

Practical Installations of Cables in Pipes by FreeFloating: Installing Cables between Offshore Windturbines, from Land!

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With a project of Siemens Gamesa carried out by JD Contractors



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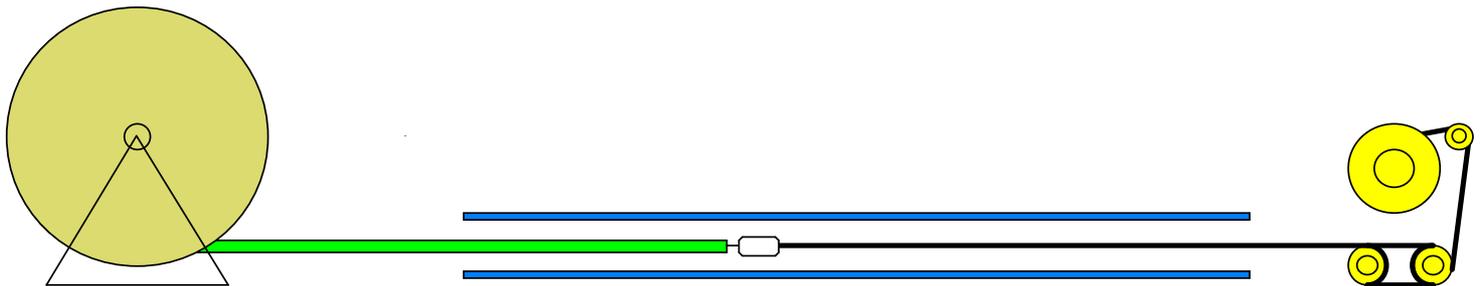
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- **The new techniques**
- **Projects**
 - Land
 - Offshore
 - Remember “Nessie”?
 - Project
 - Advantages
- **Conclusions**

Introduction

- **New techniques to install cables in pipes presented at ICC Fall 2016 meeting Scotssdale**
 - WaterPushPulling already done in several projects
 - FreeFloating only tried at a test field
- **FreeFloating now proved to work in 2 projects**
 - **Suburb of Copenhagen, over 2 sections**
 - More details in Subcommittee C
 - **Offshore Windpak in Thyborøn (also Denmark)**

The new techniques

- **Techniques to install cables into pipes**
 - **Winch Pulling**
 - Extra step of installing a winch line before pulling
 - Material and labour on both sides of duct
 - High pulling and sidewall forces, lot of wear, limited length



The new techniques

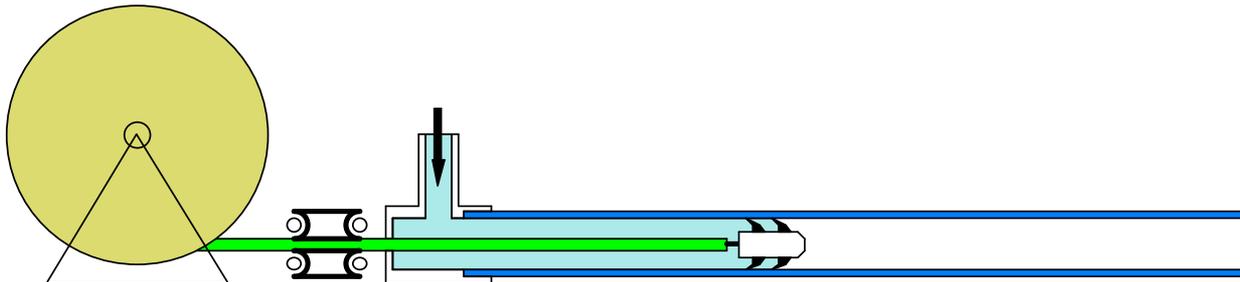
- **Techniques to install cables into pipes**

- **Winch Pulling**

- Extra step of installing a winch line before pulling
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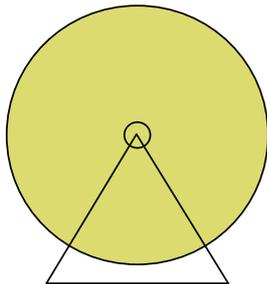
- **WaterPusPulling**

