MOTT MACDONALD

Asia Pacific offshore wind projects from a Technical Advisor's point of view

4th Asia offshore wind day 18th Sept 2018

Property of Mott MacDonald

Our Numbers

We work in
160
countries
170
permanent offices in over 50 countries
16K
staff
$2
billion
turnover
Over
150
years'
heritage

Over 1/2

of the global offshore wind parks project financed have been advised by us

Conception

- Site prospecting
- Options studies
- Feasibility studies
- Environmental & social (E&S) assessment
- Permit requirements

Development

- Energy yield assessments and optimisations
- Preliminary/detailed design development
- Procurement (EPC, O&M, PPA etc.)
- Grid studies
- Maintenance planning
- Full lender's due diligence (technical, environmental, financial, contracts)

Construction monitoring

- Project management
- Works inspection
- Site supervision
- Testing supervision, analysis and acceptance testing witnessing
- E&S management plan, action plan following the
- Equator Principle and IFC standards
- World Bank Group EHS guidelines

Operation monitoring

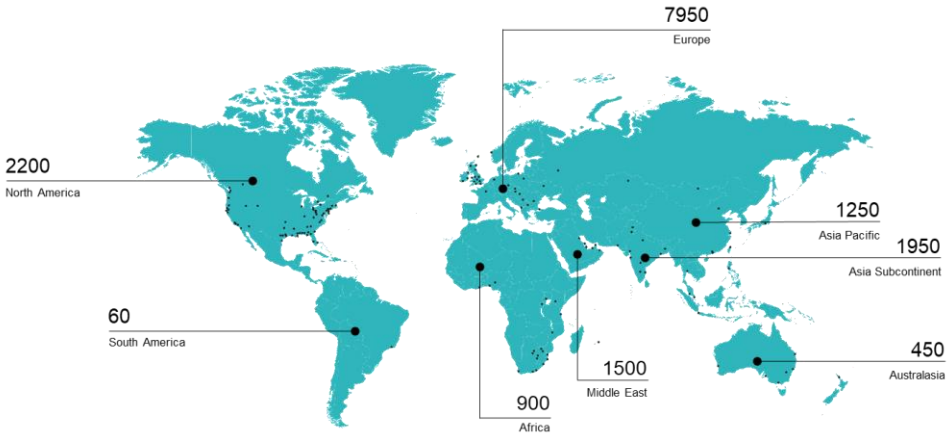
- Performance assessment
- Refinancing
- Acquisition due diligence

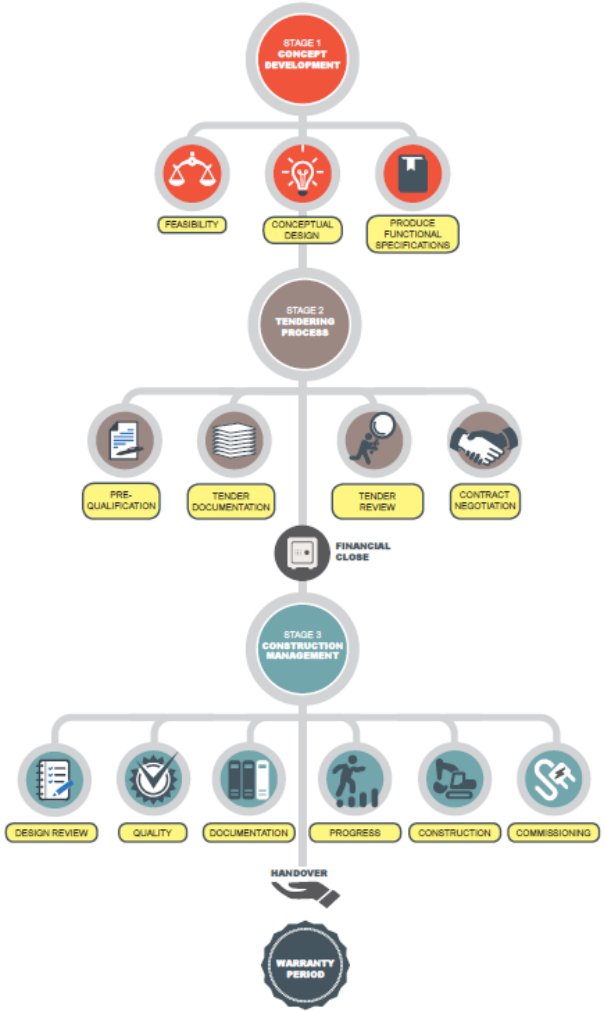
Mott MacDonald's offshore wind key service areas

