Offshore Wind Capital Projects

An approach for Owners and Investors to deliver strong project performance

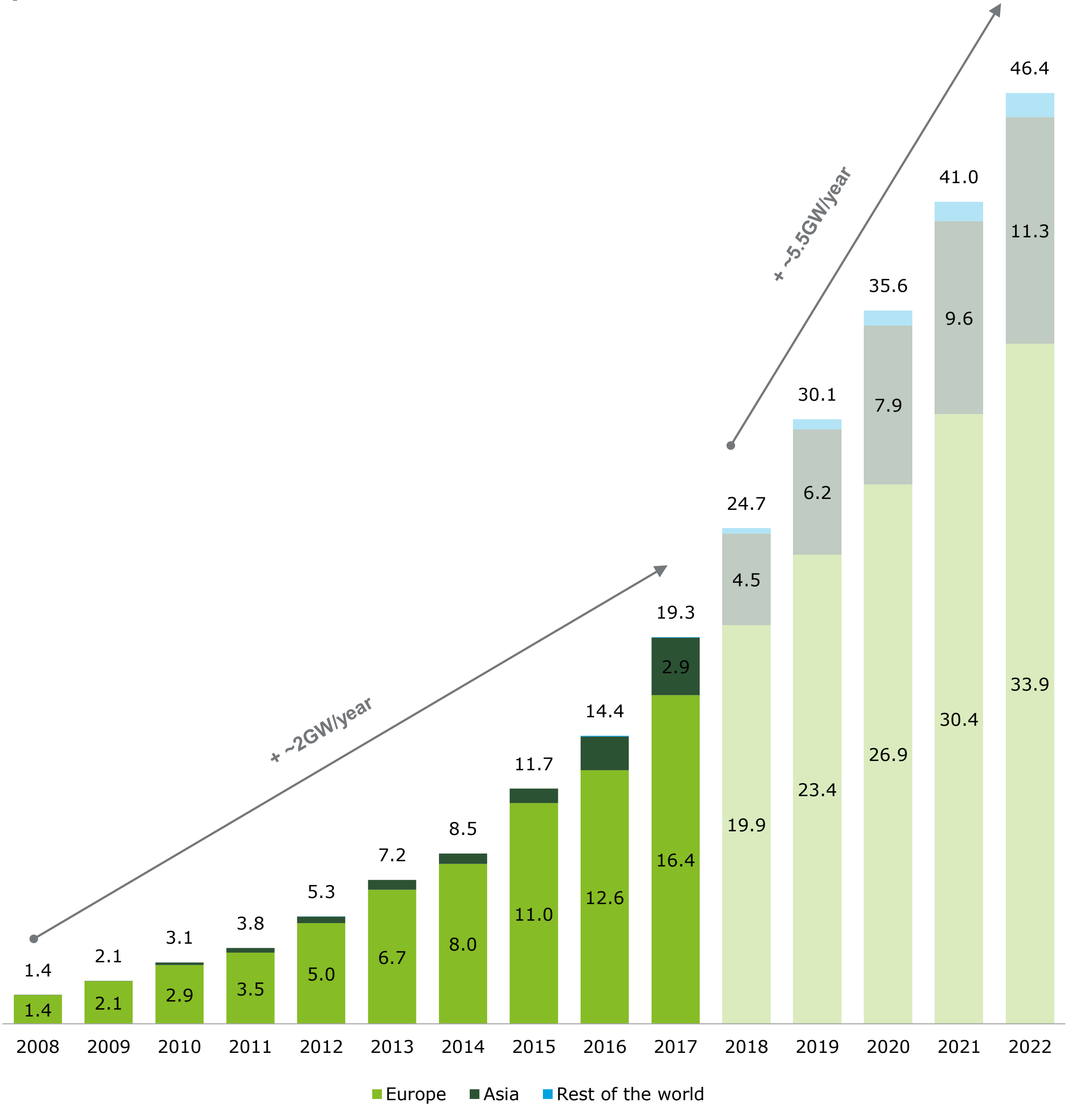
Deloitte's Point of View

The Market

Significant growth across Europe and Asia

Offshore wind has grown internationally, with most of the development occurring in Europe and the majority of future growth expected in Asia

Offshore wind cumulative capacity (global forecast) 2008-2022 (GW) segmented by continent

