Financing first tidal farms

UK Green Investment conference
Edinburgh, 27 October 2014
Agenda

- Introduction
- Market and policy context
- Bringing first arrays to financial close
The Crown Estate is a £9.9bn commercial property company which benefits the UK

- Independent commercial business, created by Act of Parliament
- Diverse portfolio of properties, including buildings, land and offshore seabed
- Objectives to enhance value of estate and generate profit for benefit of nation
- £9.9bn capital value, £267m profit (2013/14)

We play a key role in enabling offshore low carbon energy

- For over 10 years, played key role in enabling low carbon energy using offshore seabed
- Offshore wind: multiple leasing rounds, technical work to support project development and co-investment in development
  - 3.7 GW capacity fully operational
  - 1.8 GW under construction
  - 5.0 GW government financial support in place
  - 3.6 GW consented
  - 7.7 GW in planning
- Other technologies: Increasingly active over last 5 years

September 2014 data
We are also supporting growth of the tidal and wave sectors

- In tidal and wave, strategic objectives to:
  - Support growth of emerging industry
  - Attract significant investment to sector
  - Encourage major players to commit to development

- Main activities are site leasing, development support and project investment

- Also work closely with government on policies which underpin market development
We have agreed to co-invest in the UK’s first tidal farm

- First array investments initiative: In January 2013, invited expressions of interest in capital investment in first array wave and tidal current projects
  - Subsequently undertook due diligence on several schemes
- MeyGen project: In August 2014, agreed to invest £9.8m, alongside Atlantis Resources and other funders (equity, debt and grants)
  - Site at Inner Sound, Pentland Firth
  - Phase 1a project, 6.0 MW, three Andritz Hammerfest Hydro 1.5 MW turbines and one 1.5 MW Atlantis turbine
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There is potential for tens of gigawatts of wave and tidal generation around the UK

We have provided seabed rights for 40+ UK wave and tidal sites, including 10 ‘active’ leases.

- Wave and tidal current
  - 10 ‘active’ leased sites (devices, projects and/or infrastructure currently deployed or planned to be deployed within 1 year)
  - 30+ other sites in development, including 6 Demonstration Zones to host future projects
- Tidal range leasing process underway

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<th>Wave and tidal current Demonstration Zones</th>
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In tidal current, the industry’s next step is first array demonstration projects

**Project installed capacity**
- **Single prototype installations**: ~100 kW - 2 MW
- **First array demonstration projects**: 3-10 MW
- **Intermediate commercial projects**: 10-50 MW
- **Large-scale commercial projects**: 100-500 MW

**Approximate capital costs**
- **Single prototype installations**: Single £ms
- **First array demonstration projects**: Tens of £ms
- **Intermediate commercial projects**: > £100m
- **Large-scale commercial projects**: > £500m

**Status**
- **Current industry transition**
  - Historic to present
  - Multiple machines tested at EMEC and elsewhere
  - Several UK projects with consents and grid connection agreements
- **Sites under development for construction in future**
Given the costs and risk profiles of first arrays, government support is needed

- Levelised cost of electricity (LCOE, £/MWh) of demonstration projects (starting costs) considerably higher than wholesale market price
  - Government market support mechanism(s) needed to make projects financially viable
- In UK (at least), 100% government grant (no profit) support not available
  - Some proportions of capital must be for profit (equity or debt, private and/or public sector sources)
- Project risk profiles set threshold return levels (returns commensurate with risks)
  - In order to attract equity/debt, projects’ forecast returns must be above thresholds
- With current government support levels (combination of revenue support and capital grants), forecast returns for some projects below threshold
Visibility of future government support is also necessary to justify investments

• By definition, demonstration projects are means to end, not end in itself
• To justify investments in first arrays, investors must believe: -
  – Tidal farms will become competitive with other types of project (e.g. wind farms) in future
  – As costs reduce, government support will continue to be available at appropriate levels (tapered support)
• Current investor perspectives:
  – Project LCOE will fall through innovation and both project- and industry-level economies of scale (larger projects, larger-scale manufacturing, installation and operation of technologies and projects)*
  – Government support visible only for near term (UK to 2019); longer term support uncertain

* For example, see findings of Carbon Trust Marine Energy Accelerator
Investor appetite also depends on conditions in wider energy market

- European utility companies recently faced considerable challenges, limiting appetite to invest in new technology demonstration projects, including tidal current
  - First array investment cases particularly challenging due to sub-threshold returns and uncertainty of long-term support
- Meanwhile, European industrial equipment manufacturers invested in tidal current turbine technologies, initially through acquisition of start-ups and subsequently through technology commercialisation programmes
- Limited appetite and challenging investment cases for utilities means it is difficult for industrials to sell turbines
  - In turn, challenging for industrials to continue investing in technology commercialisation
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Ways forward can be considered at both market and project levels

• To overcome current challenges and enable further first arrays to reach financial close, can consider changes:
  – ‘Top down’, from whole market level to specifics of project cost and risk profiles, and associated government support
  – ‘Bottom up’, based on project financial structure and contracting approach
At market level, the starting point is to make projects more attractive to typical investors, or attract alternative investors.