- None of these drawbacks

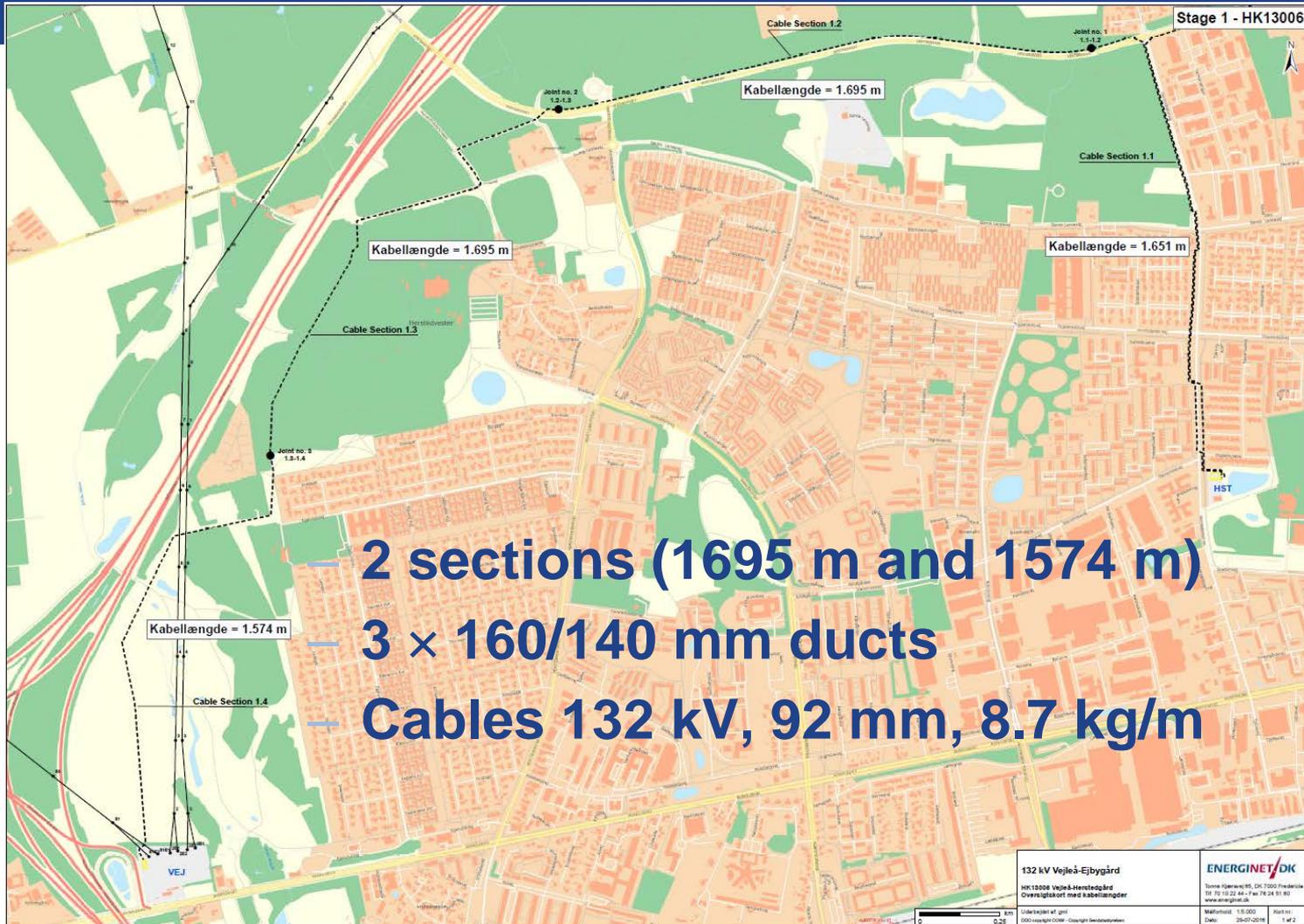


The new techniques

- **Techniques to install cables into pipes**
 - **Bonus advantage for WaterPushPulling**
 - **Once installed with this technique the cable can be transported further through the coupled ducts by the sole action of water, like “tube post”**
 - **Called FreeFloating**



Projects, land, Copenhagen (Denmark)



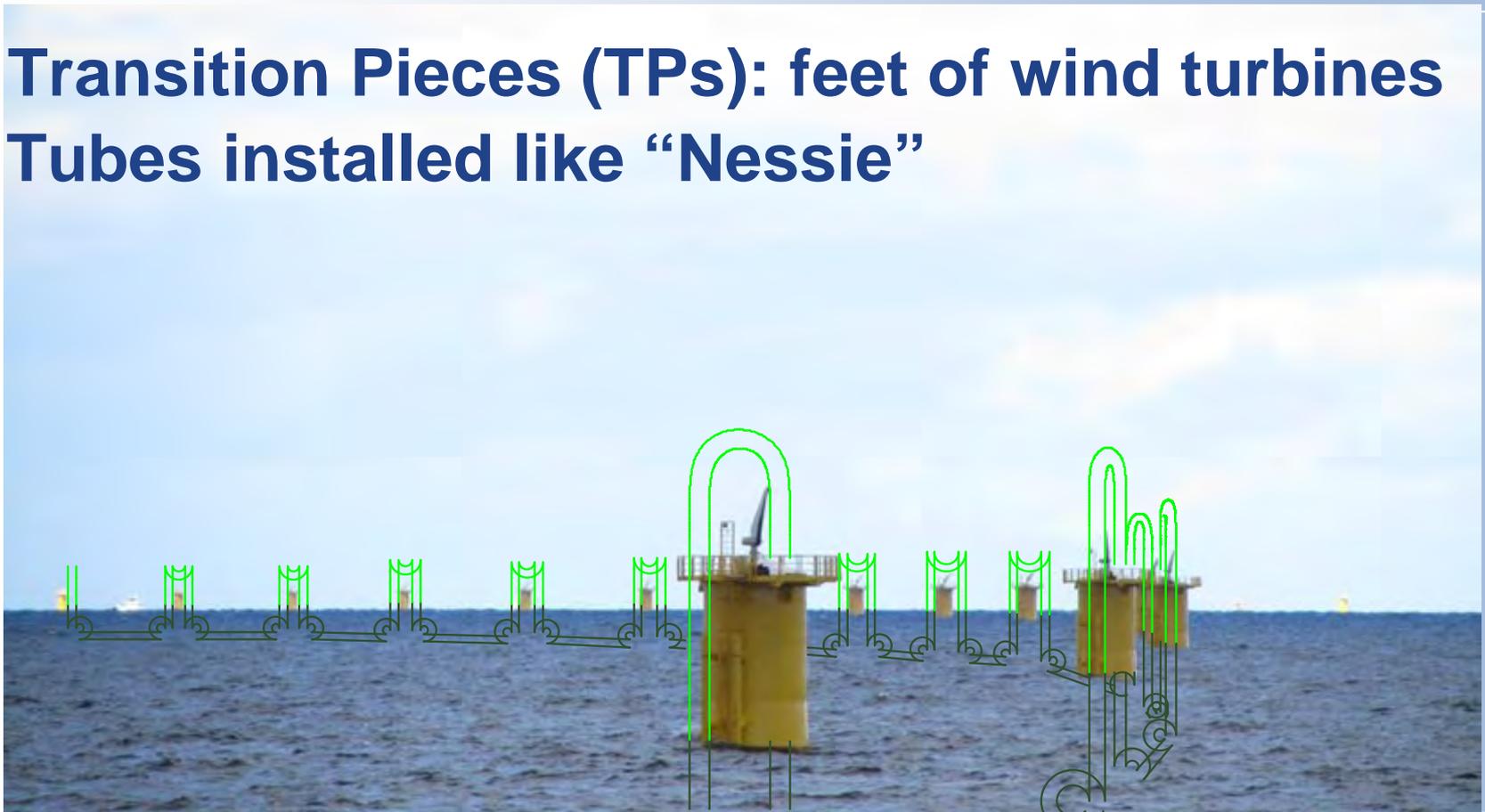
Projects, land, Copenhagen (Denmark)

- **After learning curve**
 - Installing first cable by **WaterPushPulling**
 - Then transporting further to next section by **FreeFloating**
 - After that a second cable installed behind first one.
 - Ready at 3:20 pm!



