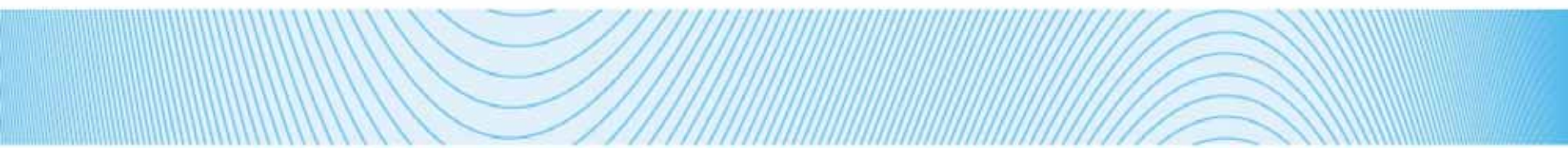


# The Offshore Valuation

A valuation of the UK's offshore renewable energy resource





**What is the value  
of our offshore  
renewable energy  
resource?**

# The Offshore Valuation Group

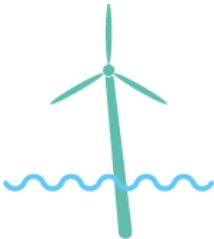
1. The Department of Energy & Climate Change
2. The Scottish Government
3. The Welsh Assembly Government
4. The Crown Estate
5. Energy Technologies Institute
6. Public Interest Research Centre
7. Scottish & Southern Energy
8. RWE Innogy
9. E.ON
10. DONG Energy
11. Statoil
12. Mainstream Renewable Power
13. Renewable Energy Systems
14. Vestas



# The Offshore Valuation Group



Fixed  
Wind



Floating  
Wind



Tidal  
Stream



Tidal  
Range



Wave



**What is the value  
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# The Offshore Valuation Group



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# Approach

- **Five offshore renewable technologies**
- **High level analysis**
- **Drawing on existing research and expertise**
- **Common appraisal of practical resource**
- **Long term, European viewpoint**

the electricity **equivalent of 1 billion barrels of oil** could be generated annually, matching North Sea oil and gas production and making Britain a net electricity exporter;

**carbon dioxide reductions of 1.1 billion tonnes** would be achieved by the UK between 2010 and 2050 – a major contribution towards 2050 climate targets;

**145,000 new UK jobs** could be  
created by industry

# Key Enablers

- **Make Round 3 grid connections ‘super-grid compliant’**
- **Take a leadership role in the current EU super-grid negotiations**
- **Continue to develop the UK supply chain**
- **Evaluate and where appropriate, facilitate new financing structures**

# Electricity demand over time

- Underlying demand growth driven by GDP
- 10-30% reduction due to energy efficiency
- Partial electrification of transport & heat to reach 2050 targets
- ~75% decarbonisation by 2030; near 100% by 2050

