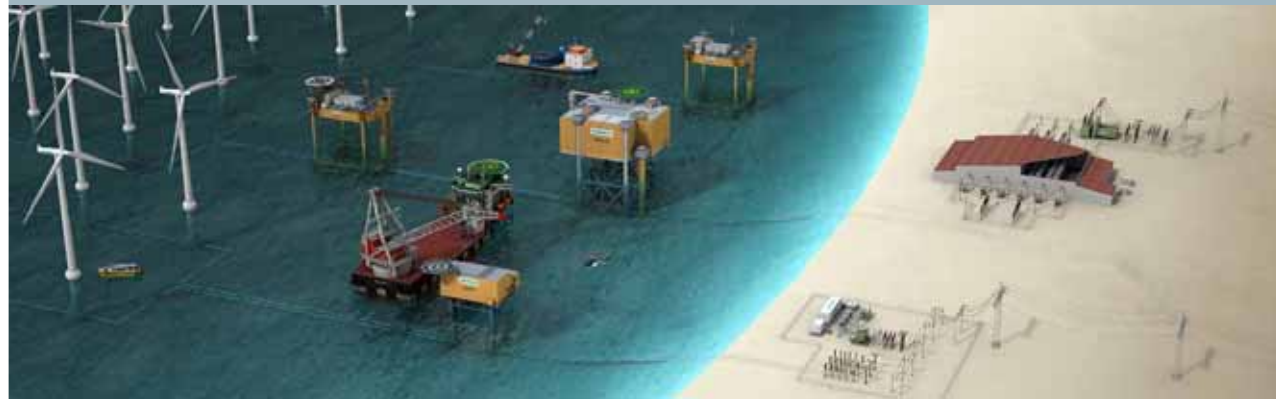


Matthew Knight,  
Head of Business Development  
[matthew.knight@siemens.com](mailto:matthew.knight@siemens.com)

## Wire Pipe Switch How hard can it be?



Siemens Transmission and Distribution Ltd.

7<sup>th</sup> October 2010

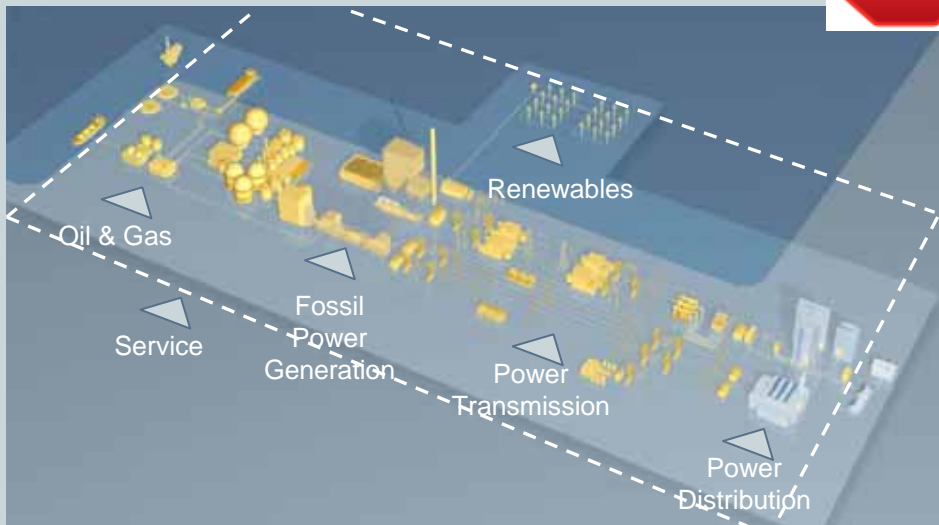
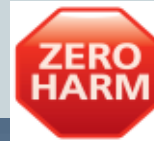
## Siemens and offshore wind