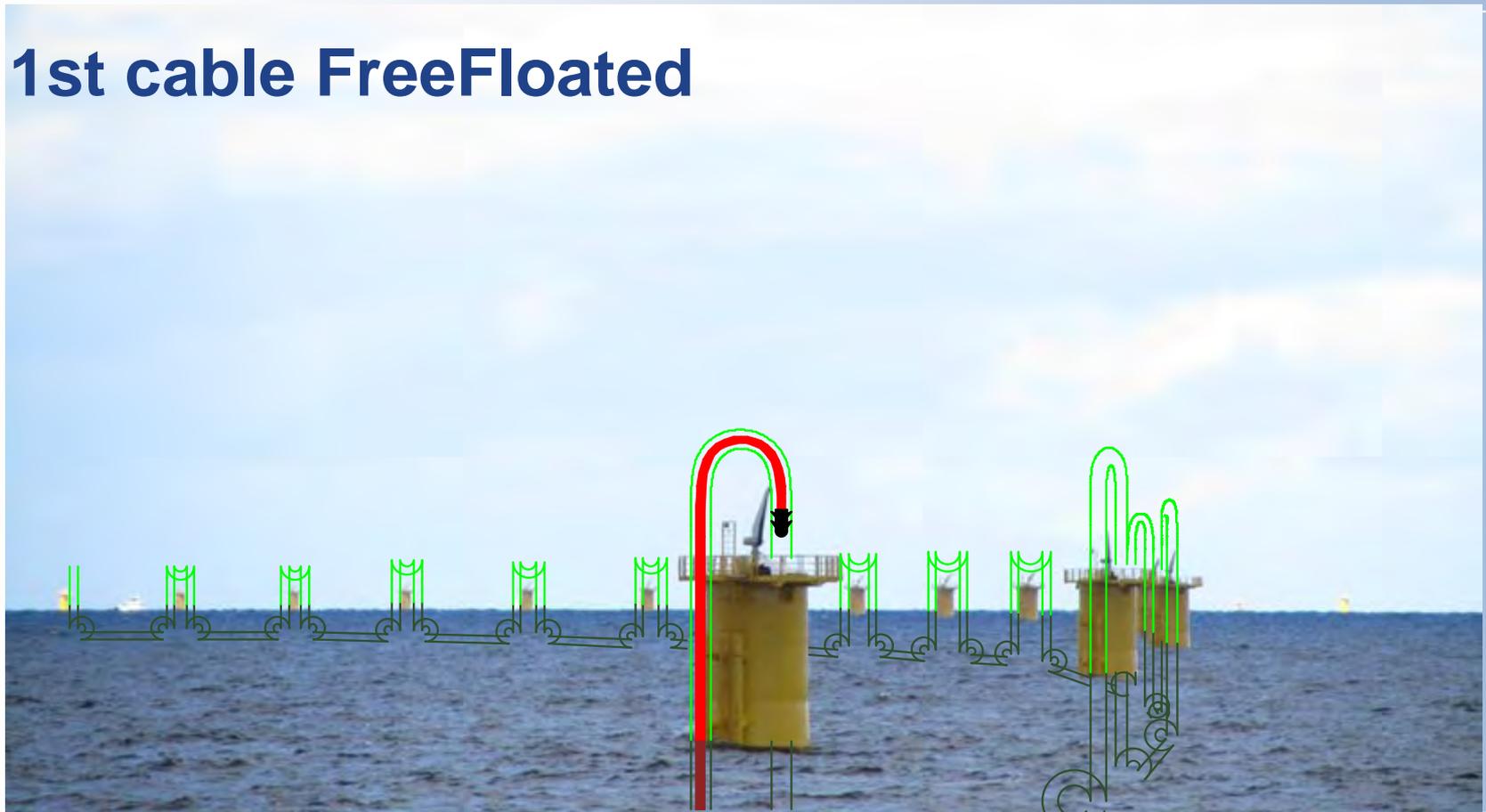
Projects, offshore, Nissum Bredning (Denmark) Remember “Nessie”?

**Transition Pieces (TPs): feet of wind turbines
Tubes installed like “Nessie”**



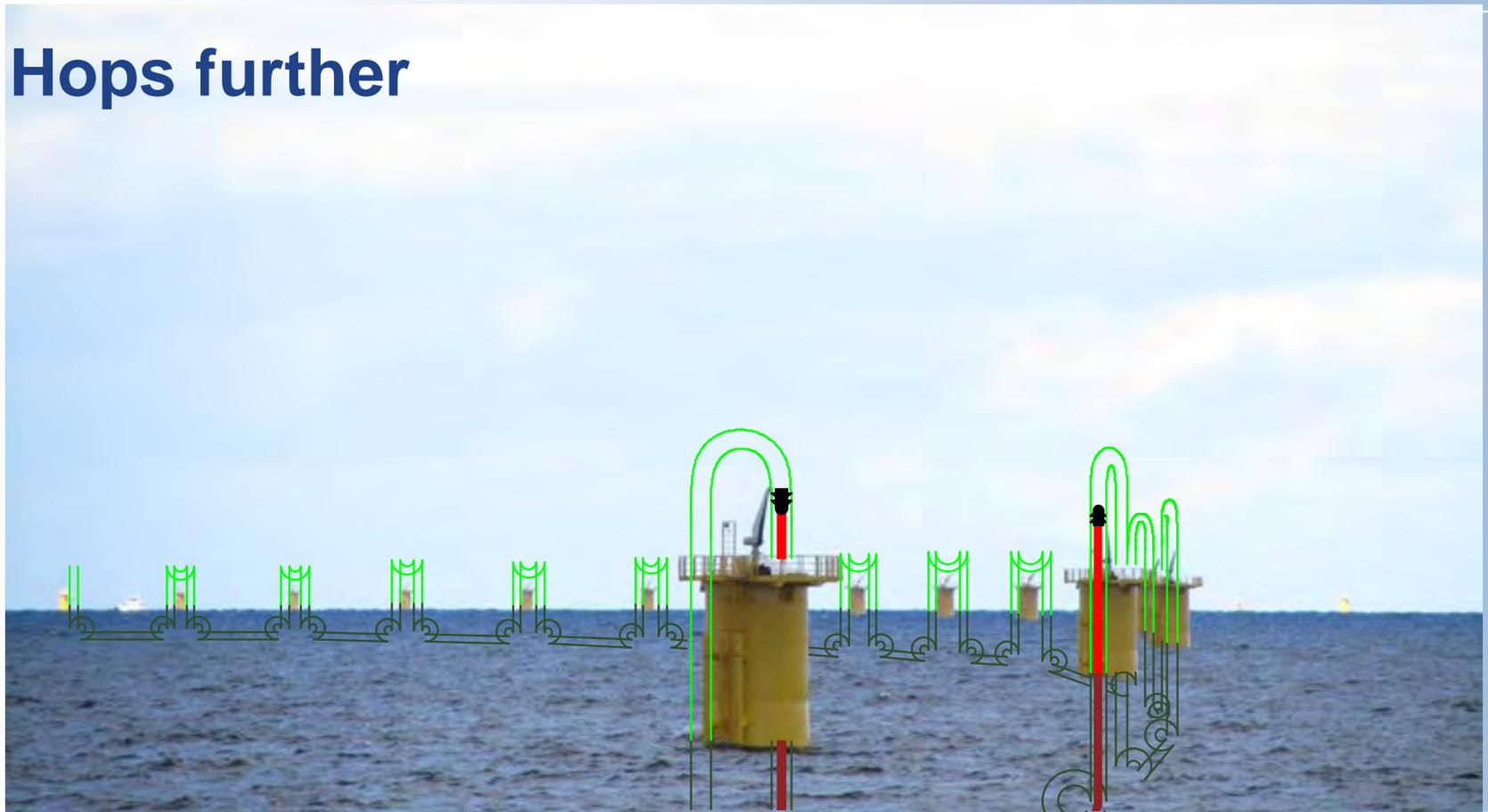
Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

