

# Ports for offshore wind: 101 and the solutions

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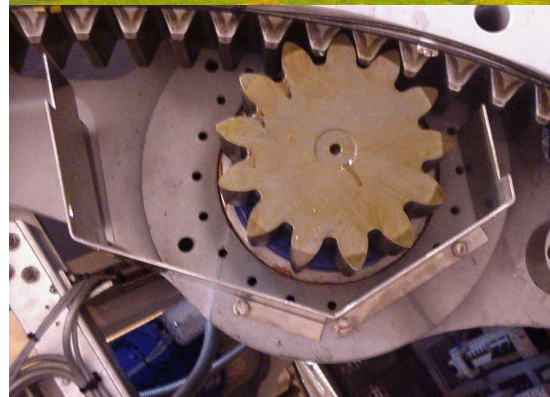
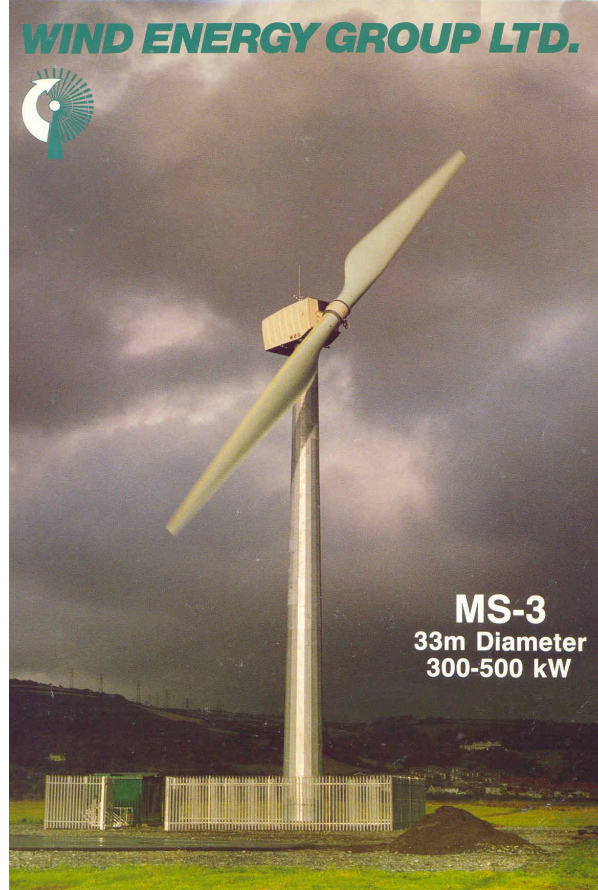
Source: The Taiwan Power Company

**Bruce Valpy**  
Managing Director,  
BVG Associates

- Chartered mechanical engineer
- 15+ Years designing wind turbines
- 20+ years in strategy consulting in wind
- Lead industry building work in emerging offshore wind markets, globally
- Led first UK Government work on ports for offshore wind in 2009

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# BVG Associates: delivering strategy-defining insights