**Central scenario: 75% increase in demand**

# Practical resource sets an upper bound on deployment



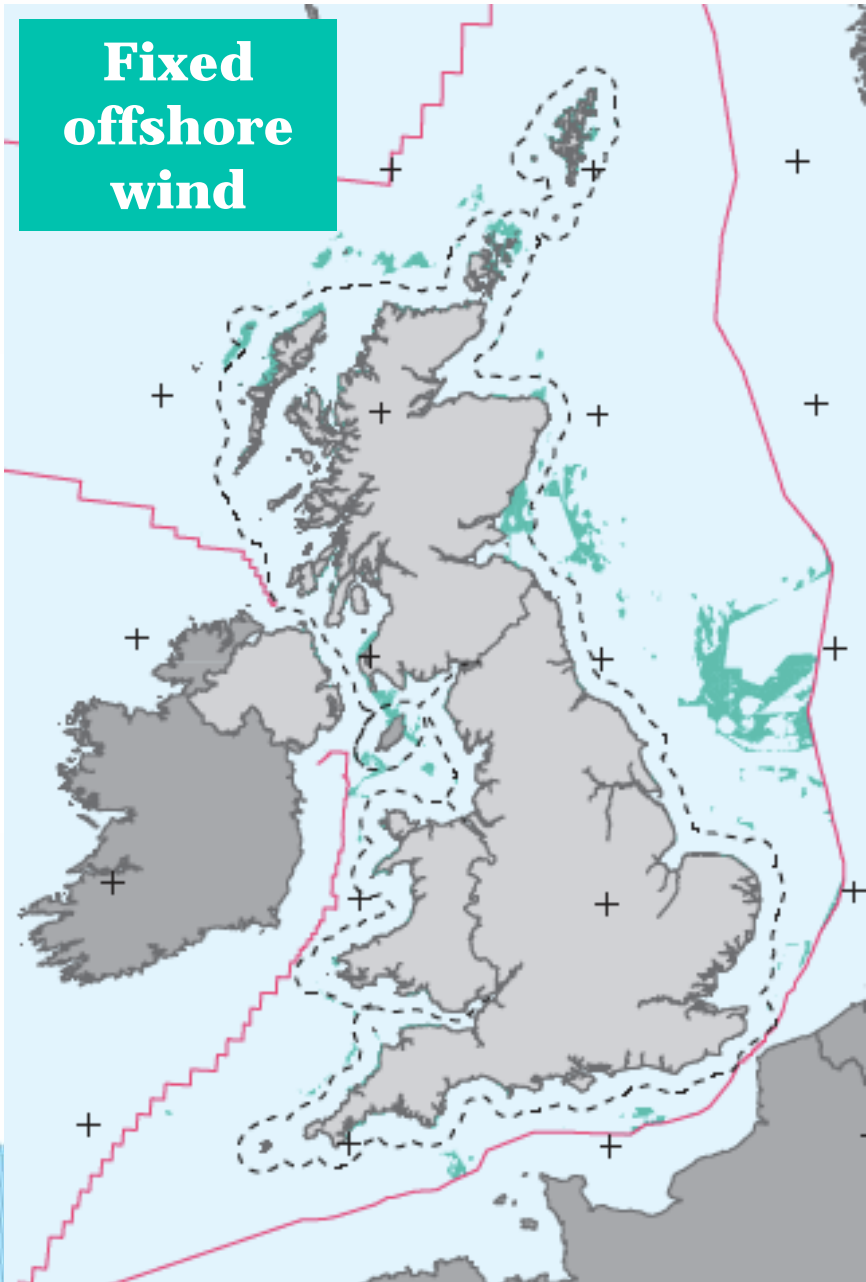
Theoretical

Technical

Practical

Economic

**Fixed offshore wind**



**Floating offshore wind**



# Wave resource

**Theoretical  
resource**

1,000km  
40 kW/m

**350 TWh**

**Technical  
resource**

Conversion  
efficiencies

**70 – 105 TWh**

**Practical  
resource**