1st cable FreeFloated



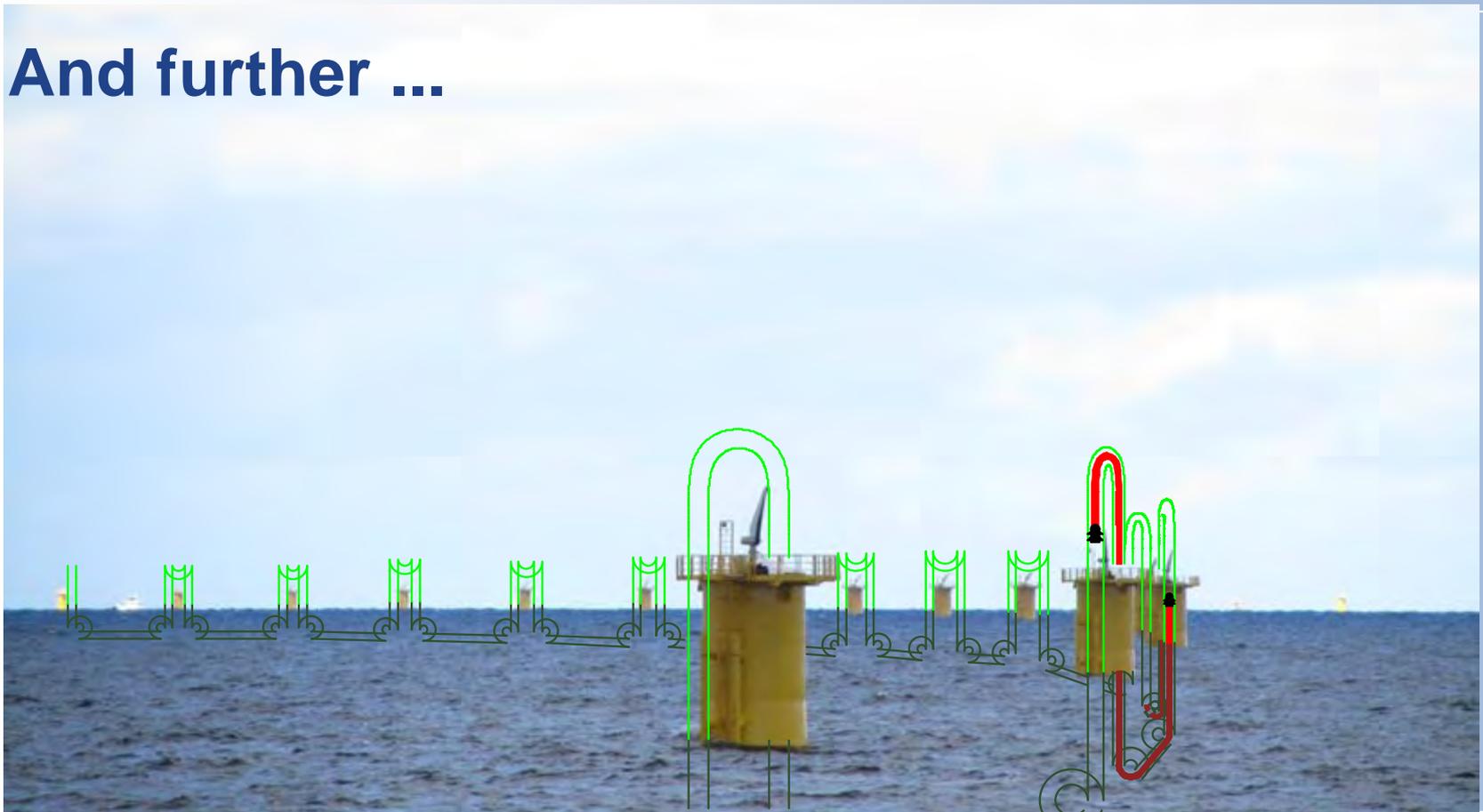
Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

Hops further



Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

And further ...



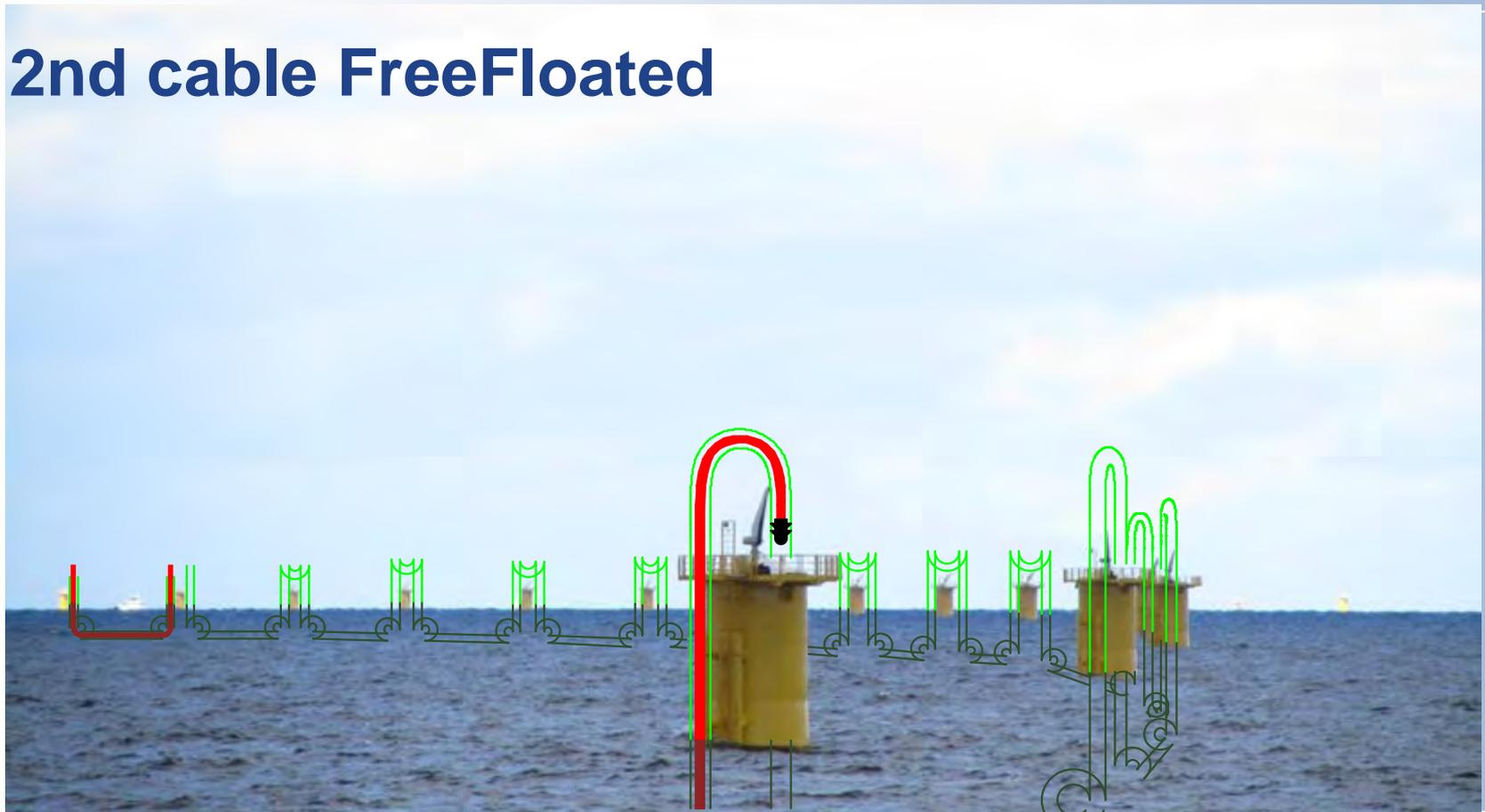
Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

