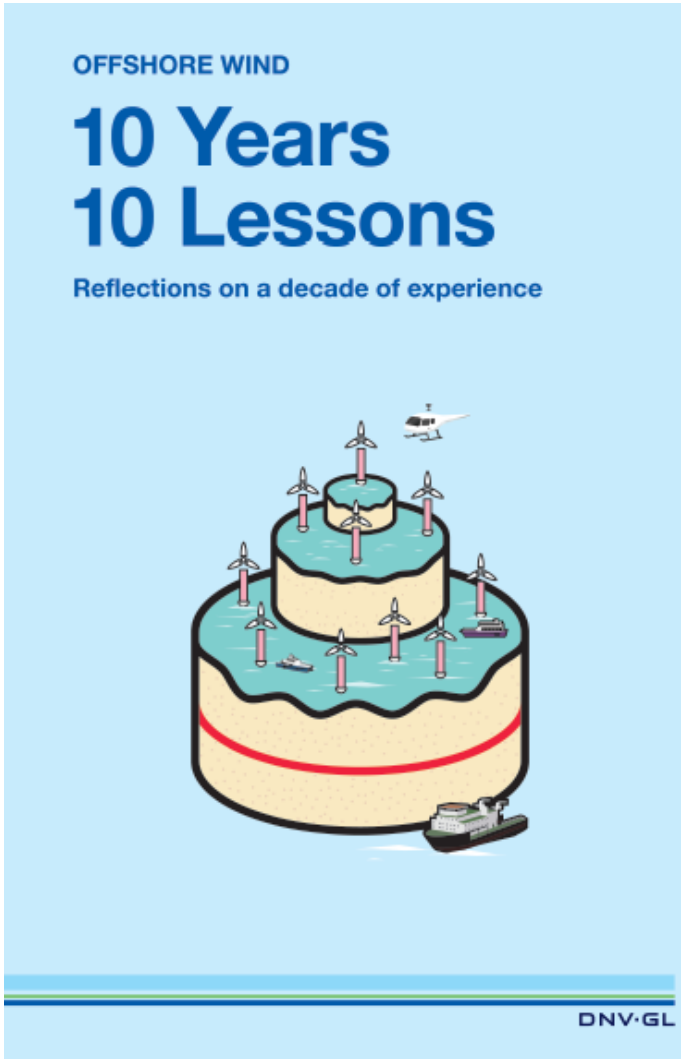
ENERGY

UK (and other European experience in offshore wind)

- reflections on a decade of experience

19 May 2014

10 Years, 10 Lessons



10 Years, 10 Lessons – 10 Minutes!

1

Politics: Energy is political

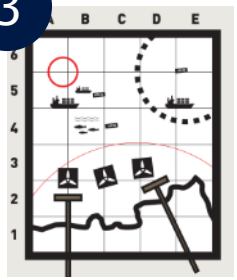
Offshore wind has a great story to tell. We need to make sure it's told.

2

Predicting the future: Get real

Offshore wind may fall short of unrealistic forecasts, but it can still deliver.

3



Spatial planning: Be strategic

Doing new things in the sea will cause tensions – understanding and predicting them is crucial to the success of offshore wind.

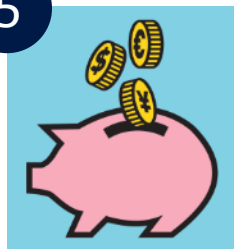
10 Years, 10 Lessons – 10 Minutes!

4

Costs: Innocence, arrogance and better offers

When dealing with new, bespoke engineering, learning curves do not tell the whole story.

5



Finance: Strength through diversity

Financial innovation in offshore wind may lag behind the engineering, but it is happening.

6

Contract management: A multi-dimensional puzzle

Offshore wind contracting is complex and clear management is more important than ever.

10 Years, 10 Lessons – 10 Minutes!

7

Construction: The value of experience

When it comes to constructing offshore wind farms, there is no substitute for hands-on experience.

8

Wind turbines: Innovation through integration

The most important lesson from 30 years of wind turbine design is that components work best when they work together.