Deep wind industry understanding where market, economics and technology overlap



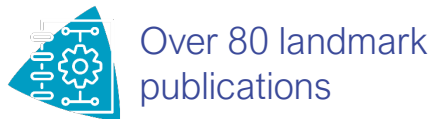
Founded in 2006



Trusted by over 400 clients globally



Over 1300 client projects delivered



Over 80 landmark publications



Consultants with over 200 years of combined industry experience



## Industry building

Market roadmaps and visions

Energy strategy, policy and framework development and delivery

Sector deals

Marine spatial planning

Supply chain and skills development

Education



## Auctions and economics

Bid strategy and competitor analysis

Bid drafting and review

Jobs, local economic benefit, and non-price factors

Cost of energy: future, spatial, new technology, site finding



## Business strategy

Market and technology strategy

Supply chain strategy

Operations, maintenance and service strategy

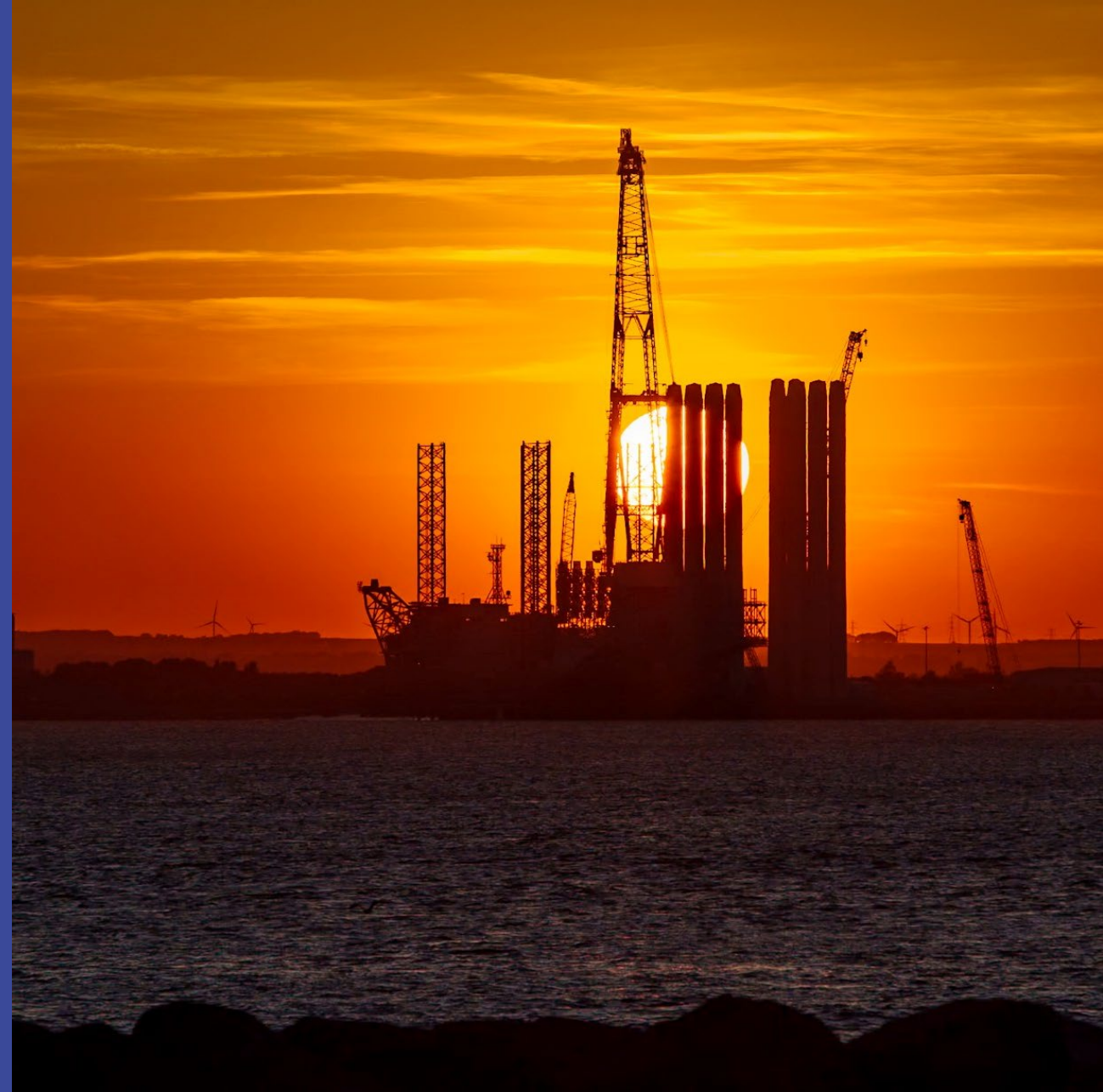
Market intelligence

Supported by our proprietary, industry-leading models and research including:  
LCOE model · Jobs and economic benefits model · Spatial planning tools  
Innovation LCOE impact model · Market intelligence tool



# Ports for offshore wind

1. 101 intro
2. Investment challenges and solutions



# The role of ports

Ports are used for:

1. Manufacture of offshore wind components too large to transport on roads
2. Assembly and marshalling during the installation phase
3. Operation