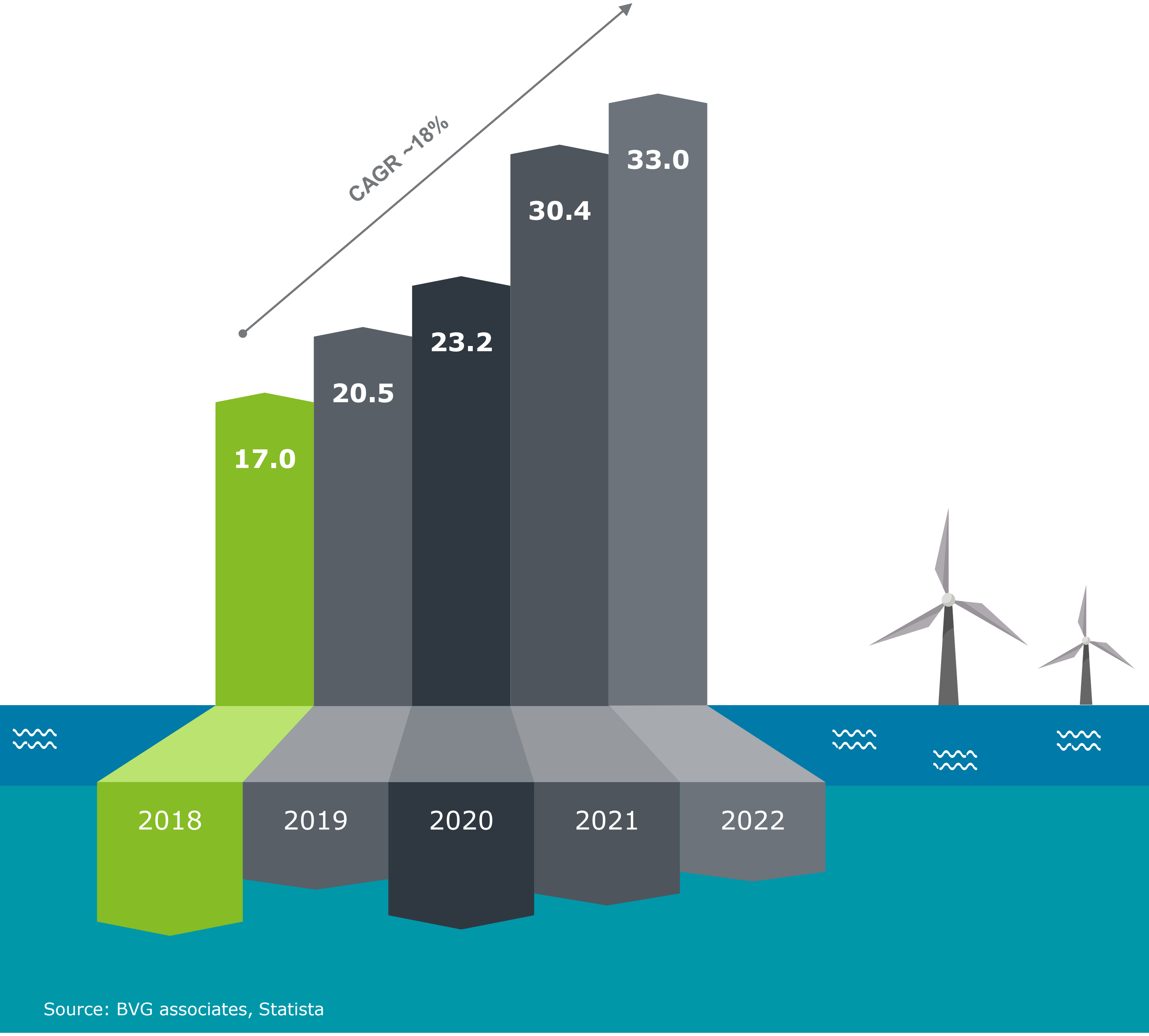


Source: International Renewable Energy Agency and Norwegian Energy Partners

Continuous investment increase

Global annual expenditure for offshore wind will be approximately £33bn in 2022, with an expected £110bn spent between 2019 and 2022

Offshore wind transaction value (global forecast) 2008-2019 (£bn) segmented by region