9

Safety: A safe environment starts with transparency

An open-book approach to offshore safety is the best way to protect the people building offshore wind farms.

10 Years, 10 Lessons – 10 Minutes!

10

The future: Floating over the horizon

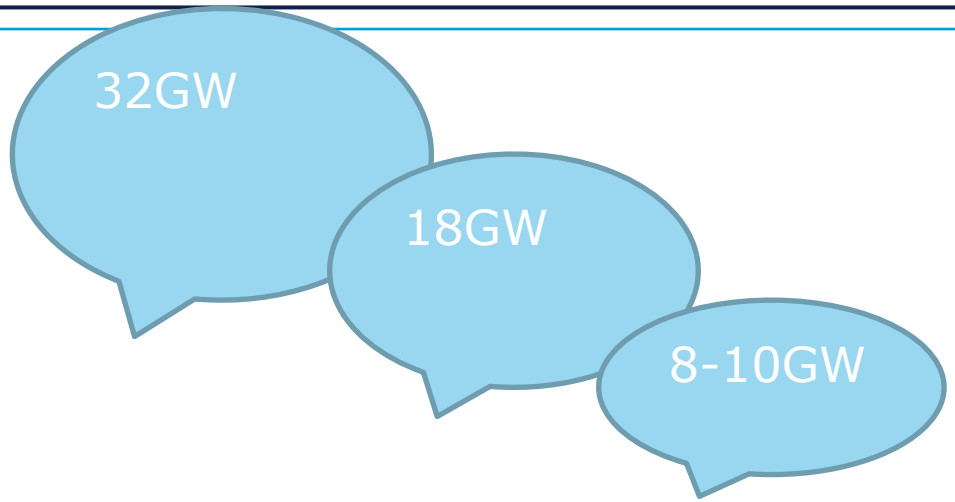
Wind energy has always been about thinking differently; floating turbines have the potential to open up a whole new realm.

Politics: Energy is political

Deployment and investment occurs where political noises remain consistently positive over the course of many years.

Predicting the future: get real

By 2020 we will have:

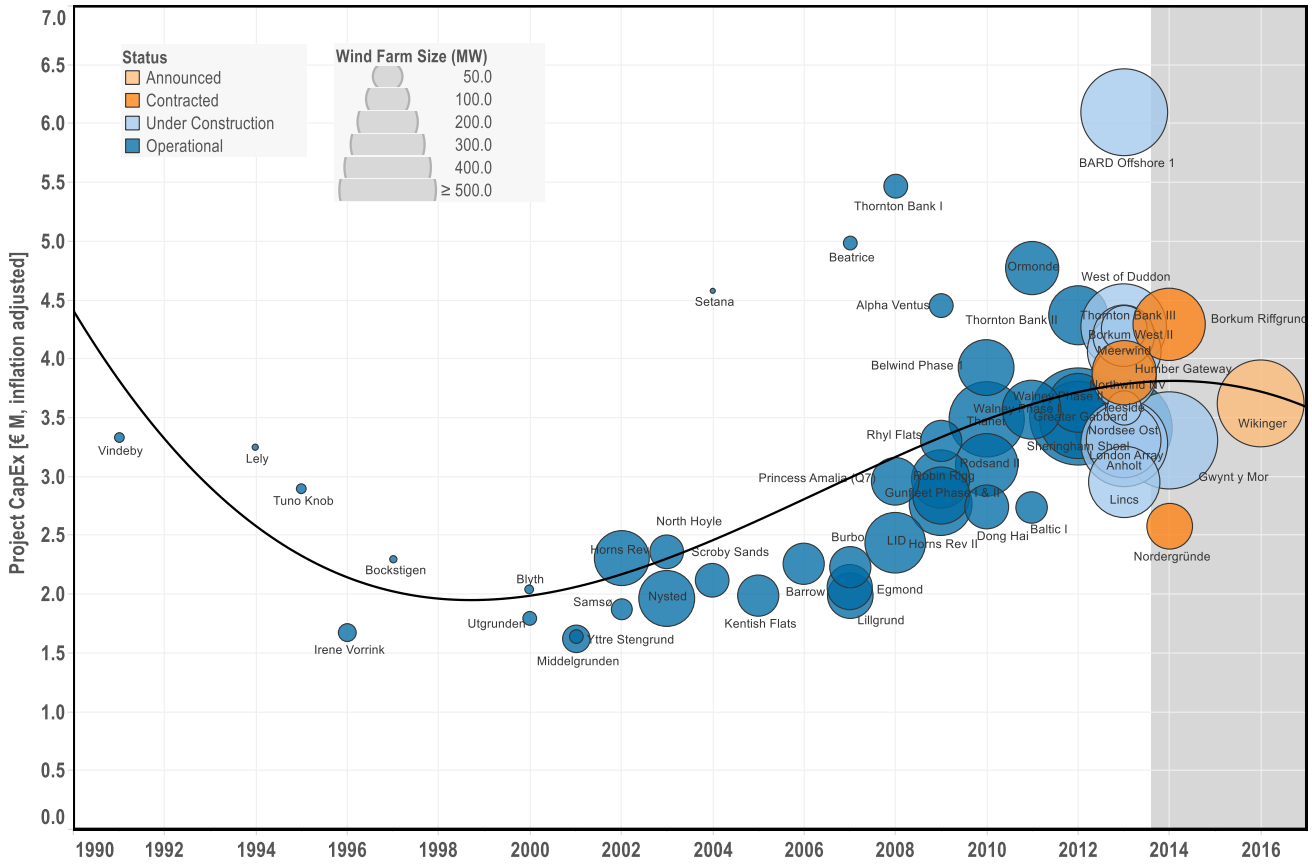


Offshore wind has fallen consistently short of predictions…but this is as much to do with forecasts as the reality of building wind farms.

In 2003, we predicted an all-or-nothing affair, fizzle or skyrocket – are we doing the same again today?

Costs: Innocence, arrogance and better offers

Offshore costs over the last decade have confounded learning curve theory – but industry is now truly starting to understand both costs and risks.



2000-2004: competition for early mover advantage, lack of expertise.

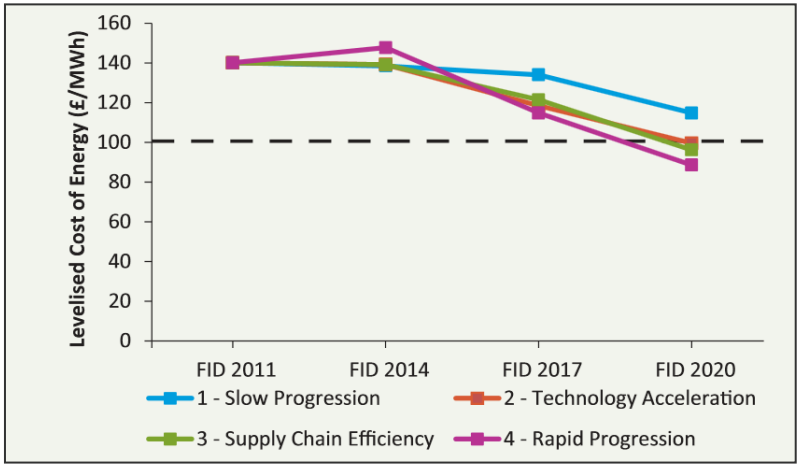
2004-2010: Price readjustment, onshore boom and commodity pricing.