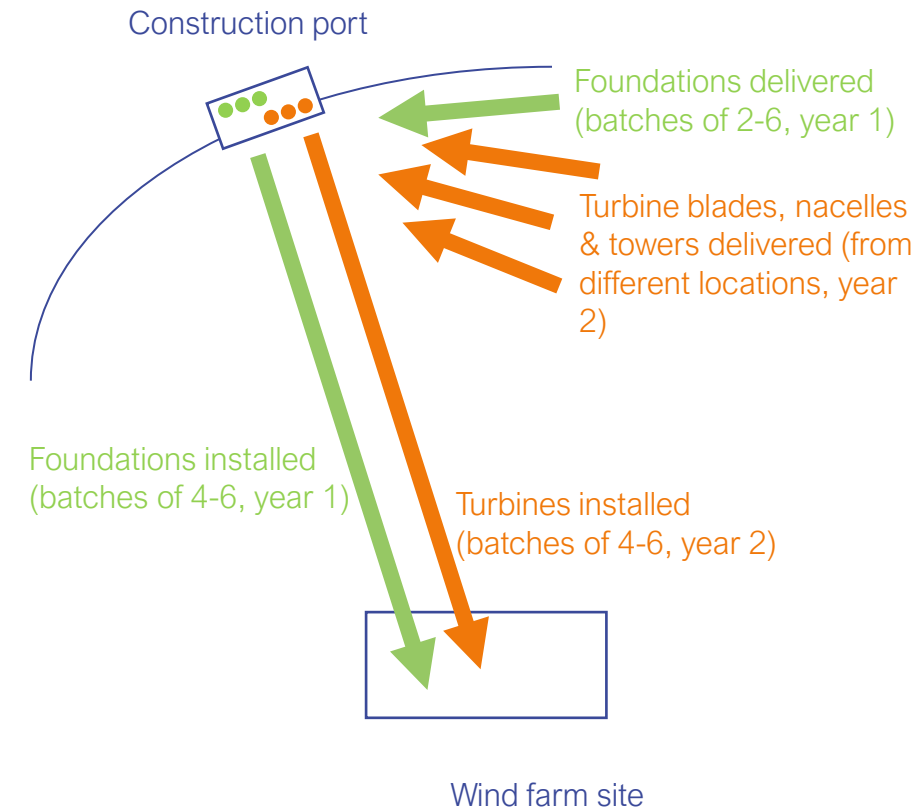
Key considerations:

- Some physical requirements are increasing over time as larger turbines are used in larger wind farms (generally decreasing LCOE)
- Floating brings different requirements
- Sub-optimal solutions (including multiple ports for 1 project) add risk and cost, but are often used, especially for early projects in a market
- Ports often take 5 years+ to upgrade
- Investment can be hard to justify for just 1 or 2 projects

See also BVGA's guides  
<https://guidetoanoffshorewindfarm.com/>  
<https://guidetofloatingoffshorewind.com/>  
<https://asia.guidetofloatingoffshorewind.com/>

# Port requirements: projects with fixed foundations (15 MW WTs)

Parameter	Minimum requirement for efficient delivery of assembly and marshalling
Distance from wind farm (km)	within 300
Entrance width (m)	65
Air draft (m)	Unrestricted
Access channel width (m)	150
Access channel depth (m below MLWS)	7.5
Landside area (ha)	12*
Quay length (m)	300*
Quayside water depth (m below CD)	7.5
Quayside bearing capacity (tons/m <sup>2</sup> )	20-30



\* For blade / foundation / cable manufacturing, add approx. 10 ha each, plus more quay length for incoming materials / supply to other projects assembled elsewhere

# Port requirements: projects with fixed foundations (15 MW WTGs)

- Monopile for a 15 MW turbine: 1,500 to 2,500 t and 60 to 100 m long
- Jacket: 1,250 to 2,250 t and 80 to 120 m high
- Foundation / turbine vessels over 200 m long x 60 m wide, drafts up to 9 m



# Example: Green port Hull (UK)

Port entrance  
width

Unrestricted

Air draft

Unrestricted

Quay length

630 m

Water depth  
(quayside)

8.3 m

Onshore areas

Red

Blade manufacturing  
plant (6 ha)