- Independent engineering supporting project finance activities, buy-side, sell-side mergers, acquisitions, appraisals, and market analysis
- Design consultancy supporting FEED, preliminary and details design and design for contractors / developers on electrical and structural elements of projects, including geotechnical
- Technical advisor and owner’s engineering supporting project development activities, project management and construction management for developers

Owner’s Engineering

- Integrate with project team
- Combine local knowledge and language capabilities with industry experience

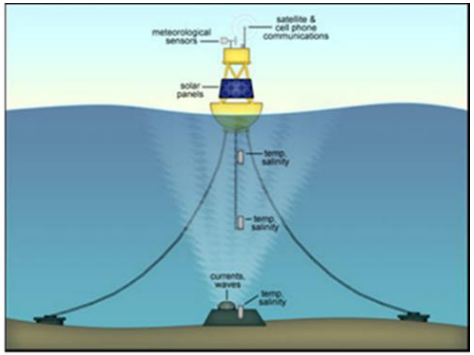




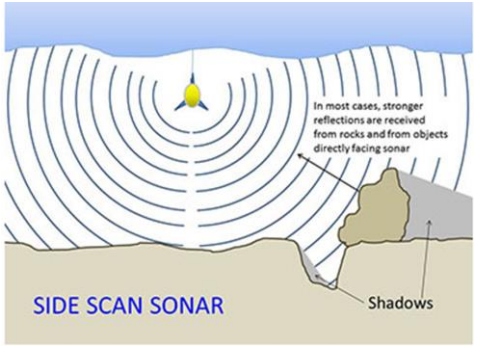
Site data campaigns

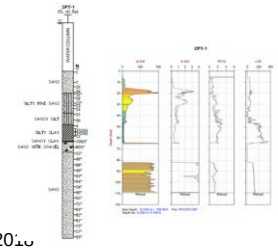
Optimise site data campaigns to ensure a strong design basis:

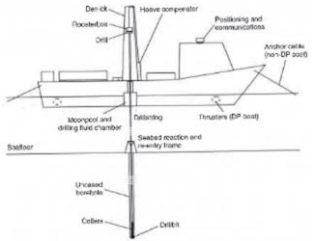
- Published data, measurement campaigns, modelled data
  - Wind Studies – extreme and non-extreme winds
  - Metocean Study – extreme and non-extreme sea states (waves, currents, water depths, etc)
  - Ship collision Impact assessments
  - Marine growth studies
  - Ice accumulation impact studies
  - Air / sea temperatures, other meteorological data
  - Seismic studies and analysis
  - Local and global scour analysis
- Scope, schedule, risk vs cost
- Complex ground conditions commonplace