Practical  
constraints and  
frequency losses

**~ 40 TWh**

# Tidal stream resource

**Shallow Wave**

**Bottom  
Friction**

**Farm method**

**Kinetic  
Energy Flux**

Closest fit with  
approach used  
for other  
technologies

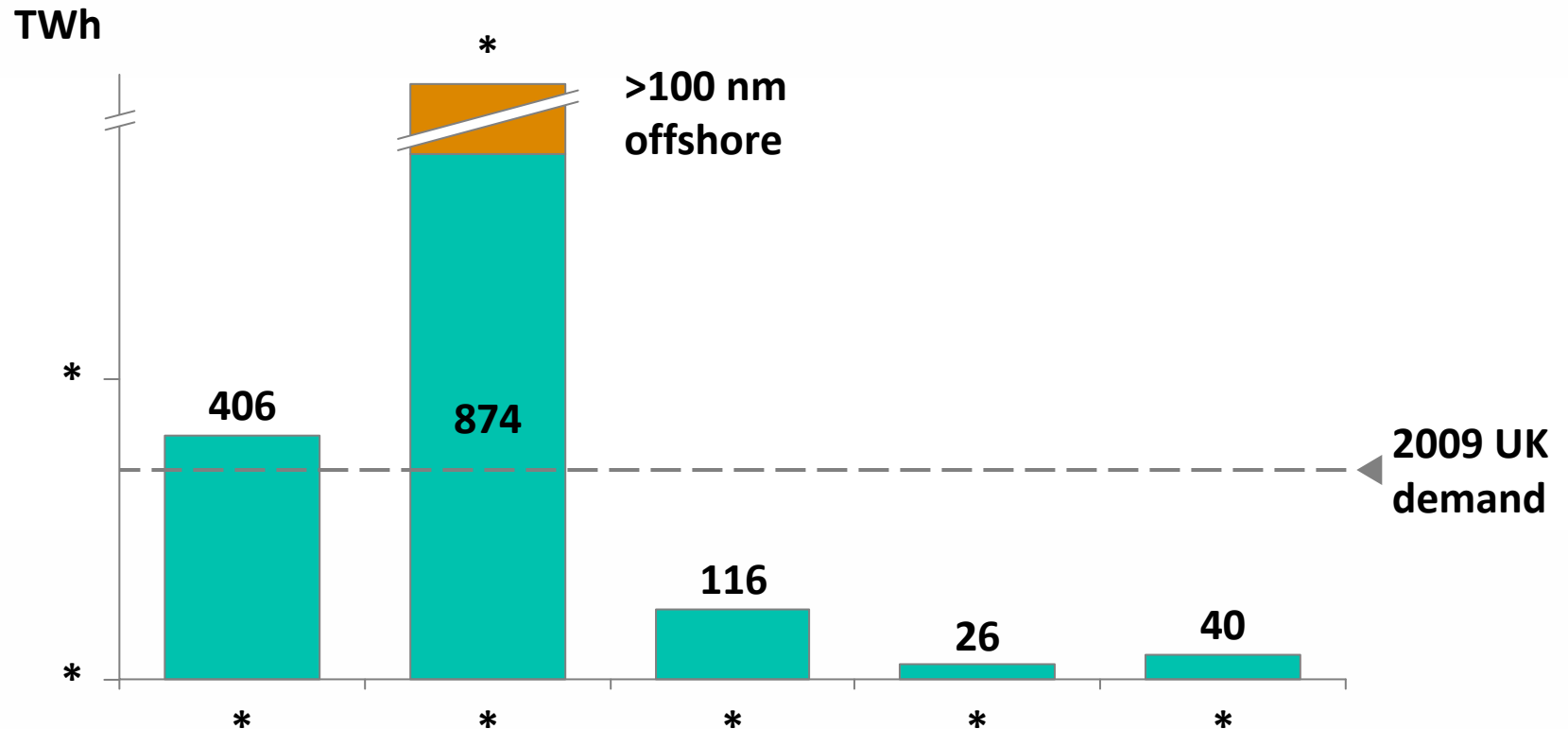


**Practical  
resource**

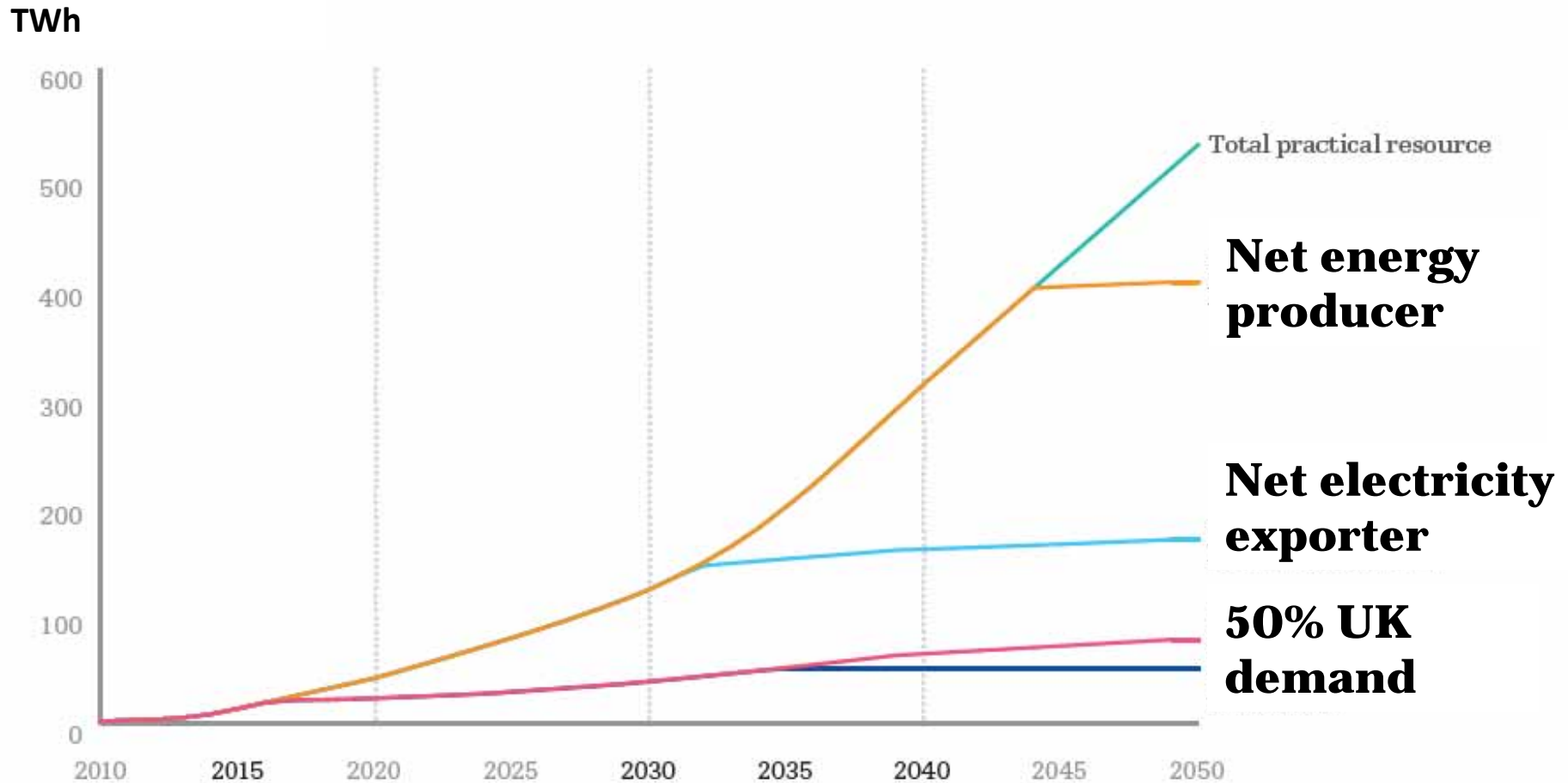
Water depth  
Flow speed  
Power density  
Constraints