1st cable arrived at destination



Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

2nd cable FreeFloated



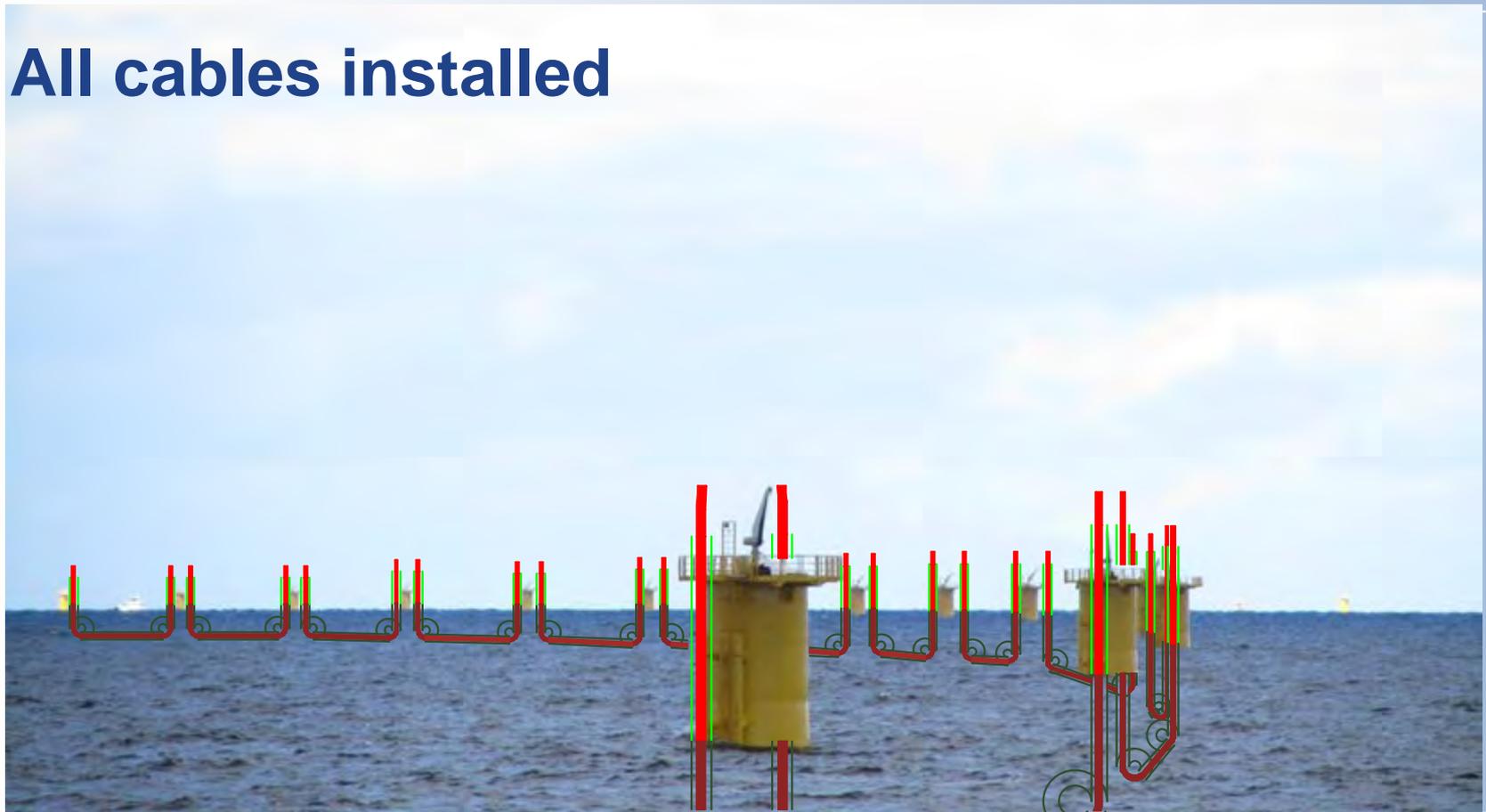
Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

2nd cable arrived at destination
3rd cable arrived at destination



Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

All cables installed



Projects, offshore, Nissum Bredning (Denmark) Remember "Nessie"?