Source: http://www.fishing-nc.com/







Project Optimisation

Optioneering

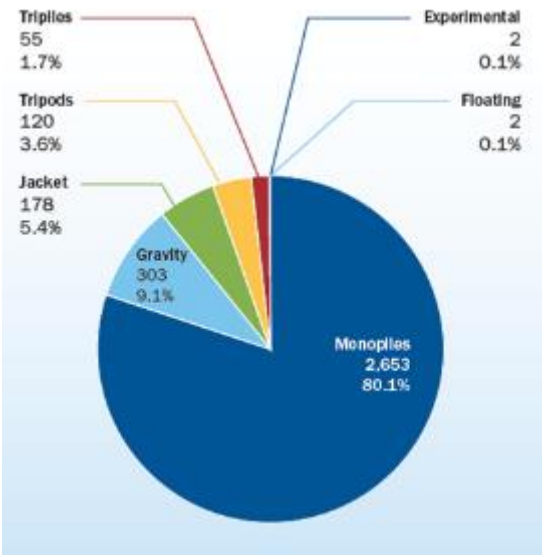
Monopile

Tripod

Jacket

Suction Bucket

Gravity Based



Project Optimisation

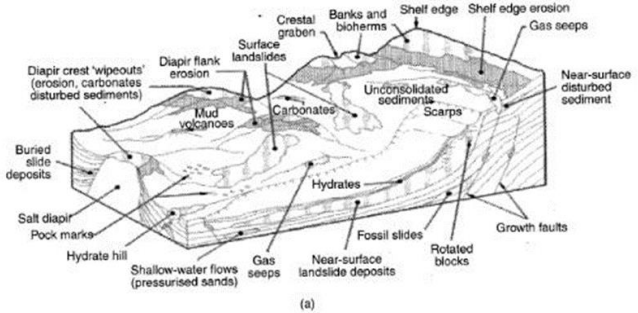
Turbine selection

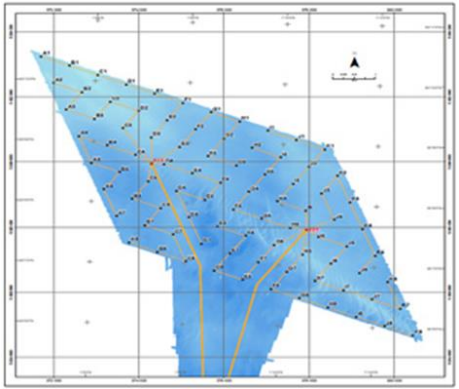
- What is optimal wind turbine for project?
  - yield
  - technology risk
  - development status
  - OEM local capabilities
- Experience with international manufacturers
- Support in getting banks comfortable with local entrants which may lack international track record
  - independent technology reviews

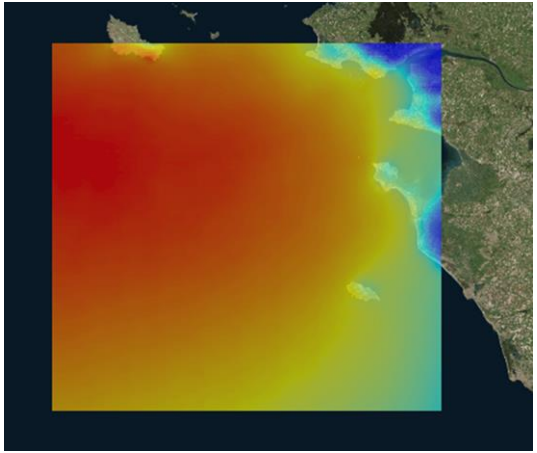
Project Optimisation

Layout design

- Optimise yield and CoE
- Energy yield and wake modelling, GIS and constraints mapping
- Ground conditions are the major driver in Japanese near shore projects
  - Variable ground conditions, slopes, basins, seismicity, rocky outcrops
  - Affects pile driveability and also cable layout (can't lay on complex terrain)



