New approach to installation of offshore wind energy cables

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To reduce costs for subsea power cables in offshore wind applications, an alternative installation method has been developed. Instead of armoured cables HDPE pipes are laid (trenched) into the seabed. A special telescopic riser has been developed to install the pipes from the Transition Pieces (TPs), avoiding J-tubes. Specially designed bend restrictors bring the pipe into position in the seabed near the feet of the mono-piles. After that, the (non-armoured) cable can be installed into the pipe. For this the cable drum and (compact) installation equipment can be previously placed inside the TP. This system can with minor modifications be applied to other foundation types, e.g. gravity- and jacket-foundations.

Cables are installed into the pipes using the water flowing technique, an alternative to traditional pulling. For cables used for offshore wind parks the technique has now been developed to work also without pig at the cable´s front-end (called floating). A high speed water flow propels the cable. Besides these propelling forces, a mechanical pusher introduces the cable into the pipe (which is under pressure), effectively pushing the cable. Because of the buoyancy of the cable in water, installation lengths are long while forces exerted on the cable are much lower than for traditional pulling, reducing wear. There is no need to first installing a winch rope. Also there is no need to place equipment at the far end of the pipe. The method can be used for installation of array cables as well as for export cables, the latter being even possible from land (current length of 3 km targeted to be increased to 5, 10, 20 km,...)

Costs savings are achieved because of the lower price of non-armoured cable, reduced AC-losses and reduced risk of pipe kinking and thus eliminated risk to kink the cable (should the pipe kink, it is much easier to repair). Telescopic riser and flexible bending restrictor will allow the cable in pipe to follow the seabed in case of erosion around the mono-pile. Tests were performed which showed that non-armoured cables in pipes are better protected against mechanical impact than armoured cables, because of the free space in the pipe. Keeping the pipes in the TP-zone filled with water, hotspots will be better cooled.

Trials done at Lindø, DK (onshore) and Thyborøn, DK (semi-offshore) are described. Here array cables (82 mm 3x300 mm^2 Alu in 125/102 mm pipe) and export cables (60 mm 1x630 mm^2 Alu in 90/80 mm pipe) were installed with ease over lengths of about 1 km, but the potential is much higher. Flexible joints were also tested to pass installation device and pipe. Using high salinity water the effective weight of the cable (in the pipe) can be tuned to zero. The same high salinity water can also be used to sink pipes. In many cases the density of the pipes with cable can even be tuned to the density of the seabed. Before the cables were installed, the pipe route was evaluated by intelligent pigging.

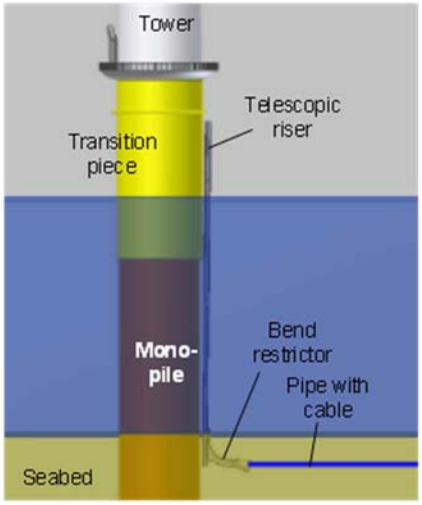

Fig. 1: Overview alternative system

Fig. 2: Overview semi-offshore trial