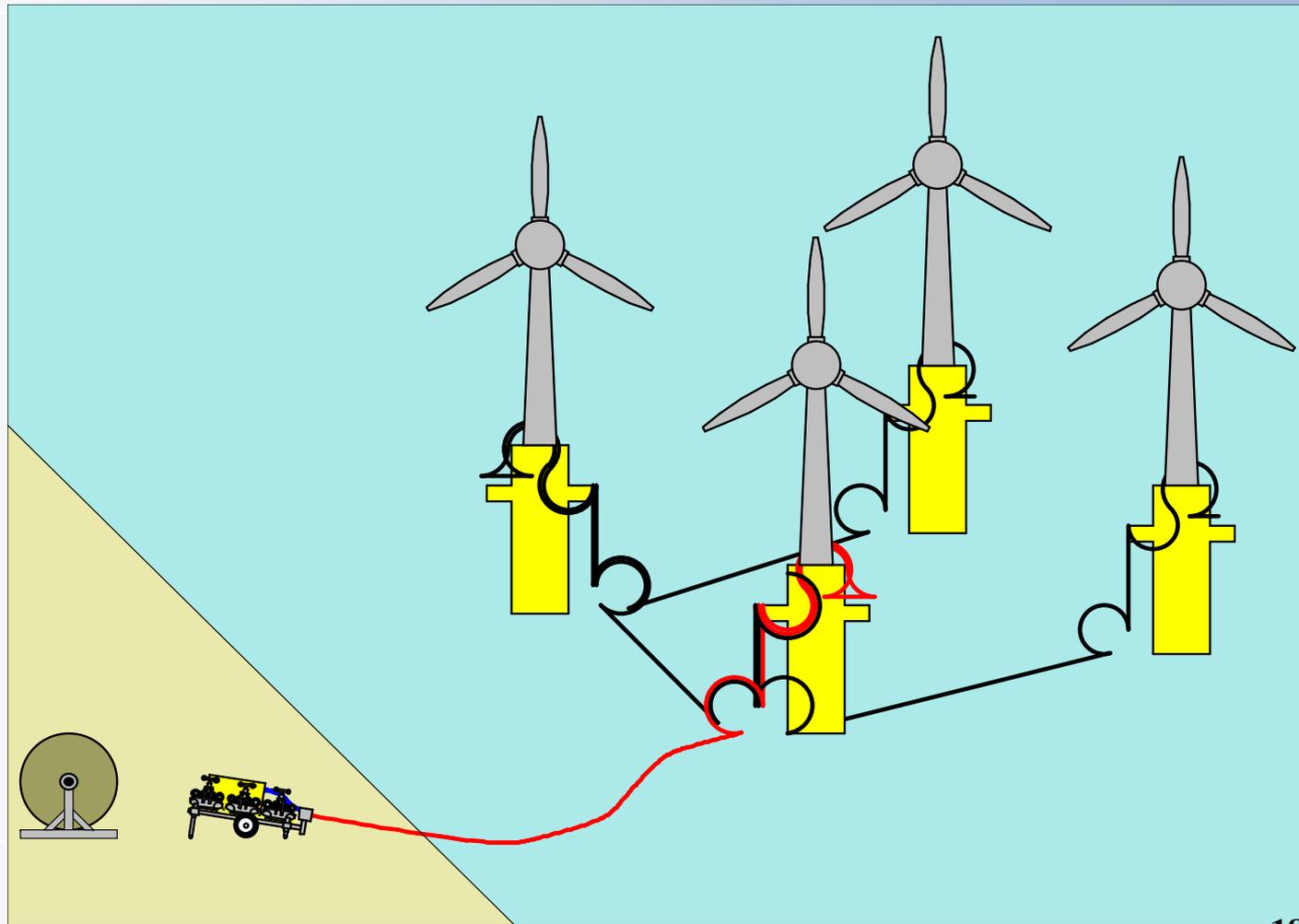
Energy supply can start



Projects, offshore, Nissum Bredning (Denmark)