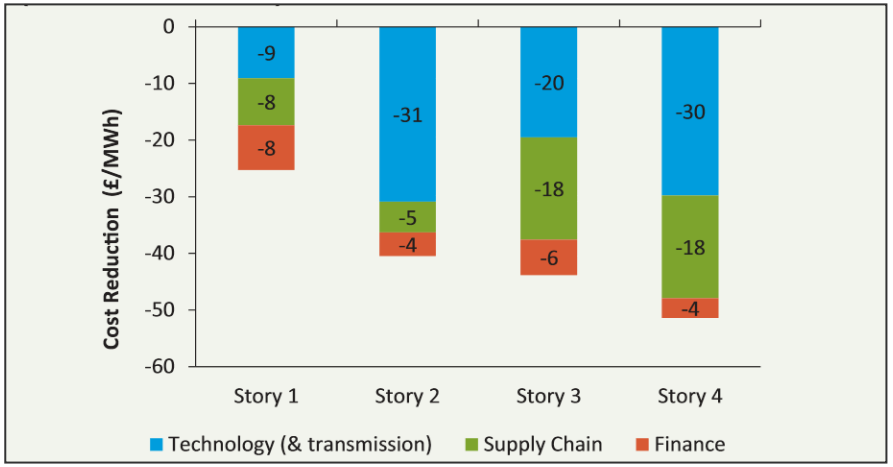
2010- : Turbine supply-demand rebalance, competitive procurement, supply chain growth.

Costs: Innocence, arrogance and better offers

The Grand Economic Bargain

Governments have pledged to support offshore wind through premium energy pricing in exchange for industry substantially lowering the cost of energy.



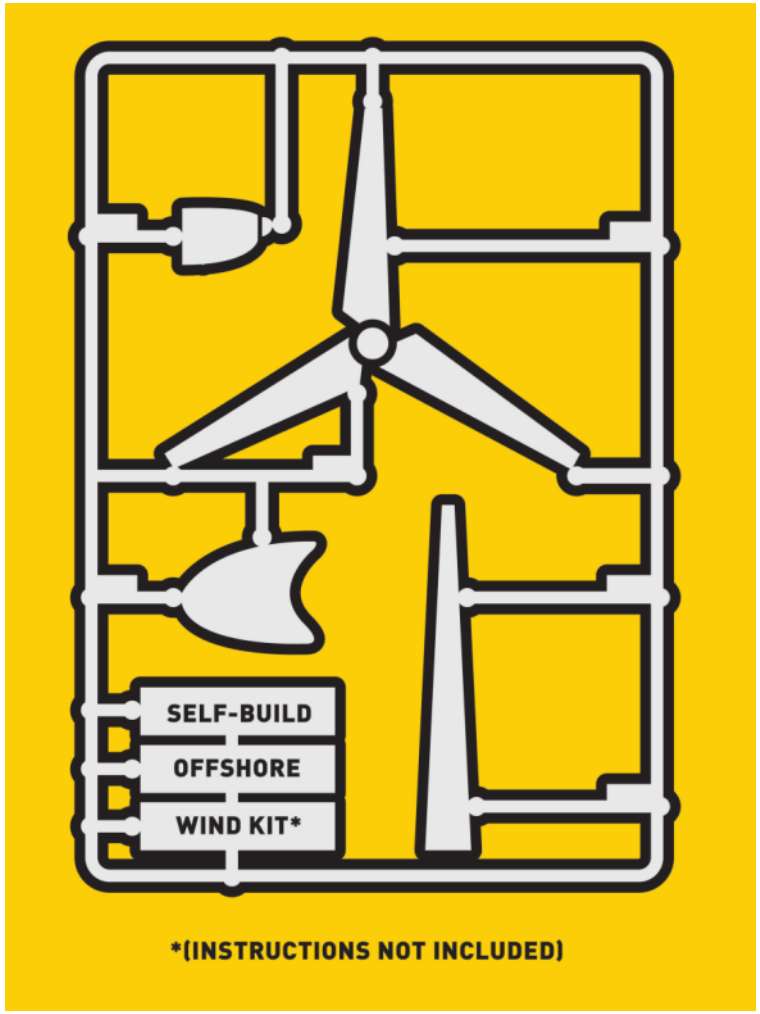


Are we doing enough to live up to our end of the bargain? Is Government?