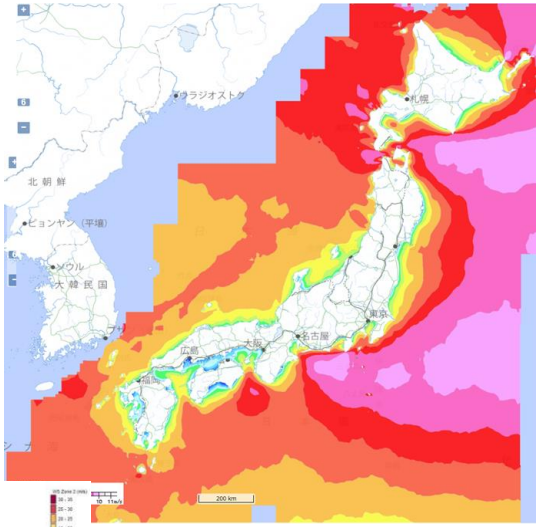


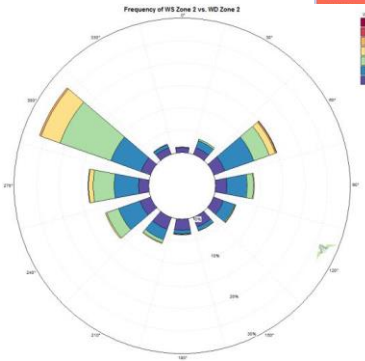


Project Optimisation

Energy yield analysis

- Combination of measured and modelled data;
- Mesoscale models use meteorological observations as input to sophisticated simulation programs
- Offshore use: for flow modelling as wind flow models such as WAsP fail to capture the variation of wind offshore
- Also use mesoscale model time series to extrapolate from met masts further away to a central node at the site
- For layout optimisation, financial modelling and raising finance



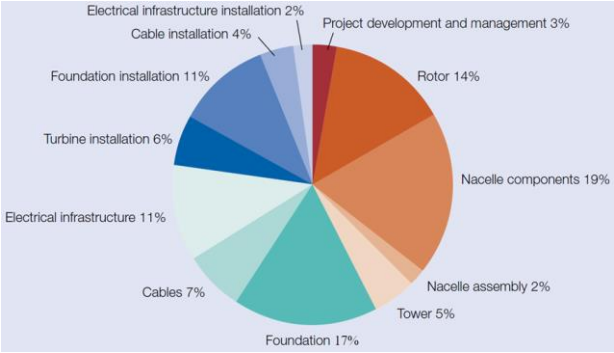


Project Optimisation

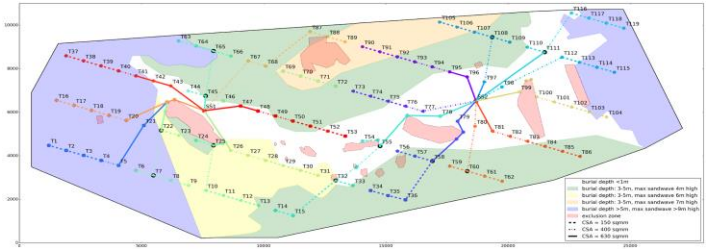
Inter-array layout

At Mott MacDonald we have produced a tool for optimising inter-array design.

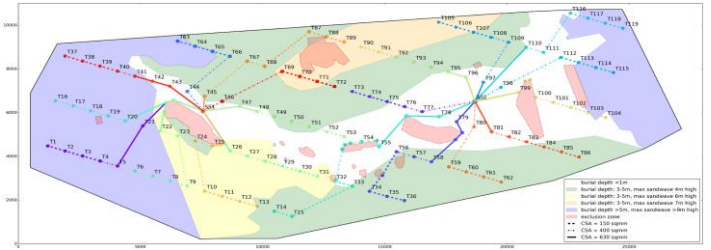
- Allows the user to select either minimization of CAPEX or OPEX or system unavailability or their combinations thereof.
- Accounts for installation, operational and commercial constraints
- Uses a ‘greedy’ algorithm and a ‘genetic algorithm to optimise layout
- Employed on European and Asian offshore wind farms
- Ground conditions are a governing factor in nearshore Japanese projects