Siemens covers the energy value chain

We provide

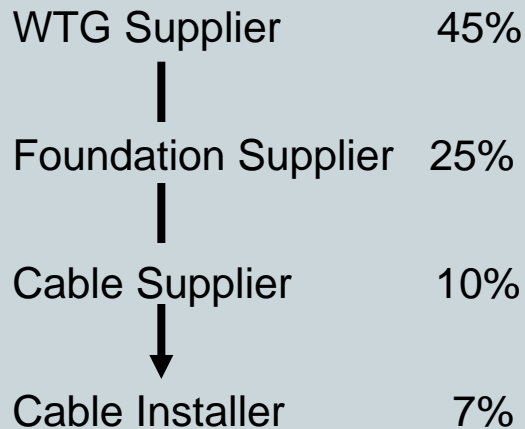
- Offshore wind turbines
- Offshore grid connections
- Offshore services
- Finance

*We don't make or install cables*



Siemens design-and-build offshore wind connections	
1	Lillgrund, Sweden 110 MW
2	Lynn/Inner Dowsing, UK 180 MW
3	Thanet, UK 300 MW
4	Greater Gabbard, UK 500 MW
5	London Array, UK 630 MW
6	Lincs, UK 270 MW
7	Gwynt y Môr, UK 576 MW
8	BorWin2, Germany 800 MW
9	HelWin1, Germany 576 MW

## Who designs the array cable access route?



7% of the Capex gives 80% of the insurance claims

A hospital building is much more expensive than the cardiologist who works there.

But if you get chest pains you don't phone a civil engineer

## A wire, a pipe and a switch

Getting from ——— to |

Installation needs to be

Quick

Flexible

Avoid undue wastage

Comply with consents

**Without compromise to the cable**

At minimum lifetime cost

(not the same as using lowest priced components)

### Challenges

- Bending radius
- Cable support
- Scour
- Solar gain
- Mechanical protection
- Pulling in
- Making off
- Terminating in a switch where you can 'prove dead'



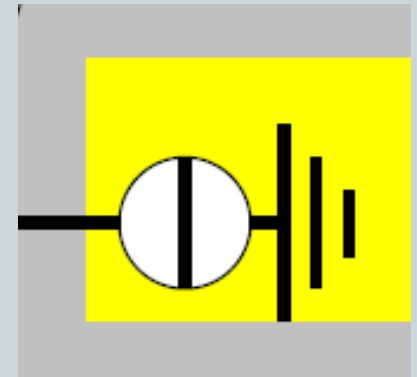
Horns Rev 1

**Q: When is a substation not a substation?**



**A: Never!**

## Separable Connectors



UK Electricity Distribution Safety Rules require an Authorised Person to prove dead at the point of work before carrying out work on a cable.

Separable connectors are designed to be attached to electrical plant

They are not suitable for bodging a connection between cables

## Design Principles

Terminate in something you can prove dead

Do whatever you can onshore

- Pre-made, pre-tested
- think solutions not components



Armoured subsea cable is heavy and hard to bend

- So hang off and terminate before you bend it
- As close to sea level as possible

