundance or biomass (Andrulewicz et al. 2003)

Impact on fishes:

Small

Impact on birds:

Small

Impact on flora:

Small

Geological/physical

Small

One year after the cable has been laid: no visible mechanical disturbances on the dynamic sandy bottom (Andrulewicz et al. 2003).

The sandwaves or dunes, present on the BPNS, may pose specific challenges to the subsea engineering works. The migration and changing characteristics of sandwaves can influence the design bed level for a structure, present a hazard to navigation and expose pipelines and cables, increasing the risk of damage Whitehouse et al. (2000) examines the current understanding of the behaviour of sandwaves in relation to the practicalities of cable laying operations.

Hydrological

Small

1.5.4 Impact on socio-economy

Social

Employment:

- Engineers
- Technical people (private telecommunication companies)

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