Amber

Quayside (5 ha)

Green

General laydown (21 ha)





*Port of Nigg supported jacket installation at Ocean Winds 950 MW Moray East project  
(Credit: Sarens)*

*Port of Cromarty Firth supported monopile installation at Ocean Winds 882 MW Moray West project  
(Credit: Sarens)*



*Jan De Nul Voltaire jack up installs GE 12 MW turbines at SSE and Equinor's Dogger Bank project*



*Deme Innovation loading turbines for installation*

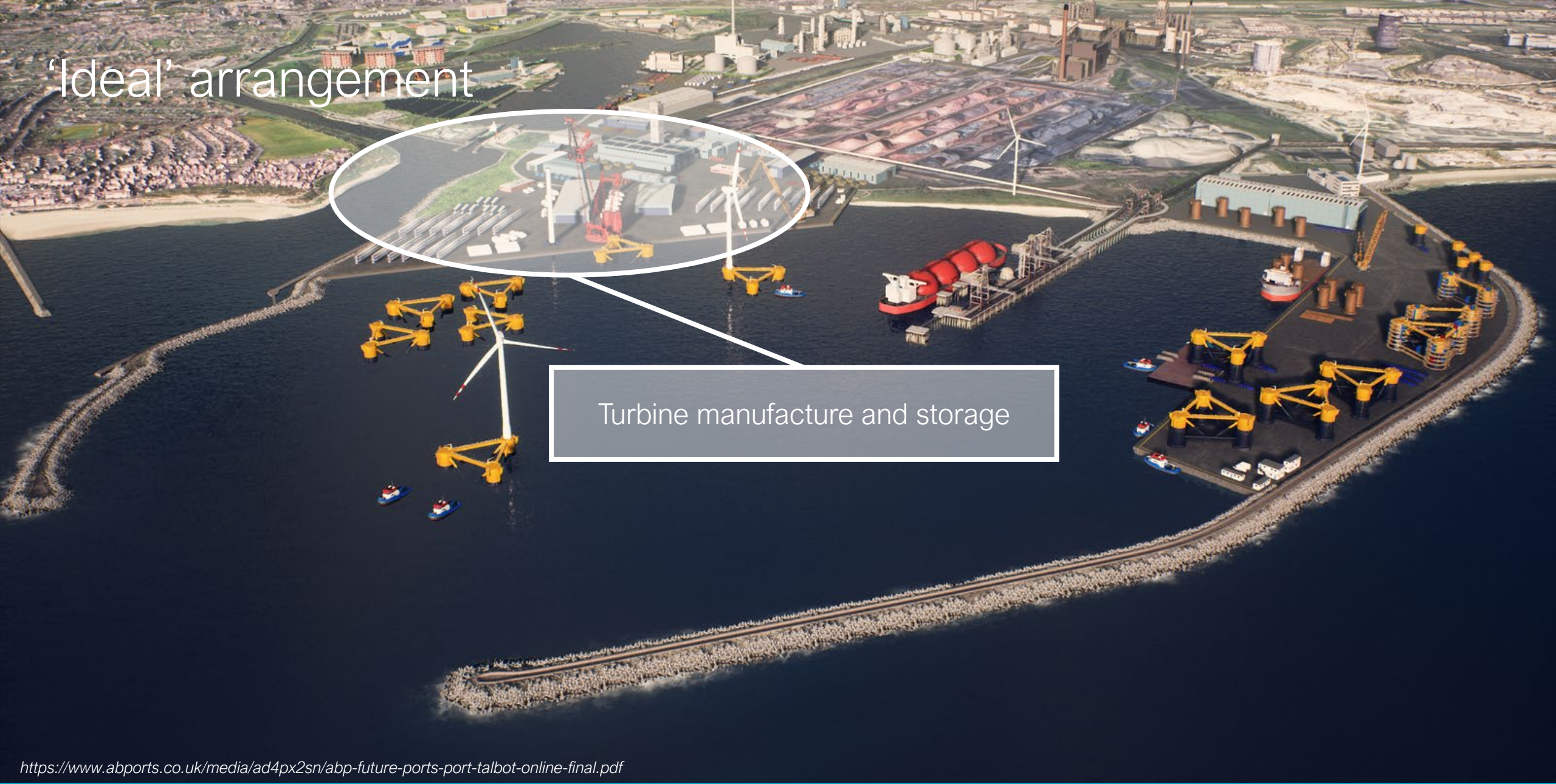


# Port requirements: projects with floating foundations (15 MW WTs)

- More demanding requirements than for fixed:
  - Deeper draft
  - More laydown space
  - More in-port logistics
  - Wet storage
- Steel / concrete semi-sub: 100 x 100 m and 4,000 t / 16,000 t
- Large port-based ring cranes (50 m in diameter footprint with a large turning circle and large laydown area)

Parameter	Fixed	Floating*
Distance from wind farm (km)	~300	~300
Entrance width (m)	65	125
Air draft (m)	Unrestricted	Unrestricted
Access channel width (m)	150	250
Access channel depth (m below MLWS)	7.5	15
Landside area (ha)	12	20
Quay length (m)	300	400
Quayside water depth (m below CD)	7.5	15
Quayside bearing capacity (tons/m <sup>2</sup> )	20-30	30-50

'Ideal' arrangement



Turbine manufacture and storage

<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>



Integrated floating foundation hull manufacture

<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>



Floating foundation marshalling and load-out



<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>



Floating hull temporary wet storage

<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>



Foundation and turbine assembly

<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>



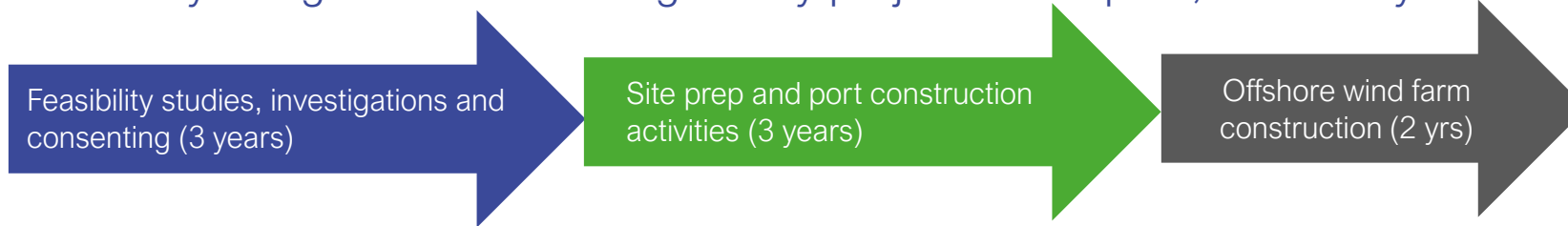
Tow-out to site or further wet storage