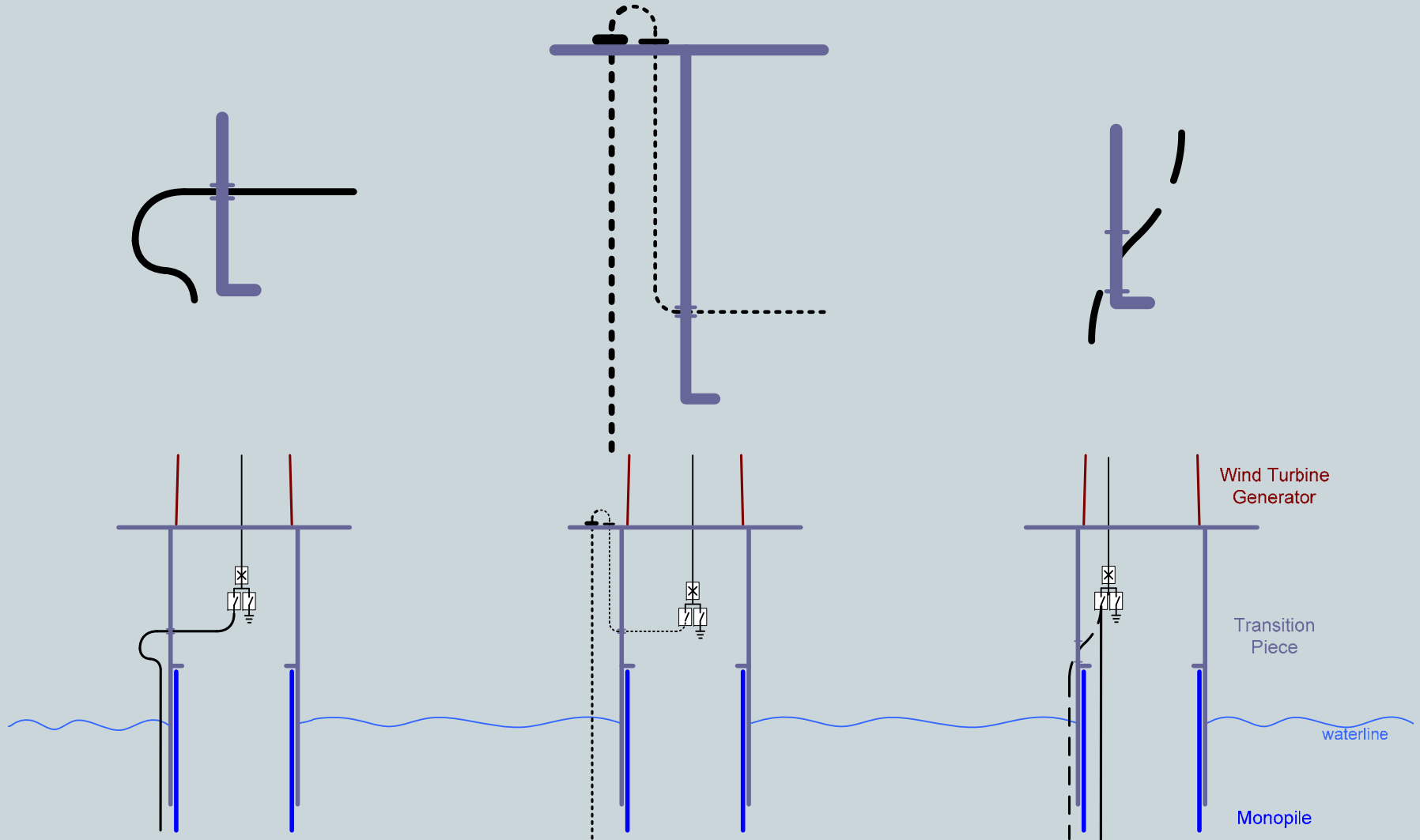
Energise the array before the wind turbines arrive

Reassess the value of availability

- Consider operational costs and lost revenue when deciding between rings or radial