**~ 116 TWh**

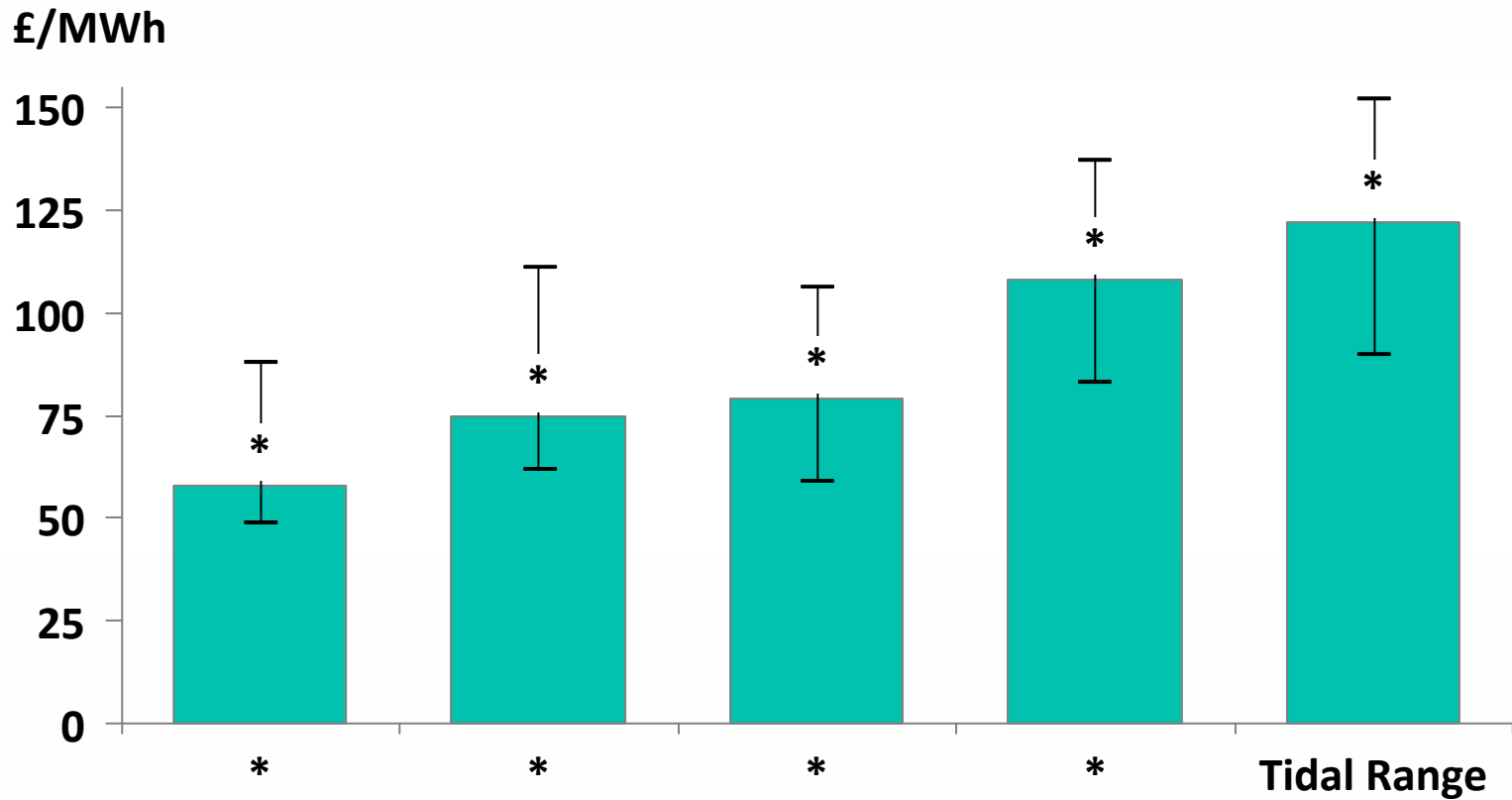
# Practical resource : 2,100 TWh



# Three deployment scenarios

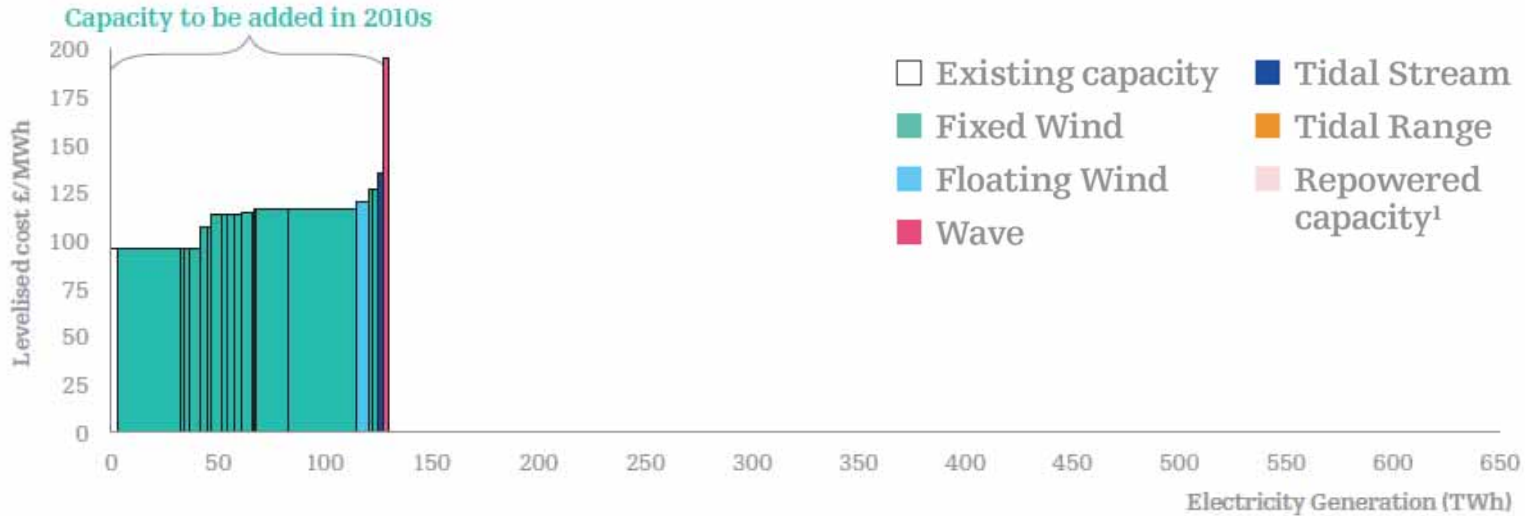


# Estimated costs in 2050

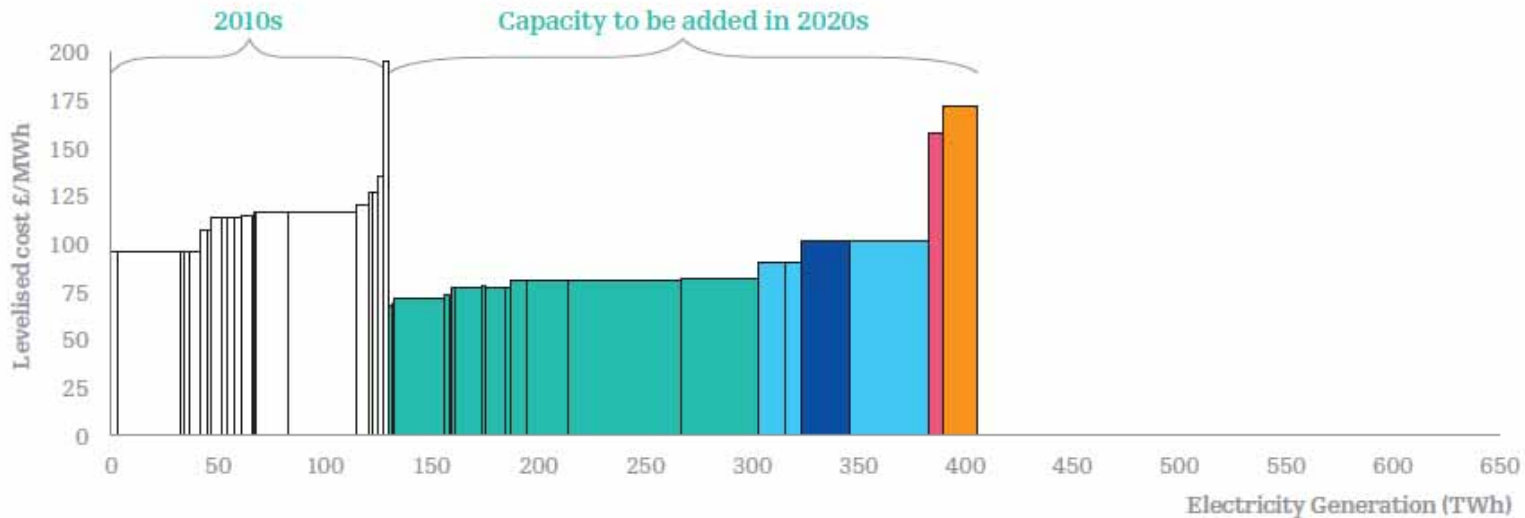