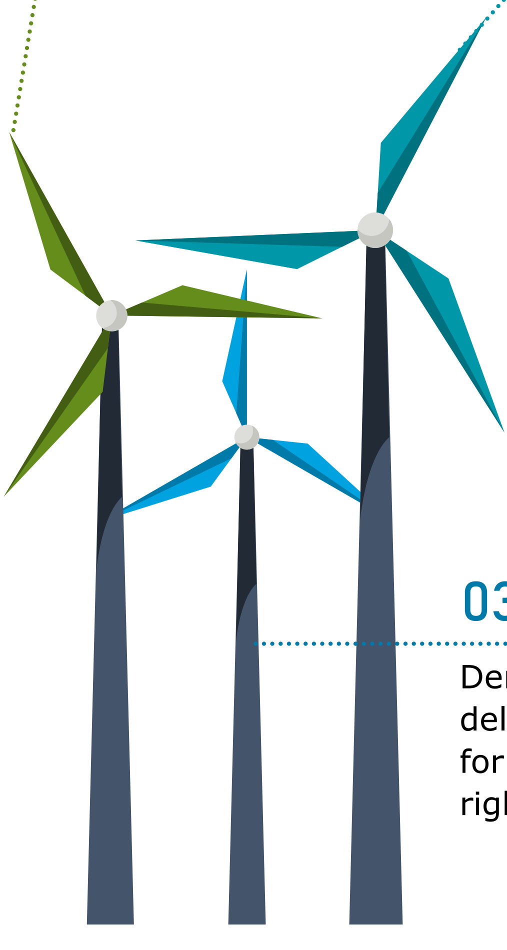


Source: BVG associates, Statista

The Challenge

Key challenges

Critical factors in developing / agreeing to invest in an offshore wind farm are revenue generation certainty, cost certainty and demonstration of deliverability competencies



01

Revenue generation certainty

- Wind speed assumptions
- Availability of wind turbines during Operations & Maintenance period

02

Cost certainty

- Risk of increase of high capital costs
  - Projects at sea, increasingly offshore and potentially floating
  - New technologies
  - Specialised vessels
  - Bespoke solutions (e.g. ports, foundations)
- Complex interfaces
- Often multiple supplier parties with implications for the owner

03

Demonstration of deliverability competencies for licencing / development rights as well as for financing

Deloitte's Point Of View

Project Success Factors

We have identified 10 levers that drive project performance in offshore wind

Pre-Final Investment Decision | Project Construction | Operations & Maintenance | Decommission/ Re-power

1. Understand site and underlying risks
2. Get procurement model right
3. Confirm critical supply chain early
4. Build robust schedule
5. Understand logistical complexities
6. Setup appropriate project governance
7. Setup and maintain appropriate Project Controls`
8. Monitor progress through suitable reporting and proactive KPIs
9. Integrate the Operations & Maintenance Strategy across the project lifecycle
10. Develop a robust Decom./ Re-powering strategy