Branched Design

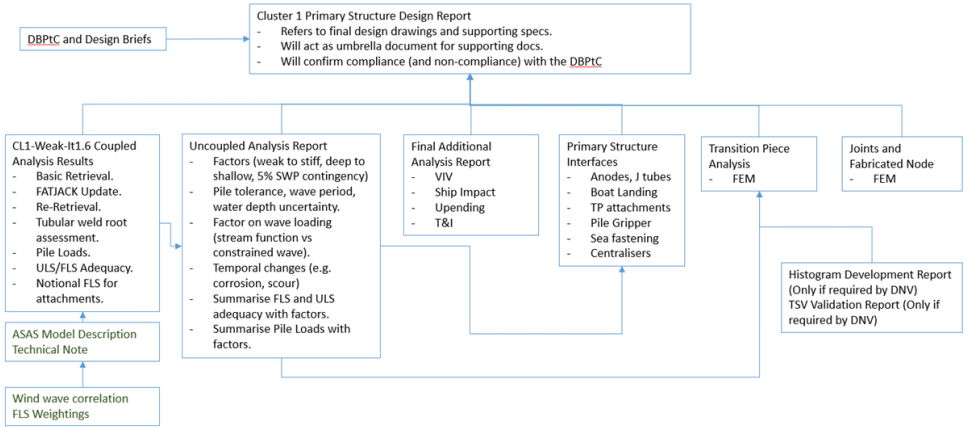


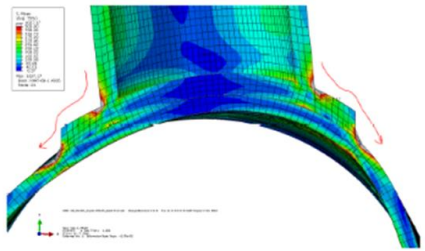
Radial Design

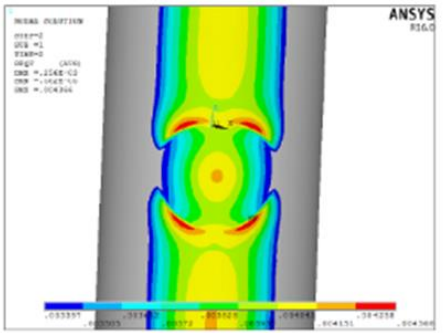


Project design and certification planning

- Project Certification
  - Good Practice
  - Bankability
  - Verified structural design
  - Risk reduction
- Local design houses or EPCIs not familiar with the requirements of international certification
- Local set of offshore standards not fully developed – presently a reliance on codes intended for other applications
- An understanding of the timelines and process is key to ensure that design schedule and certification schedule align.

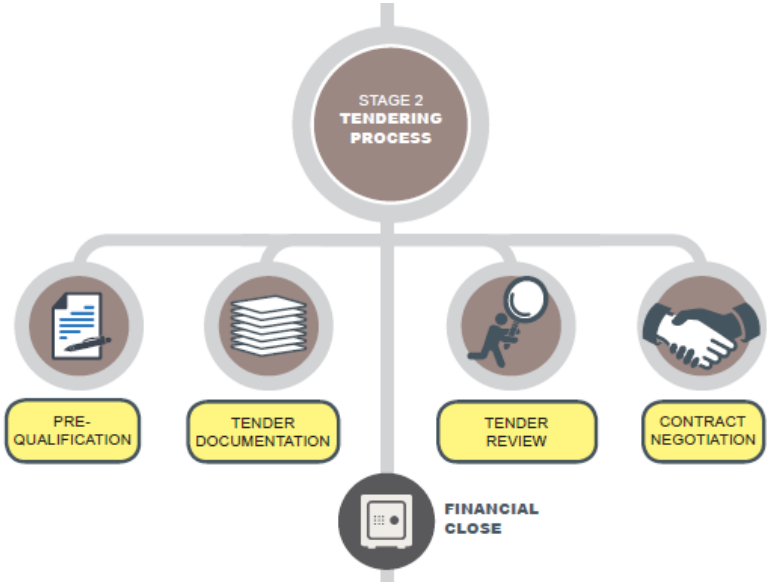






Procurement support

- Contracting strategy:
  - Risk, interfaces
  - Vessel provision
- Prepare ERs and tender pack
  - Sufficiently well informed in order to achieve well developed and clear offers
  - Allow enough time for translation and preparation of offers
- Tender review and contract negotiation support
  - Often benefits from support in local and European offices



Thank You

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www.mottmac.com/wind

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