# Net electricity exporter

2010



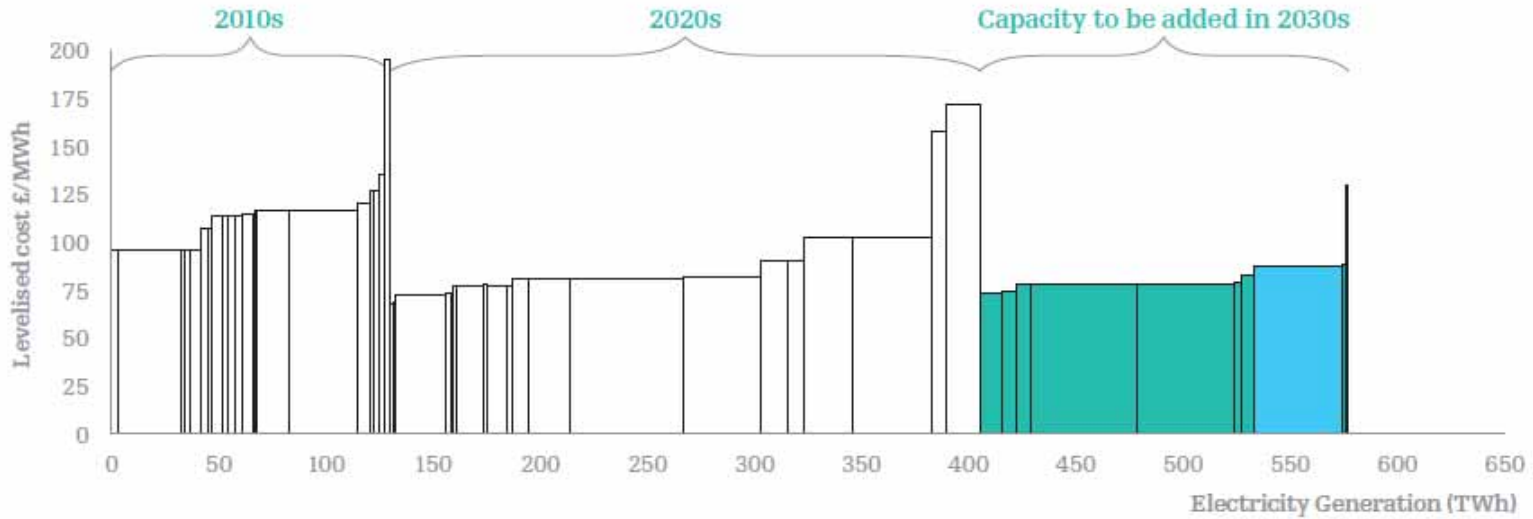
2020



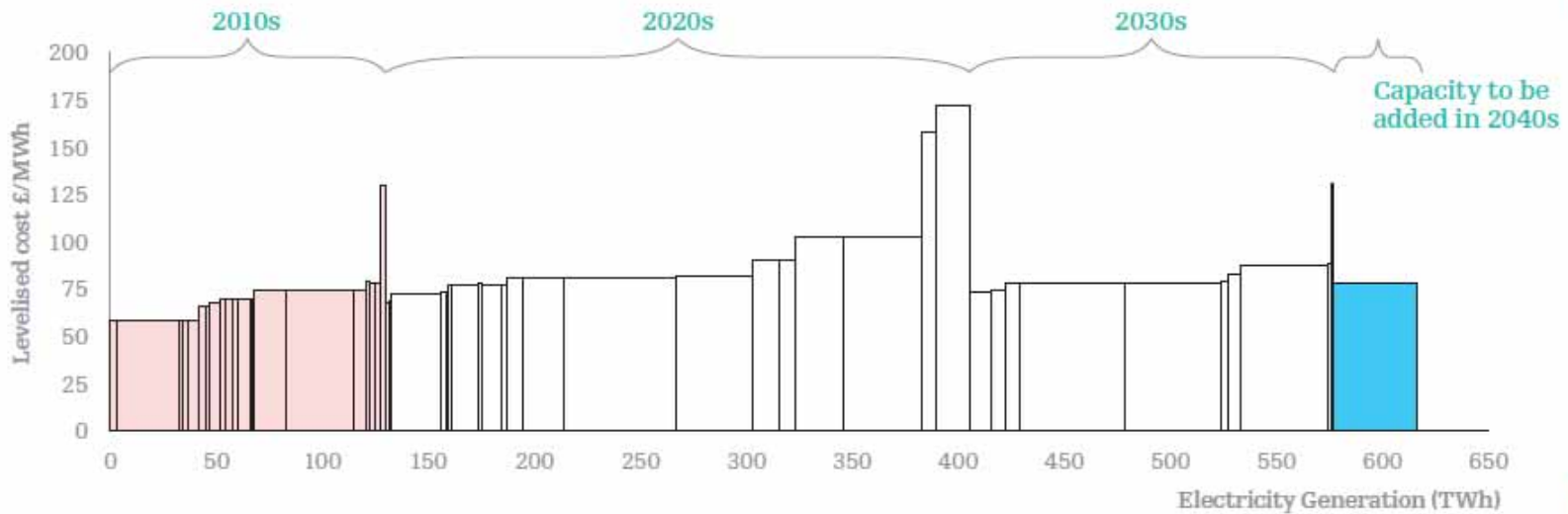
2030

**Max build rate 8 GW / year**

# Net electricity exporter



2040



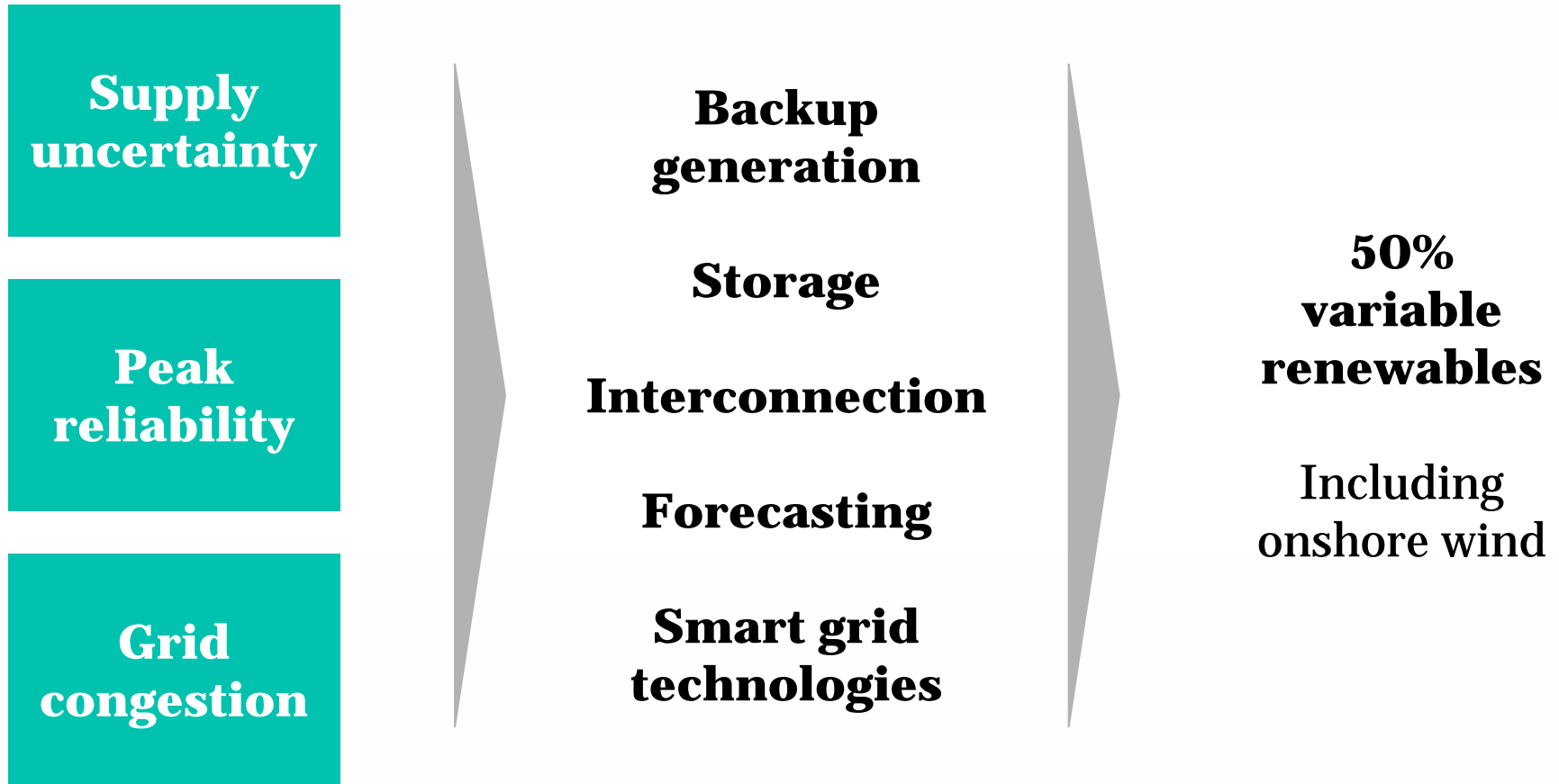
2050

**20,000 offshore wind turbines**

# Principal challenges

- Provision of low cost **financing**
- Managing **variability** of power
- **Grid** connections between centres of supply and demand
- **European demand** and price level