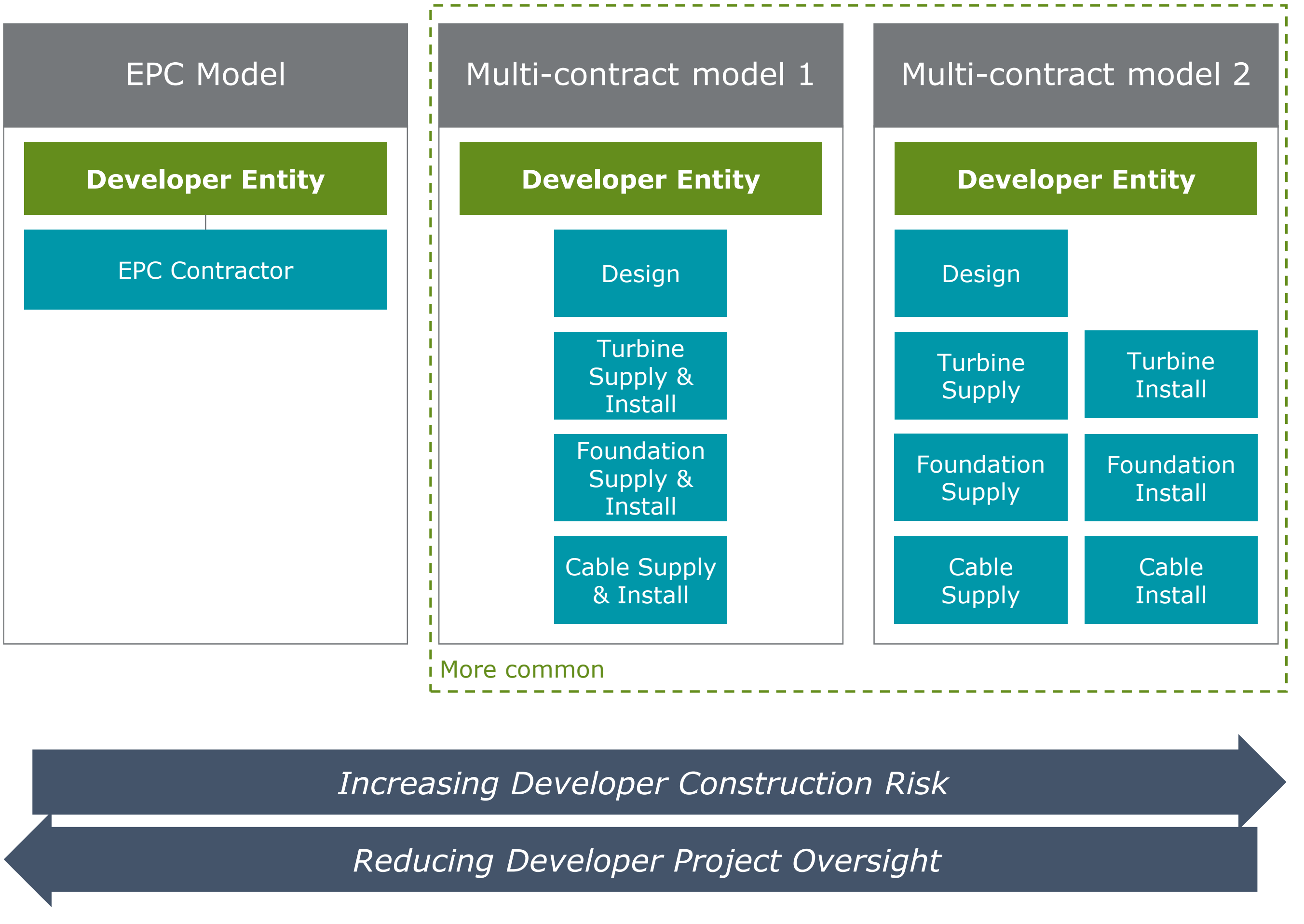
Lever 1 – Understand site and underlying risks

Site characteristics based on accurate and dependable site information support a robust business case and reduce execution risks

	Context	Business Case impact	Execution Risk impact
Wind Speed	Wind speed assumptions can vary depending on the **location of the met mast** and the height of the data collection point and the **number of years** that data have been collected for	Energy generation and hence **revenue is proportionate to the wind speed**. As such wind speed assumptions is the most significant parameter of the business case. If data is limited or inaccurate, there is high risk that the project's revenue generation assumptions will be inaccurate.	Weather conditions, and most importantly wind tolerances for specific activities, determine the **weather windows** which allow construction to take place offshore (e.g. to lift a turbine it is necessary to have X hrs of certain wind conditions). Weather windows feed into the **schedule assumptions** and as such have an impact across overall project duration, contract inter-dependencies and logistics.
Seabed	Seabed considerations drive **foundation and cabling** specification as well as installation activity restrictions	Understanding ground conditions will allow appropriate specification for foundations and cabling to be defined, hence reducing the **material and installation cost** of over-design.	**Un-identified objects** on seabed have hindered projects which were mid-construction, having a significant schedule delay and cost impact. Understanding these issues early means these can be incorporated in the integrated schedule of activities from the project start.
Grid connection	Grid **connection and capacity** availability is necessary to ensure energy generated can be fed to the system	Understanding the **location and timing** that the wind farm is expected to connect to the grid is vital to estimate the **underlying cost** to reach such connection point (e.g. Cabling) but also to **evaluate the risk** of delay, should a third party be required to conduct work impacting the project grid connection (e.g. Grid capacity upgrade).	Execution phase interfaces need to be considered and incorporated on the **project schedule and risk assessments** to ensure that the technical interfaces are properly considered and timely addressed.