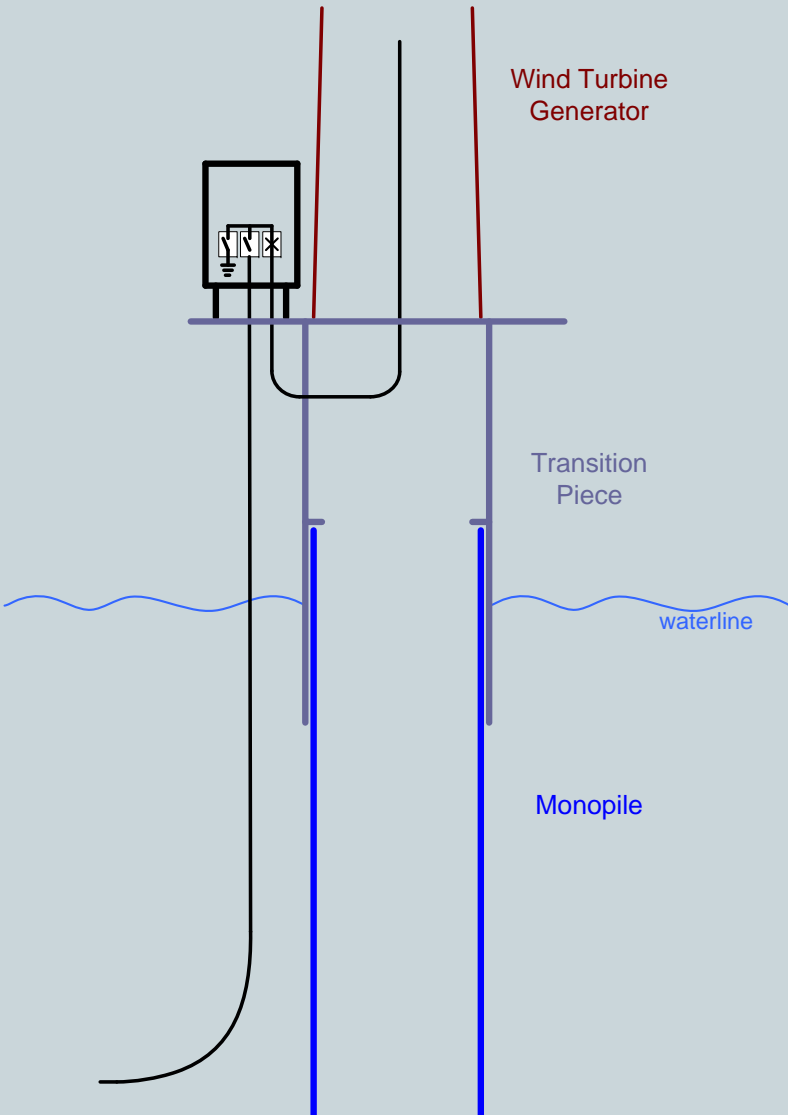


## Cable route options



# Externally Mounted Switchgear

- Greater independence from WTG
- Simple cable installation
- Much simpler interfaces
- Just in time delivery when cables are ready
- Easy access to switchgear
- Easy fault replacement
- Good environmental design vital
- Could even include transformer