Construction: A multi-dimensional puzzle

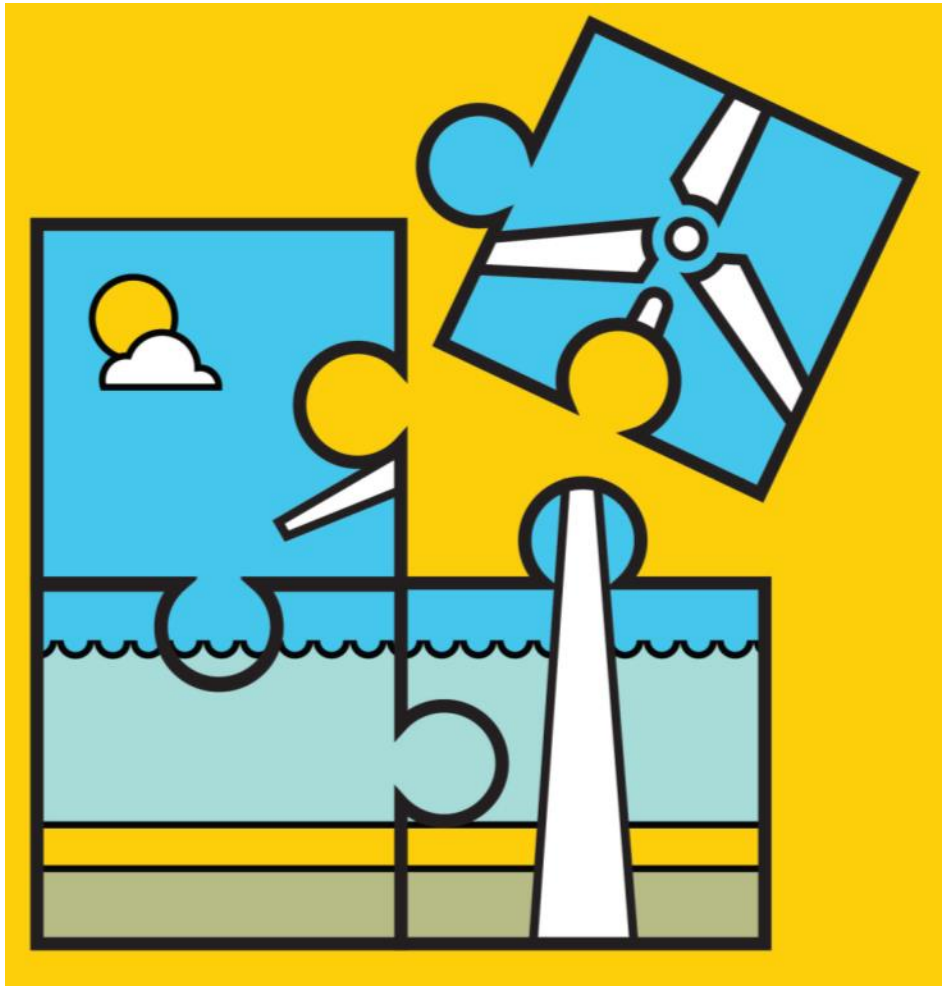
- Offshore wind contracting is **complex**
- Project management should ensure that there are **no gaps** or **overlaps**
- Failing to meet promises **damages trust** and reduces confidence
- Multi-contracting is **here to stay**
- Success will come from **squarely facing** up to **complexity**
- **Model** 10^6, Do 10^0

Construction: The value of experience



- Offshore engineering is always a challenge
- 'Learning by doing' has built up a substantial body of expertise in Europe
- Problems can be avoided by carrying out upfront work
- Use people who have 'been there and done that'

Wind turbines : Innovation through Integration



- Understand the loading – **make measurements**
- Develop **integrated** industry **standards** based on this
- Develop and **validate integrated** numerical **models**
- Testing of components in **integrated** test facilities
- Difficult, time consuming and expensive…..crucial!

The future is bright: the future is floating

- US, Canada, Brazil and Japan have 7,000GW potential
- Low day rate for installation vessels
- Commissioning in sheltered waters
- Potential for lower construction risk
- Reduced cost of weather
- Cheaper O+M
- No piling
- Greater scope for modularisation
- High learning rates

Floating wind could tear up the rule book and make offshore wind a truly global technology.

Colin Morgan
Colin.morgan@dnvgl.com
+44 117 972 9900

www.dnvgl.com

SAFER, SMARTER, GREENER