Lever 2 – Get procurement model right

There are multiple procurement models and various factors to be considered before deciding on the optimal one



CONSIDERATIONS

- Internal capabilities
- Willingness to take on construction interface risk vs. improved project oversight
- Wind Farm components requirements vs. installation vessel specification
- Lead time of key components and spare parts strategy
- Track record of suppliers / sub-contractors
- Guarantees provided by suppliers / sub-contractors
- Maintenance requirements and alignment with O&M strategy
- Decommissioning / Re-powering considerations

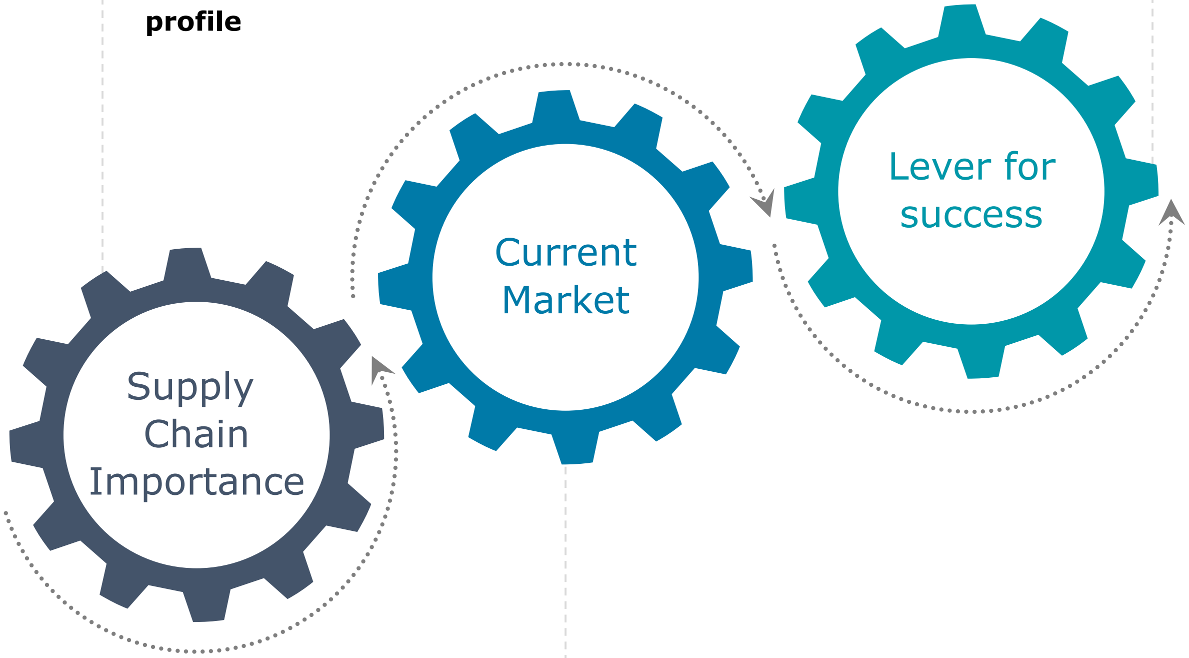
Lever 3 – Confirm critical supply chain early

Identifying and confirming the critical supply chain partners can significantly de-risk the project and provide improved cost certainty

Irrespective of the procurement model chosen, it is hence important that **critical supply chain partners/suppliers** are:

1. Identified both **strategically** (e.g. vessel owners) and **locally** (e.g. understand local government requirements and pressures to be overcome)
2. **Confirmed** and secured as early as possible
3. Consulted and their input is fed into the **project schedule** to improve its robustness