# Managing variability in 2050



**Supply  
uncertainty**

**Peak  
reliability**

**Grid  
congestion**

**Backup  
generation**

**Storage**

**Interconnection**

**Forecasting**

**Smart grid  
technologies**

**50%  
variable  
renewables**

Including  
onshore wind

# Required grid connections

Enhanced Supergrid layout used for cost modelling

— Additional capacity

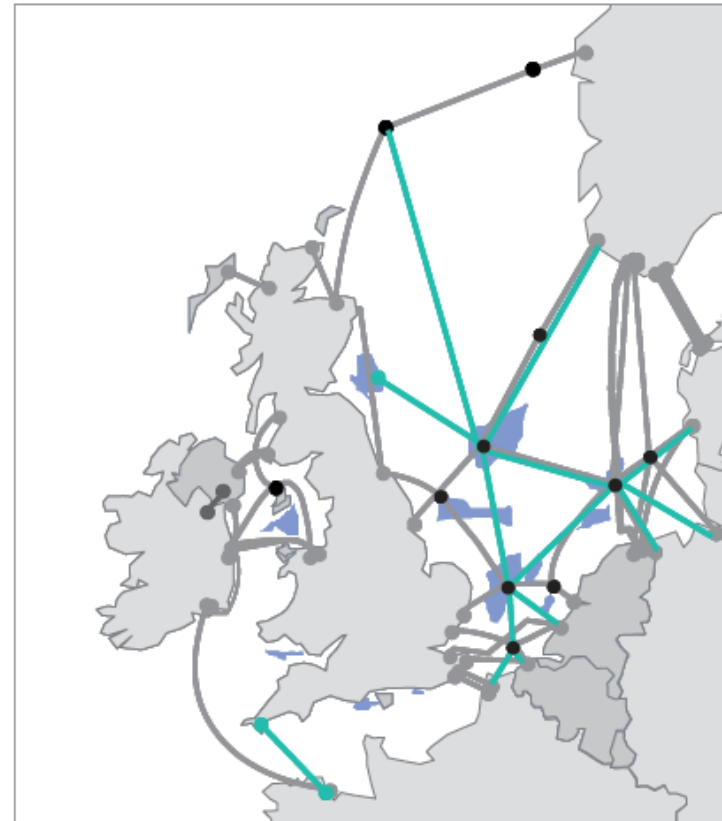
— North Sea Super Grid

● Mid-sea supernode

**50% UK demand  
= 21 GW**

**Net electricity  
exporter = 106 GW**

**Net energy producer  
= 342 GW**



# Overall valuation : Positive NPV of offshore renewables

- 50% UK demand £ 17 billion
- Net electricity exporter £ 36 billion
- Net energy producer £ 55 billion

# Conclusions

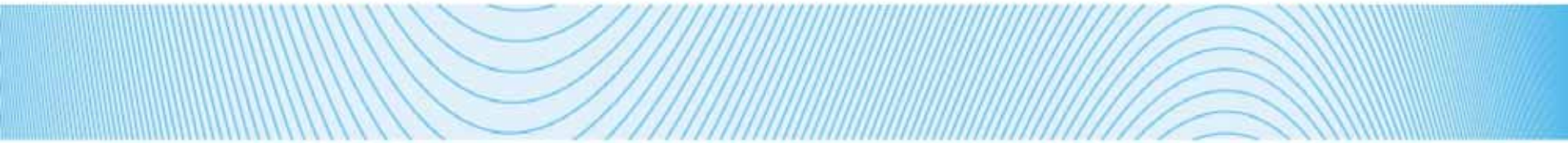
- **the electricity equivalent of 1 billion barrels of oil per year**
- **carbon dioxide reductions of 1.1 billion tonnes**
- **£35 billion revenue in 2050 from net electricity exports**
- **positive Net Present Value**

# Key Enablers

- **Make Round 3 grid connections ‘super-grid compliant’**
- **Take a leadership role in the current EU super-grid negotiations**
- **Continue to develop the UK supply chain**
- **Evaluate and where appropriate, facilitate new financing structures**

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Full report  
PDF format 5mb

The Offshore Valuation Group

## The Offshore Valuation



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Executive report  
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Full report  
PDF format 5mb