## I am no expert but..

If you don't know ask someone who does

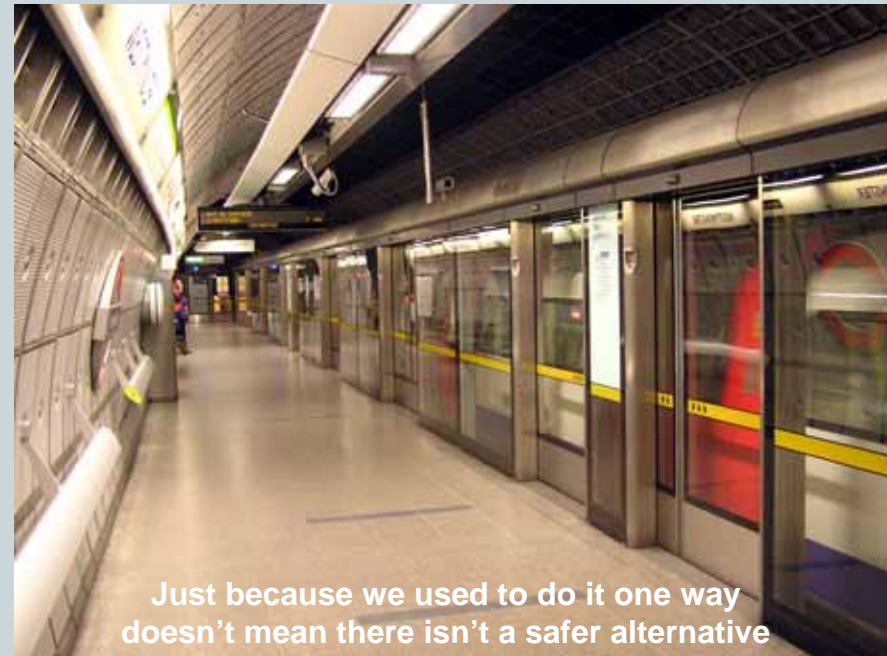
Check that they really do know

The cheapest component is not the same as the least lifetime cost solution

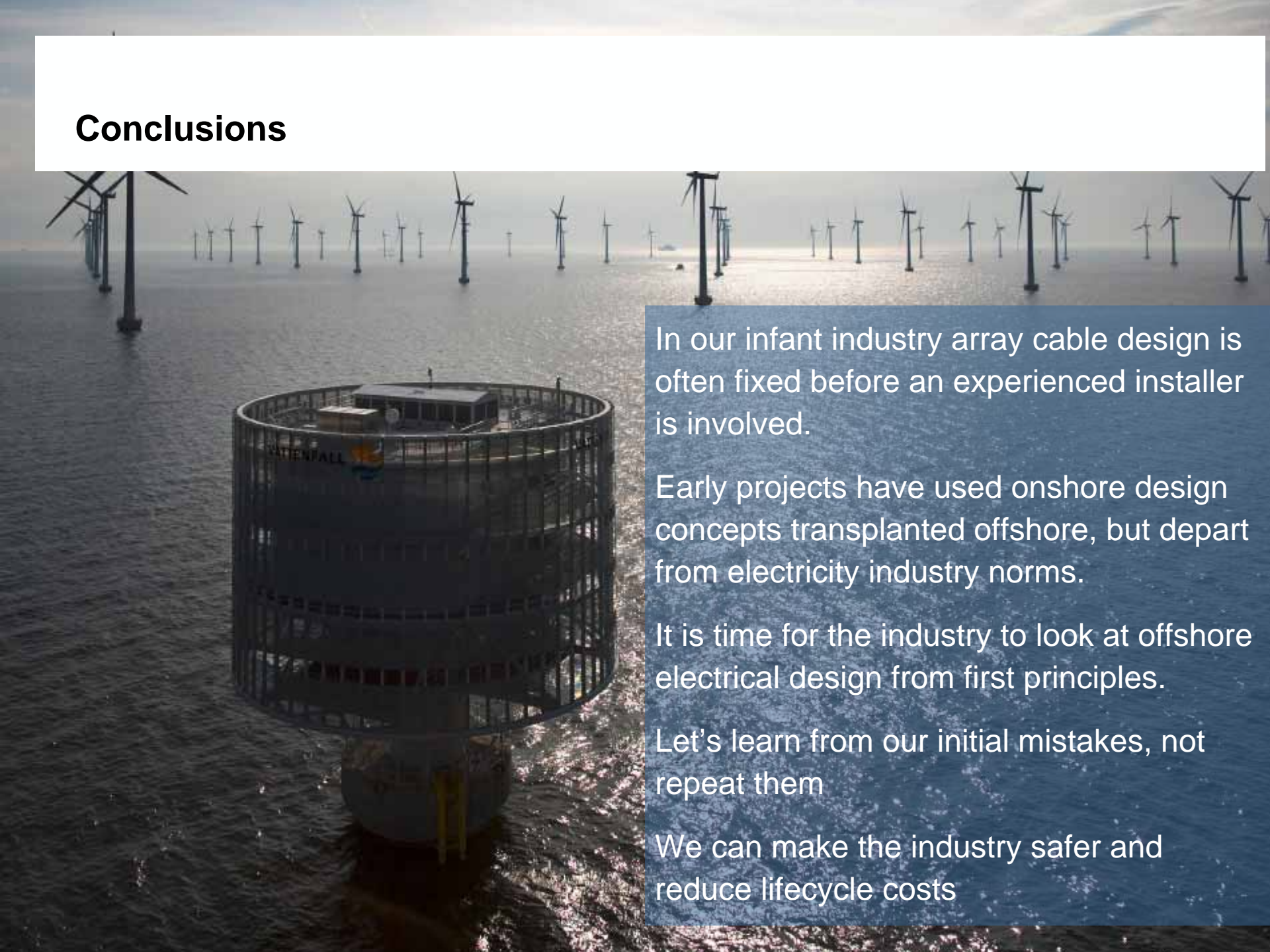
I know we can make array cabling simpler and safer

I believe we can also increase availability and reduce lifetime cost

Let's use the work of the Carbon Trust to find best practice



## Conclusions

An aerial photograph of an offshore wind farm. In the foreground, a large, cylindrical metal substation platform is visible, with the name 'WATFALL' and a logo on its side. The platform is situated in the middle of the ocean. In the background, a long line of wind turbines extends across the horizon under a clear sky.

In our infant industry array cable design is often fixed before an experienced installer is involved.

Early projects have used onshore design concepts transplanted offshore, but depart from electricity industry norms.

It is time for the industry to look at offshore electrical design from first principles.

Let's learn from our initial mistakes, not repeat them

We can make the industry safer and reduce lifecycle costs