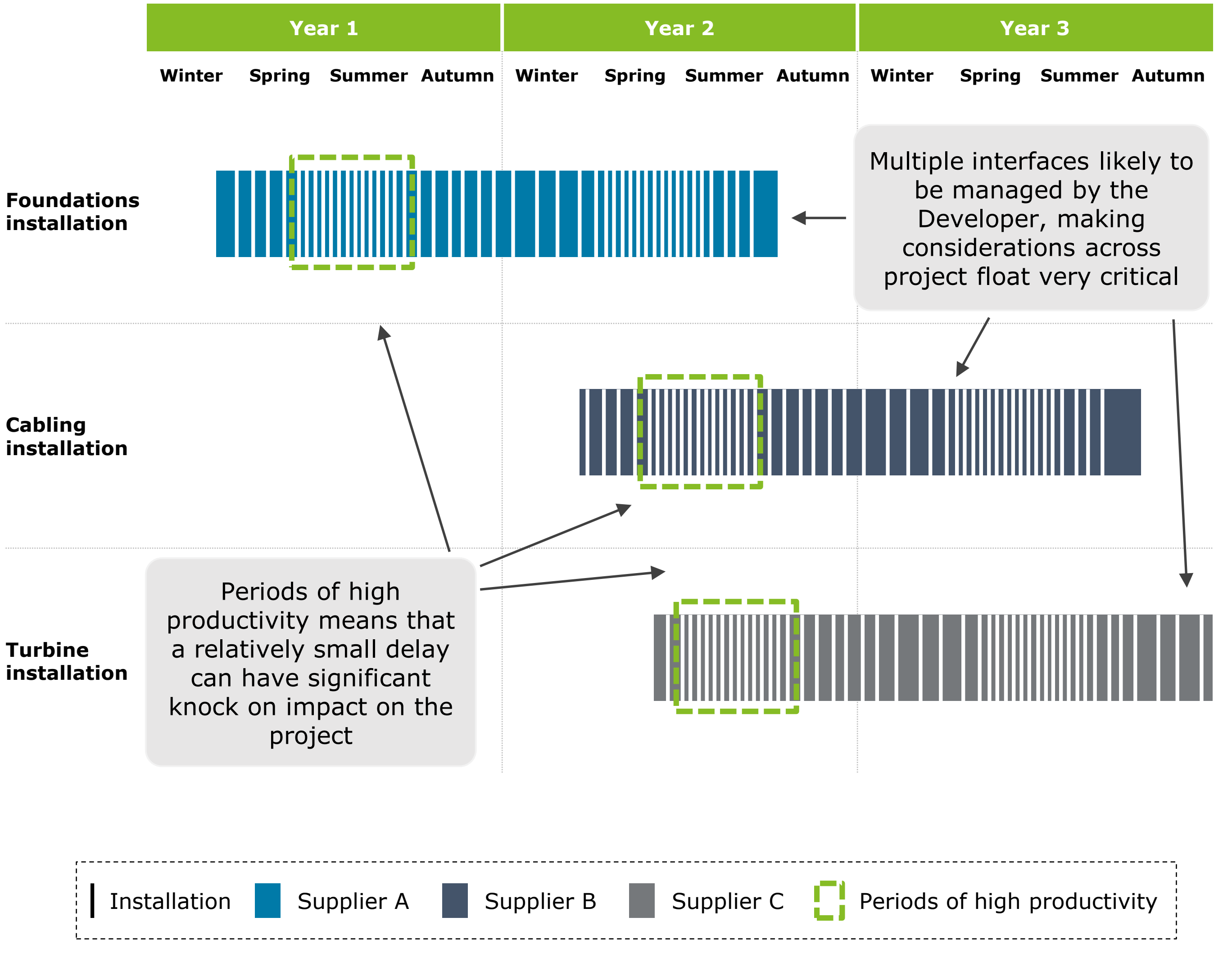
Competent and experienced supply chain partners/ suppliers provide **increased cost certainty** and **reduced risk profile**



However, the number of such supply chain partners/ suppliers is **finite** (and/or it can depend on local requirements) and the offshore wind market is **growing**, leading to **pressures in securing such contracts**

Lever 4 – Build robust schedule

Project schedule is dependent on progress during good weather windows and on key scope interfaces, making float consideration critical to the project success



Lever 5 – Understand logistical complexities

A number of logistical challenges between the manufacturing sites, construction port and installation area need to be overcome

Logistics dilemma to be resolved:

Option 1 – Development of individual foundation elements aligned to individual turbine locations