res power for good

The Scottish Government

THE CROWN ESTATE

energy technologies institute

Statoil

e-on

SSE

DONG energy

MAINSTREAM RENEWABLE POWER

Vestas

public interest research centre

RWE The energy to lead

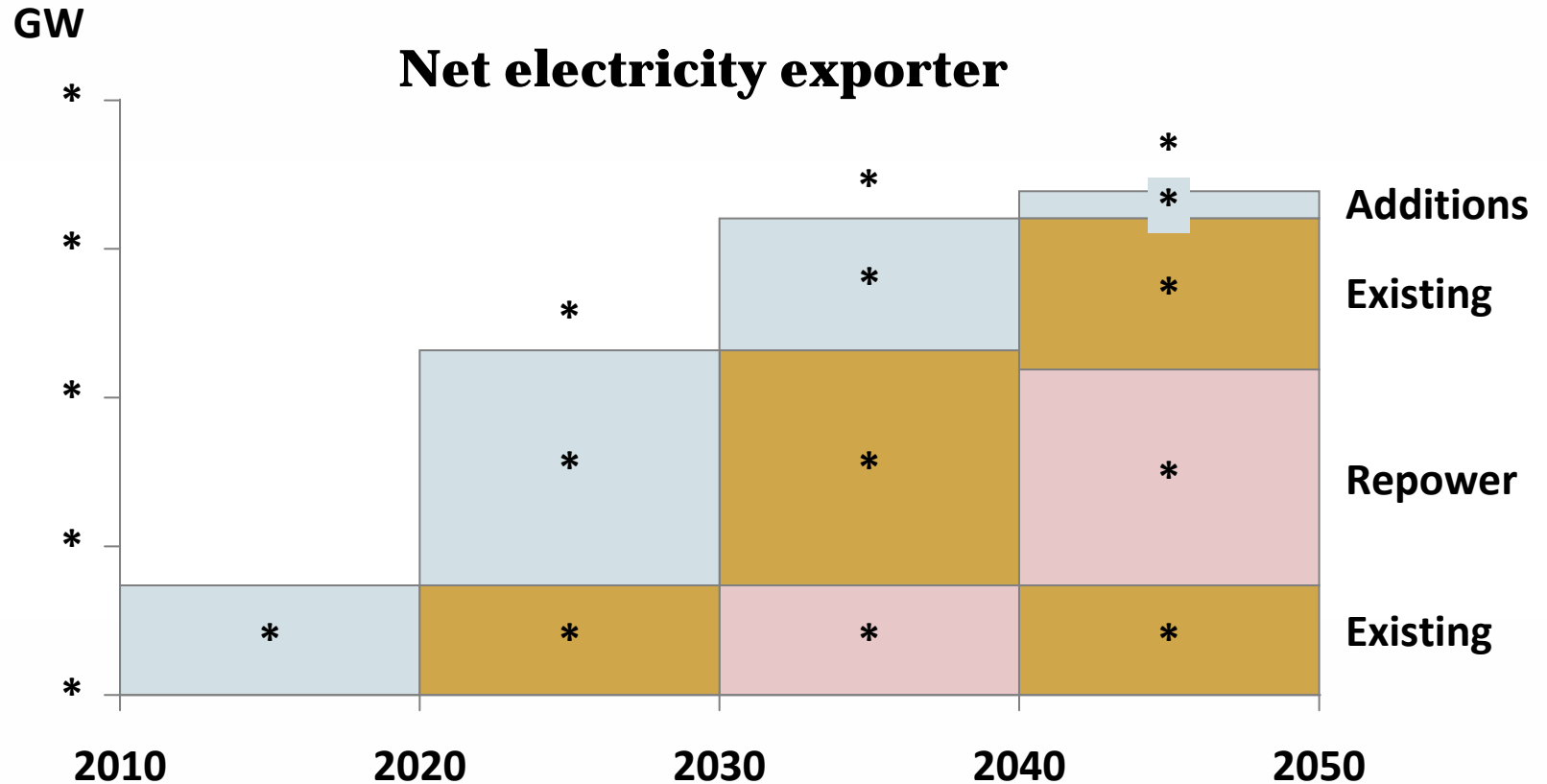
ENERGY CLIMATE CHANGE

[www.OffshoreValuation.org](http://www.OffshoreValuation.org)

# Appendix

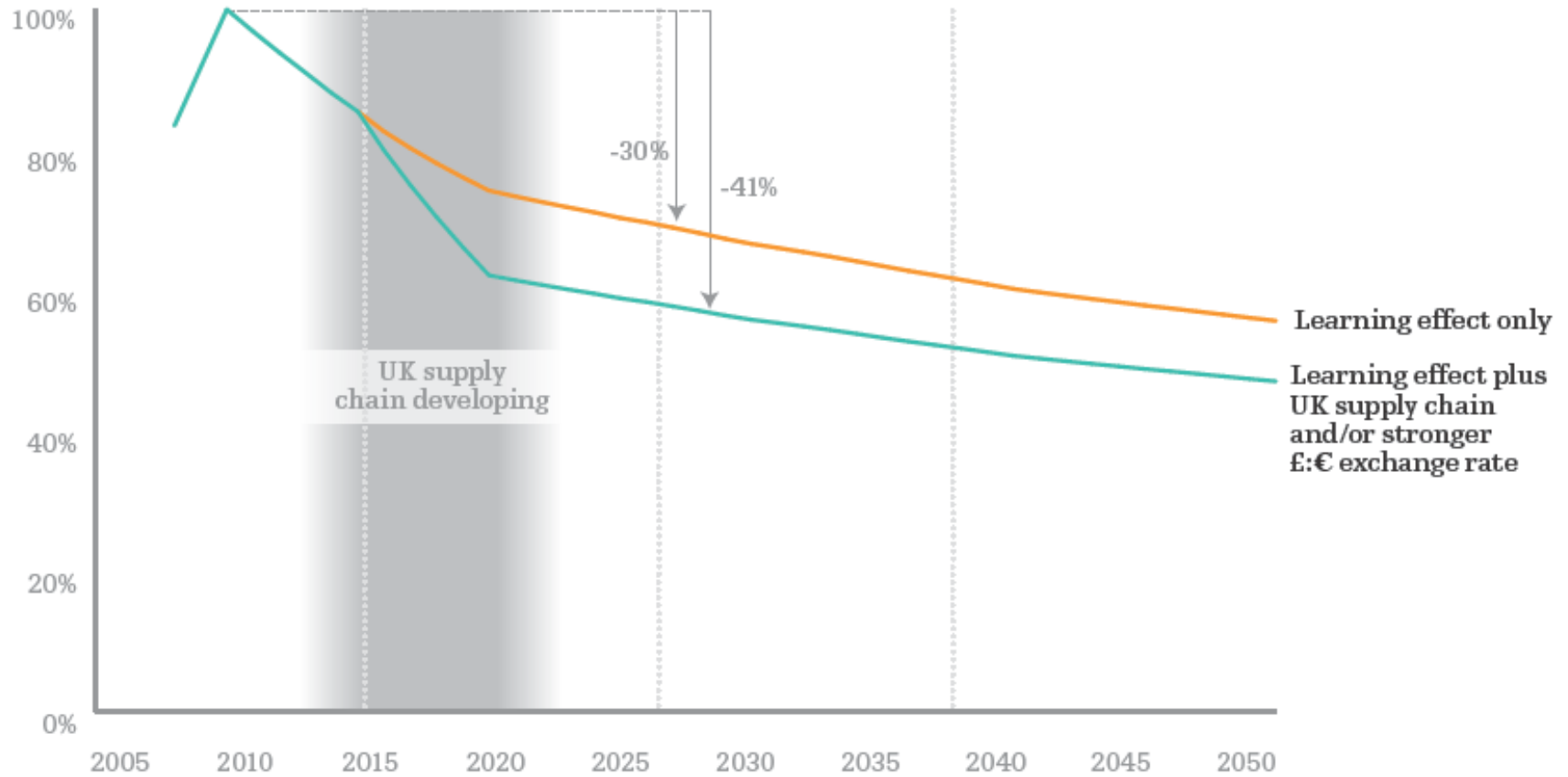


# Scale of the supply chain



# The Offshore Valuation Group

Levelised cost  
(% of 2010 cost)



# The Offshore Valuation Group

	Installed capacity	Resource utilisation	Capital expenditure	Annual Revenue in 2050	
Scenario 1	78 GW	13%	£170B	£28B	50% UK demand
Scenario 2	169 GW	29%	£443B	£62B	Net <i>electricity</i> exporter
Scenario 3	406 GW	76%	£993B	£164B	Net <i>energy</i> producer