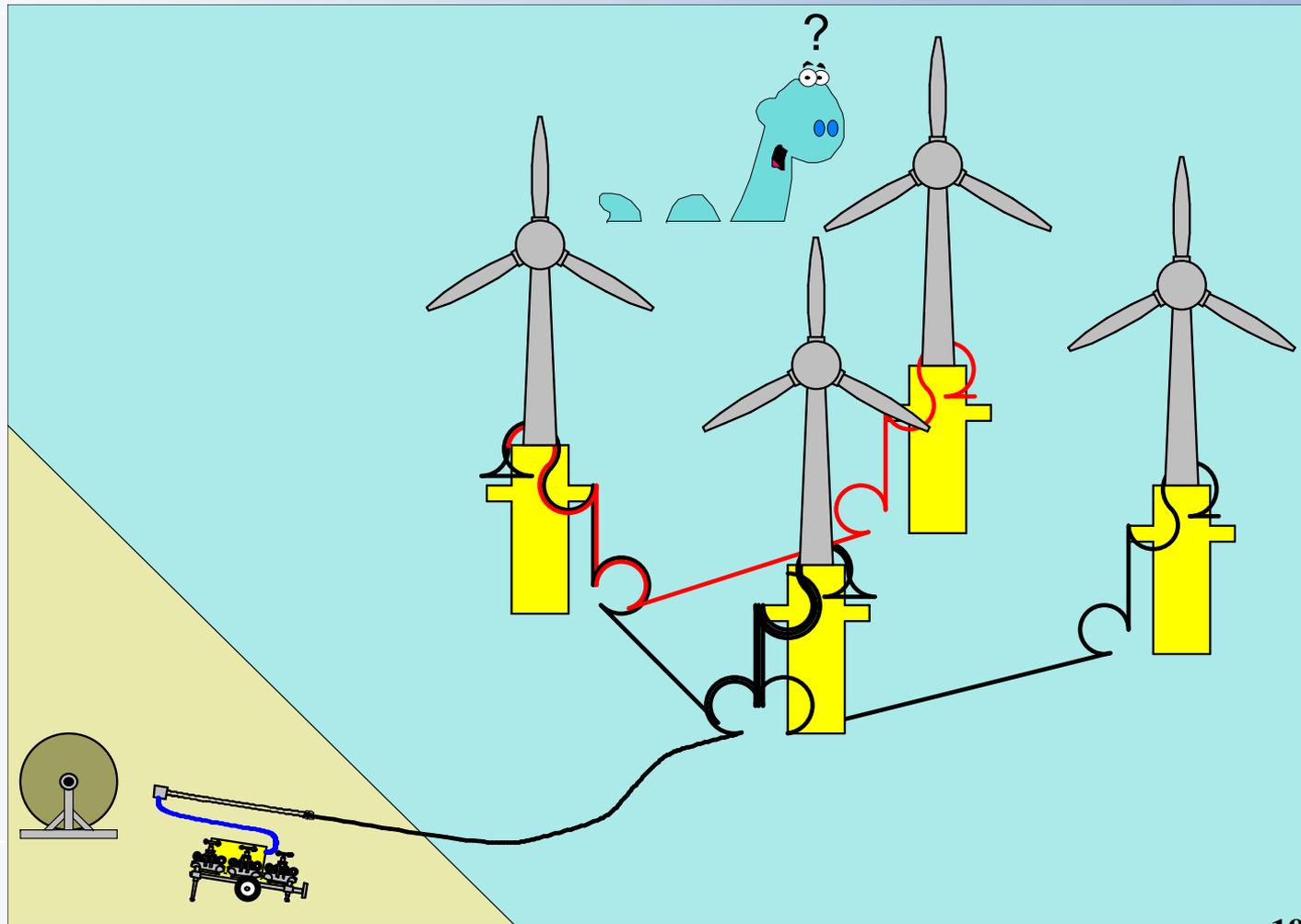
**Nessie:
not only
a legend!**

**Done in
Nissum
Bredning
project!**



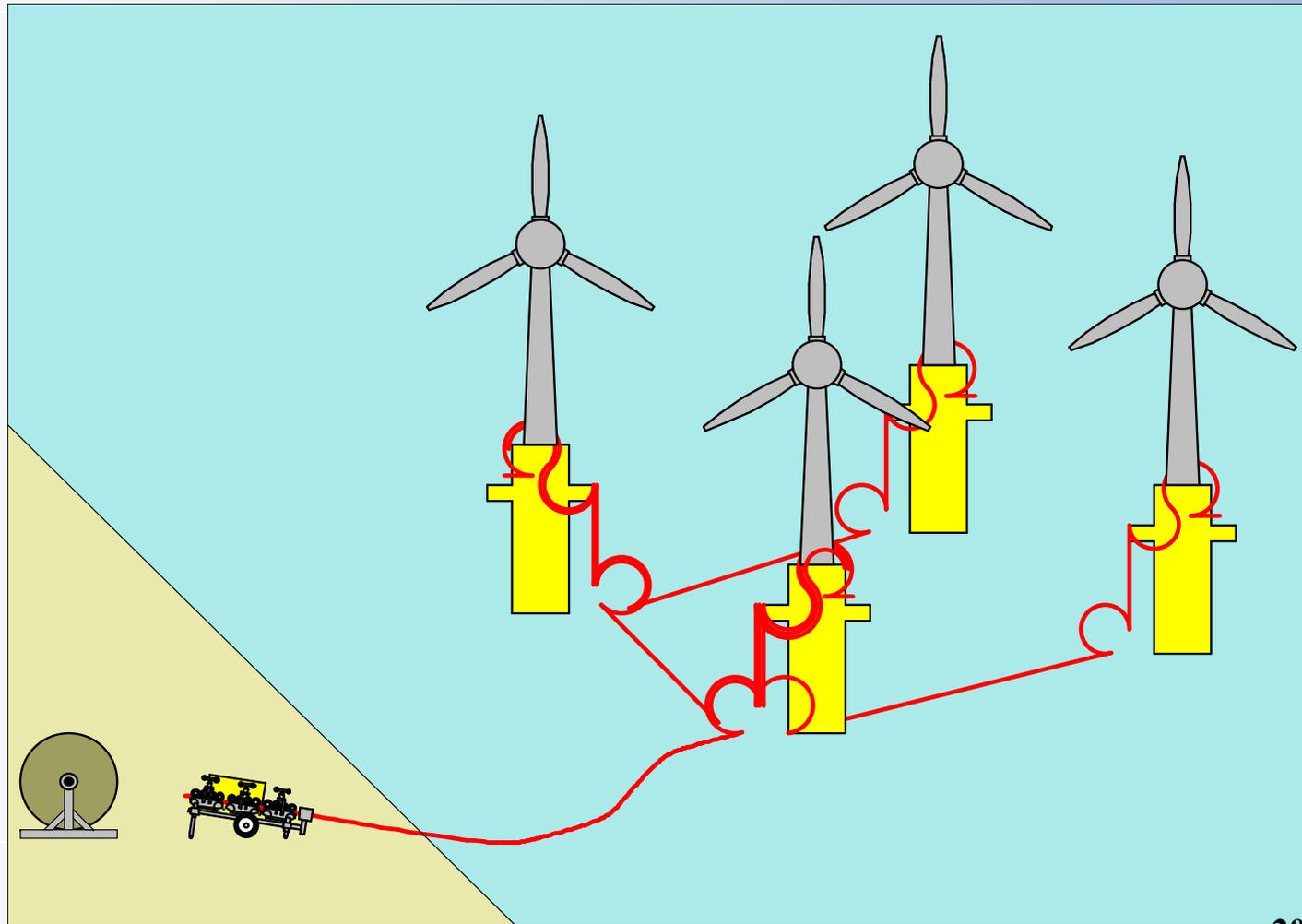
Projects, offshore, Nissum Bredning (Denmark)

**FreeFloat
to end,
2 loops**

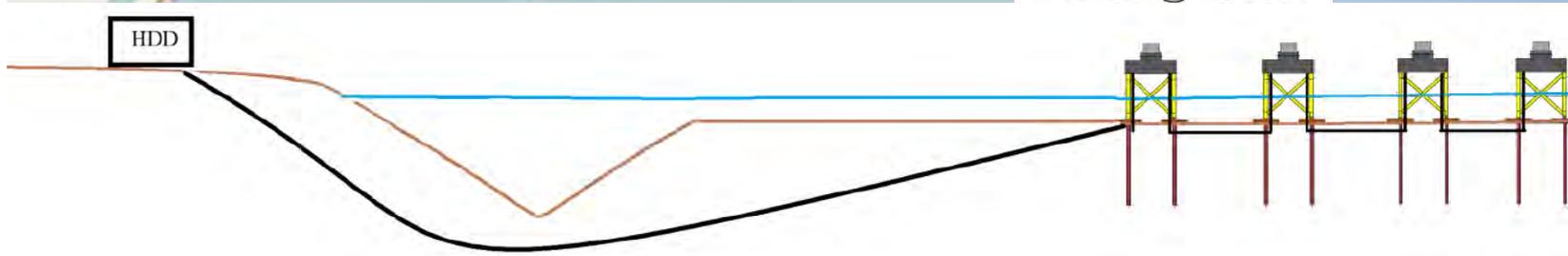
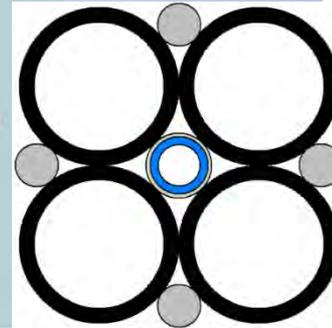
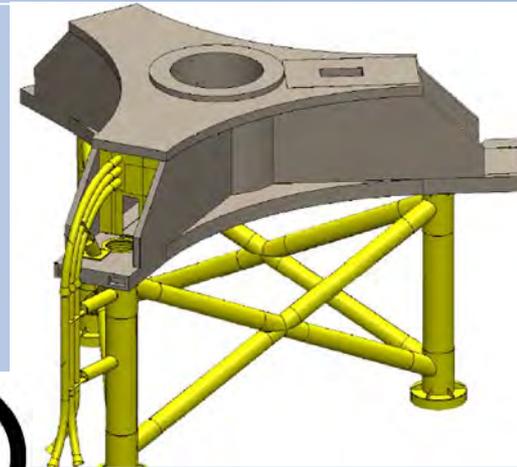
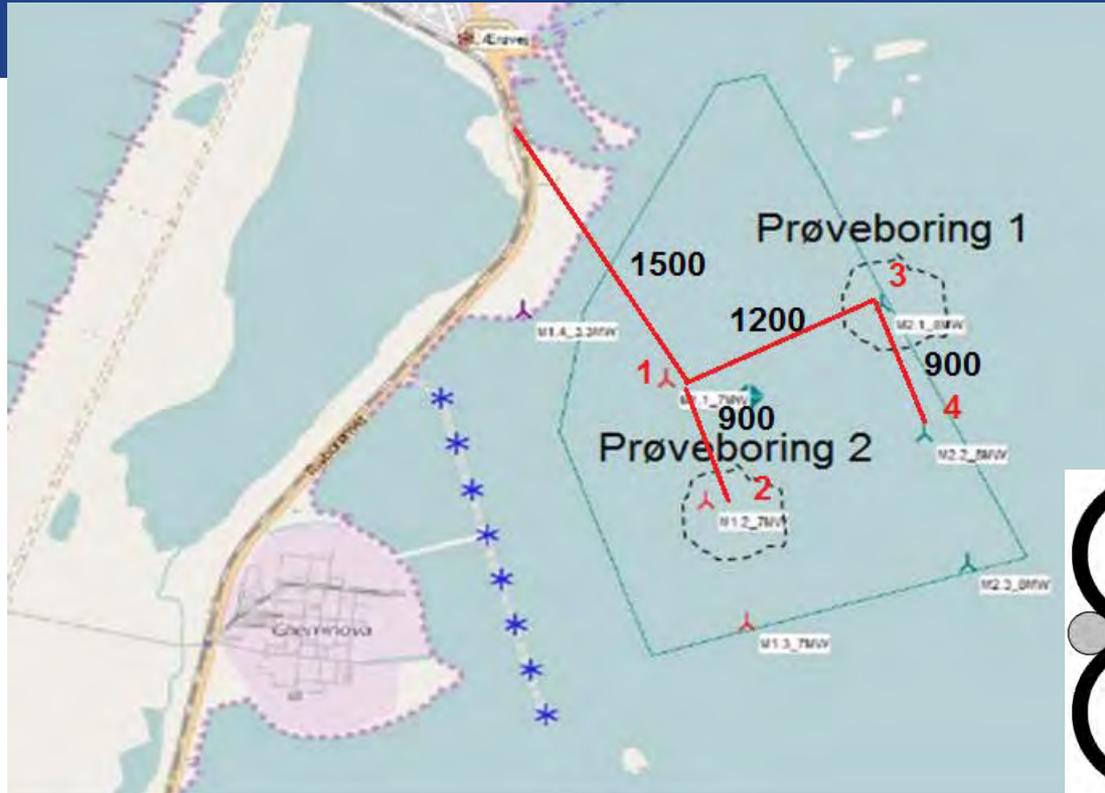