+ Material cost savings

- Logistical challenges

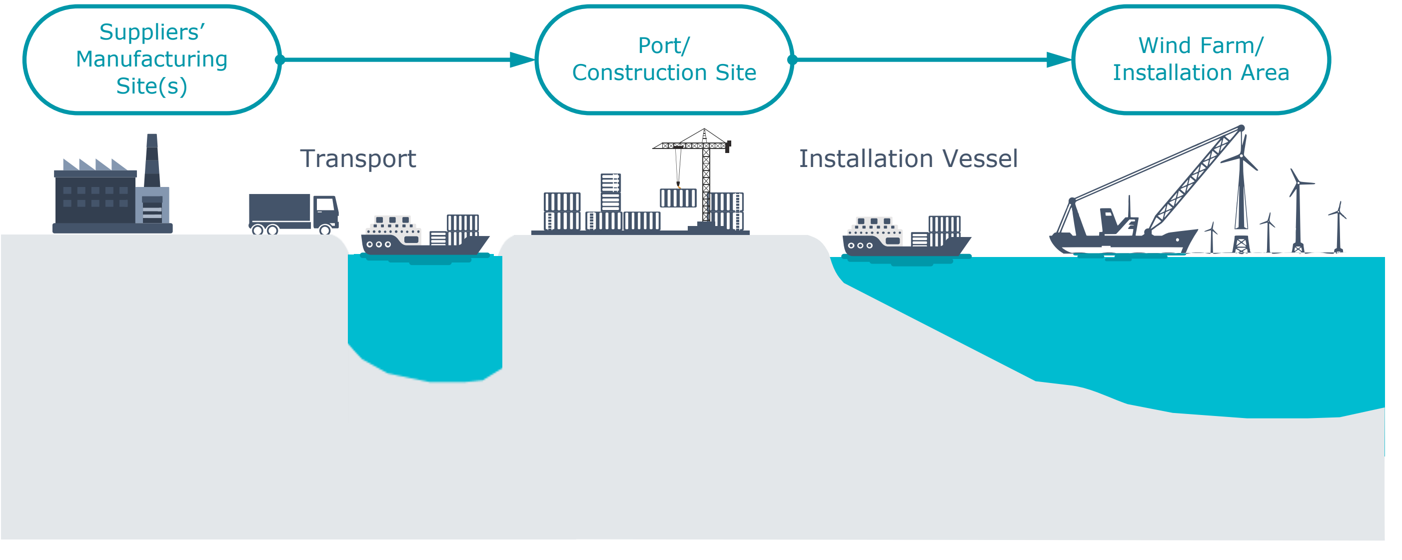
Option 2 – Development of standard foundation elements which can be used at any turbine location

+ Reduced logistical challenges

- Material cost savings

Balance to be achieved

- Schedule requirements vs. Manufacturing vs. Port Site capacities
- Port installation buffer requirements
- Weather constraints between Manufacturing and Port and Port and Wind Farm
- Tidal constraints



Lever 6 – Setup appropriate project governance

A governance structure that provides sufficient flexibility but also maintains control at the right level will allow for an efficient and effective management of the project

KEY CONSIDERATIONS

- Investor requirements
- Roles and Responsibilities
- Escalation Routes
- Client requirements
- Reporting lines
- Meetings cadence and Terms of Reference
- Organisation structure (e.g. matrix)
- Delegated Levels of Authority
- Technology to be used

Lever 7 – Setup and maintain appropriate Project Controls

Appropriate and integrated project controls will allow project to be understood and tracked effectively and risks to be escalated timely

Scope and Change Management	Schedule Management	Cost Management	Risk Management
Development of scope requirements	Development of initial schedule	Development of initial budget	Development of risk provision and management reserve
Baseline set up to measure progress against	Schedule integration	Development of cost estimate	Monitoring of risk exposure vs. provision & mgt. reserve
Initiation of changes to scope	Critical path identification	Update of forecast	Qualitative Risk Review
Review and evaluation of changes	Milestones definition and tracking	Costs reporting	Quantitative Risk Analysis
Approval of changes and re-baseline	Continuous monitoring of schedule	Risk mitigation measures incorporation	Schedule Risk Analysis

Full integration across project control areas and alignment with reporting requirements

Lever 8 – Monitor progress through suitable reporting and proactive KPIs

Aggregation of the right, forward-looking KPIs through system generated dashboards will improve efficiency and decision making and provide a single source of the truth

Insight creation

Identify **forward-looking KPI's**

↓

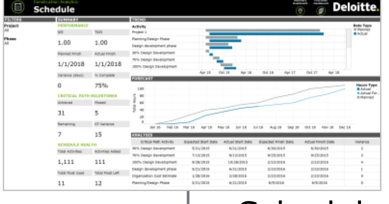
Create **data-informed dashboard**

↓

Forward-looking decision making

Monitor project performances

Cost



Schedule

Risk

↓

Insight to action
Intervention on ongoing projects & sharper project selection

Lever 9 – Integrate the Operations and Maintenance Strategy across project lifecycle

Early production of the Operations and Maintenance (O&M) strategy will allow Construction to account for it, increasing energy generation and reducing cost in the long term

O&M interfaces across project lifecycle

Pre-Final Investment Decision → Project Construction → Operations & Maintenance → Re-power

Pre-Final Investment Decision – Factors impacting O&M:

- Number of turbines
- Turbine selection
- Foundation type

Project Construction – Factors impacting O&M:

- Port base
- Key equipment for O&M use (e.g. turbine cranes)
- Material selection and their design life

Operations & Maintenance – Factors impacting O&M:

- Pro-active / Re-active
- Vessel availability
- Weather constraints
- Spare Parts