<https://www.abports.co.uk/media/ad4px2sn/abp-future-ports-port-talbot-online-final.pdf>

## 2. Investment challenges and solutions

# Timelines and costs associated with port development

- Long development time
  - Always longer than lead time given by project developers, when they are willing to start paying



- The scale of the investment required can be significant - typically over €100 m in Europe
- Port income from a “typical” 1 GW construction campaign is ~€20m
- Annual income of ~€0.5m/yr for operation phase services
- A port can typically facilitate only one offshore wind construction project at a time
  - Needs lots of space for 2 years
- Timing of projects is difficult to estimate until FID (typically 2 to 3 years’ lead time)
- A port typically needs non-offshore wind work to justify investment on commercial terms
- Port investments need to be future-proofed: larger turbines / floating etc.
- Public investment can consider local economic benefit

# The solutions

- Government build industry confidence
  - Design the OSW project route to market to give clarity which ports will be needed first
  - Be clear on industrial policy, including local component manufacture
  - Ensure port decision makers learn about offshore wind / have engagement with industry / clients
  - Support inward investment, including in-port manufacturing
  - Combine offshore wind thinking with wider industrial strategy, upgrading brownfield sites
- Industry be creative
  - Multi-use facilities
  - ‘Good enough’ solutions, rather than ideal
  - Innovation using different sea conditions to Europe
    - Use less land / lower cost quays
    - Larger hub-ports and feeder vessels
    - Multi-port solutions
    - Floating quays



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