Projects, offshore, Nissum Bredning (Denmark)

Continue
rest



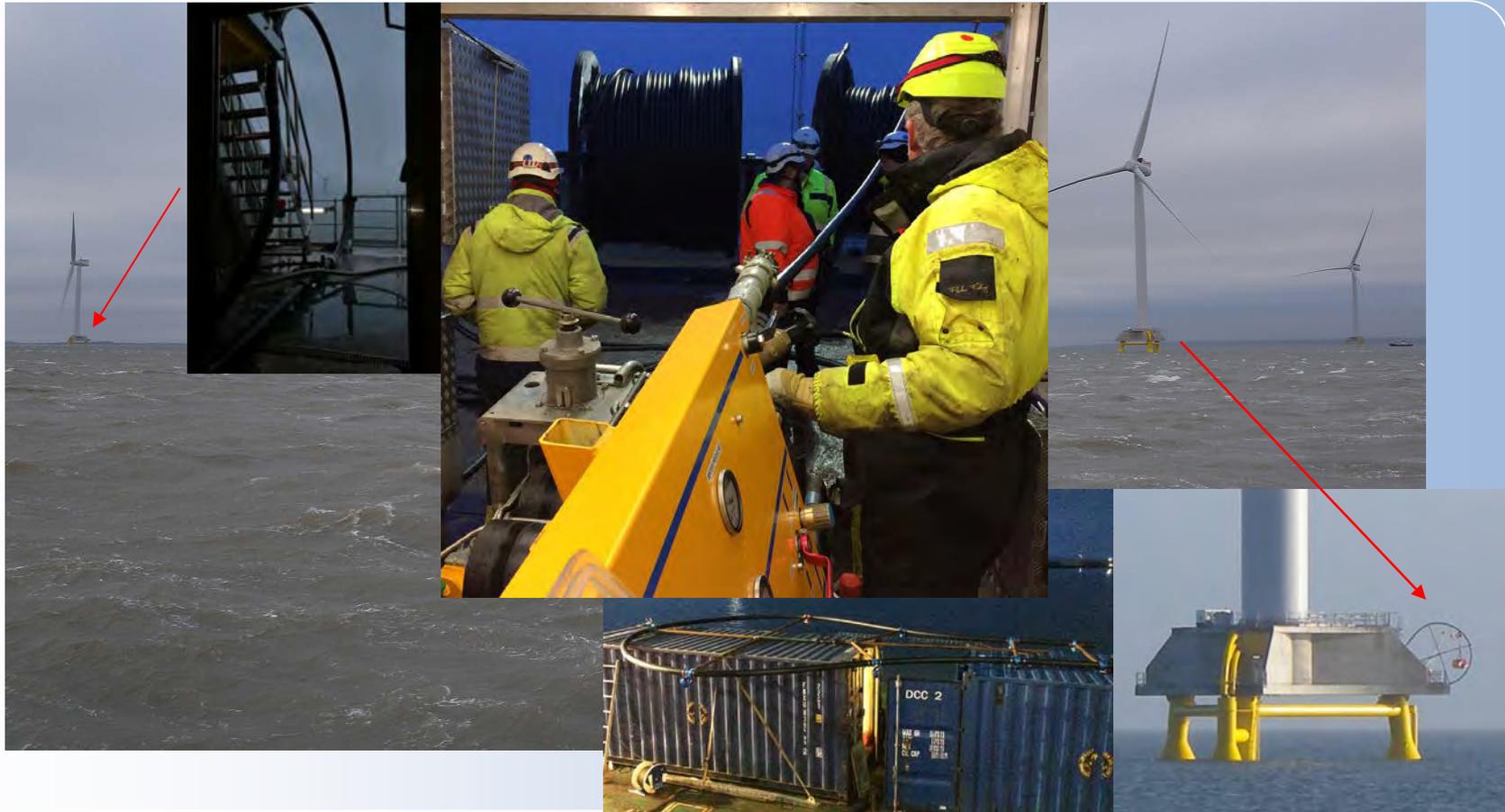
Projects, offshore, Nissum Bredning (Denmark)



Projects, offshore, Nissum Bredning (Denmark)

- **4 “nearshore” wind turbines, each 7 MW**
 - **Connection from land via HDD drill**
 - **Export and array cables the same**
 - **Duct bundle 4 × 110/90 mm, with steel ballast**
 - **Cables 72 kV, 68.1 mm, 4.6 kg/m, longest 1300 m**
 - **WaterPushPulling from land (export cables) and from sea (array cables)**
 - **FreeFloating from land (array cables)**
 - **Cable speed of 28 m/min reached!**
 - **Installed even with Beaufort windforce 8!**

Projects, offshore, Nissum Bredning (Denmark)



Projects, offshore, Nissum Bredning (Denmark)



FreeFloating

WaterPushPulling



Projects, offshore, Nissum Bredning (Denmark)

- **Advantages Cable in Pipe for Offshore**
 - Standard onshore cables on standard drums
 - Wider range of cable suppliers, cost reduction
 - Reduction in AC-losses (no steel armouring)
 - Pipe and cable can be installed with low cost vessels
 - Cable can also even be installed from shore
 - Trenching of pipe and cable less critical and can be done independent of other operations
 - Less (no) risk for cable damage during installation
 - Pipe damage easy to repair
 - Cable easily replaced when damaged in future

Conclusions

- **Both WaterPushPulling and FreeFloating (“Cable Tube Post”) proved to really work in 2 projects**
 - **Two subsequent sections in Copenhagen**
 - **Possibility to reach city center from convenient suburb location, without going there with material and labour**
 - **Offshore Windpark in Denmark**
 - **All cables could be installed from shore!**
 - **Was even be done at Beaufort windforce 8!**
 - **Costs and installation advantages Cable in Pipe for offshore**

Thanks for your attention