KEY DECISIONS

- Port base
- Vessel types depending on site and maintenance requirements
- Framework agreements with installation contractors for proactive maintenance
- Consideration of risk associated with installation contractors for proactive maintenance (e.g. other potential commitments impacting ability to serve maintenance agreement)
- Mitigation strategies for reactive maintenance and spare parts strategy

Lever 10 – Develop a robust Decommissioning / Re-powering strategy

As projects get towards the end of their design life, determining whether they should be extended, re-powered or decommissioned becomes a key question to be answered

	ADVANTAGES	DISADVANTAGES
Extension	No need for **major component** change	Not easy to determine length of extension achieved, reducing confidence on **business case**
Re-Powering	Potential for replacement of wind farm with **larger turbines** or like for like replacement with a lower cost Solid assumptions on **revenue generation** on basis of past performance	Requirements to un-install and re-install offshore wind turbines **not yet tested** in the industry Environmental / Social **constraints** as per project delivery
Decommissioning	Clean end to **project lifecycle**	Incurring of cost without additional **revenue benefit**

Why Deloitte

Why Deloitte

Deloitte provides expert advice across the lifecycle of capital projects for project owners, investors, lenders and contractors

INVESTMENT CONFIDENCE – FINANCE, FUNDING AND PROCUREMENT

Providing the confidence that the value of the organization is maximized and the right decisions are made which are strategically aligned with organizational objectives to attract investment.

DELIVERY CONFIDENCE – GOVERNANCE, PEOPLE AND ORGANIZATION

Building an efficient and scalable organisation, robust systems and controls to improve the confidence in delivery of capital projects and operation of the asset being created.

COST & SCHEDULE CONFIDENCE

Providing the confidence that project's cost and schedule during the design, engineering and construction are effectively planned, managed and controlled.

ASSET MANAGEMENT & OPTIMISATION

Maximising asset availability, life and value for customers, shareholders and asset users.

DIGITAL TRANSFORMATION

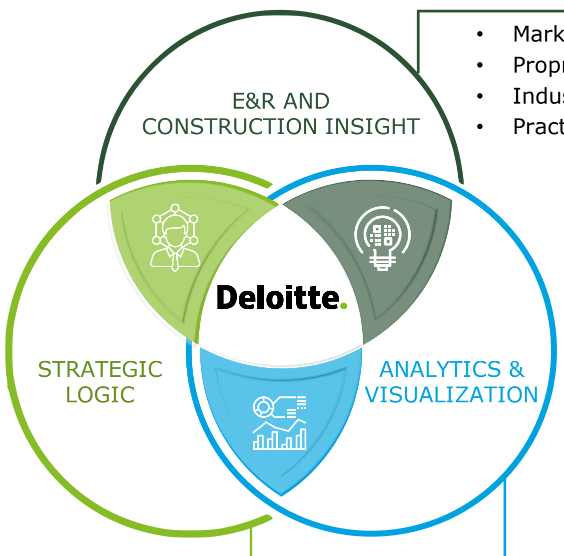
Enabling capital project organisations to adopt the latest technology innovations and develop their capability to use deep data insights and analytics for better control, efficient delivery and operations of capital projects.

Why Deloitte

Deloitte is a leading global strategic consultancy, with extensive energy and resources and construction experience

Combined Capabilities of Deloitte

We bring a unique combination of skills and assets:



- Market research
- Proprietary sources
- Industry
- Practitioners & Capabilities

- Business expertise
- Proofs and empirical reasoning
- Case studies

- Designated Analytics & Information management
- Solid track record

Deloitte's main points of contact

ROB SCOPES

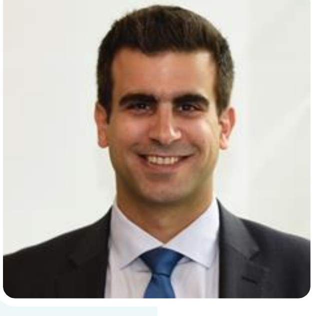
Partner
Financial Advisory Capital Projects
United Kingdom

+44 20 7007 8629
+44 7803 853955
rscopes@deloitte.co.uk

MARC O'CONNOR

Partner
Infrastructure and Capital Projects
United Kingdom

+44 20 7303 5324
+44 79766 608156
maoconnor@deloitte.co.uk



ALEX TSAROUCHIS

Assistant Director
Financial Advisory Capital Projects
United Kingdom

+44 20 7007 4562
+44 7775 017220
atsarouchis@deloitte.co.uk

Deloitte.