Are alternative investors interested?
In this context, do their needs differ to typical investors?

Make projects more attractive to typical project investors (e.g. utilities)

Enable further investments in first array projects

Seek alternative investors for projects
Typical investors may be more attracted by changes to projects or the government support framework

‘Top down’ model

Enable further investments in first array projects

- Make projects more attractive to typical project investors (e.g. utilities)
- Seek alternative investors for projects

- Change configuration of projects, to increase investor risk-weighted returns above threshold
- Change government support framework, to increase investor risk-weighted returns above threshold
Project LCOE and risks can either be reduced (project change) or better covered (government support change)

- **Top down** model

  - **Enable further investments in first array projects**
    - Make projects more attractive to typical project investors (e.g. utilities)
    - Seek alternative investors for projects
  - **Change configuration of projects, to increase investor risk-weighted returns above threshold**
    - Reduce project LCOE
    - Reduce project risks
  - **Change government support framework, to increase investor risk-weighted returns above threshold**
    - Increase financial support
    - Cover risks/reduce exposure
There are various options to reduce project LCOE and risks

‘Top down’ model

Reduce project LCOE
- Increase output of turbines (turbine design and site selection)
  - Possible to some extent, though highly energetic sites may be higher risk
- Reduce costs of turbines
  - Possible to some extent, but limited by small-scale/one off manufacturing (including components)
- Reduce costs of balance of plant
- Reduce installation costs
  - Difficult, given project diseconomies of scale (small size), need for main contractors to carry risk and limited near-term market prospect for contractors

Reduce project risks
- Reduce construction risks
  - Possible to some extent, though residual risks likely to remain due to limited experience of installation at tidal stream sites
- Reduce operating (performance) risks
  - Difficult, given limited track record to date/definition of project purpose

Change configuration of projects, to increase investor returns above threshold risk-weighted
But collectively, these do not appear to increase returns sufficiently. "Top down" model:

- Change configuration of projects, to increase investor returns above threshold risk-weighted.
- Reduce project LCOE.
- Reduce project risks.
  - Increase output of turbines (turbine design and site selection).
  - Reduce costs of turbines.
  - Reduce costs of balance of plant.
  - Reduce installation costs.
  - Reduce construction risks.
  - Reduce operating (performance) risks.

Various possibilities for incremental change, but combination insufficient to increase returns above threshold.
This means that to attract typical investors (at least), changes to support framework may be needed as well as project changes.

**‘Top down’ model**

- Enable further investments in first array projects
  - Make projects more attractive to typical project investors (e.g. utilities)
    - Seek alternative investors for projects
  - Change configuration of projects, to increase investor risk-weighted returns above threshold
    - Change government support framework, to increase investor risk-weighted returns above threshold
  - Reduce project LCOE
  - Reduce project risks
  - Increase financial support
  - Cover risks/reduce exposure

**Insufficient to increase returns above threshold**

**Need to explore changes in support framework**
Looking ‘bottom up’, developers need to arrange a suite of financing, supply and other contracts and agreements.

**‘Bottom up’ model**

- **Project company (SPV)**
  - **Investor(s)**
    - **Equity**
  - **Lender(s)**
    - **Debt**
  - **Government**
    - **Grant**
  - **Finance**
  - **Offtake contract (PPA)**
  - **Offtaker**
  - **Revenue support**
    - **Government**
  - **Consents**
    - **Lease**
  - **Land rights and legal permissions**
    - **The Crown Estate**
  - **Operation & maintenance contract**
  - **Equipment supply and construction contracts**
  - **Operator (and contractors)**
  - **Contractor(s), including tidal current turbine supplier**

**Capital structure and funding sources**

**Contracting approach and risk allocation**

**Electricity sales**
Capital may be provided through a combination of equity, debt and grants. Grant intensity is significant.

'veBottom up' model

Grant intensity has a significant bearing on risk-weighted returns and total capital required, but is State Aid limited.

Given project risk profile majority of funding expected to be equity.

Debt may be available from public sector institutions.

Contractor(s), including tidal current turbine supplier.

Capital structure and funding sources:

- Investor(s)
- Lender(s)
- Government

- Equity
- Debt
- Grant

Finance

Project company (SPV)

- Operation & maintenance contract
- Offtake contract (PPA)

Electricity sales

Offtaker

Revenue support

Government

Operator (and contractors)

Land rights and legal permissions

Consents

Lease

Government

Equipment supply contracts

Operator (and contractors)
Certain lease terms are significant to investment attractiveness, and consent conditions are also relevant.

'Bottom up' model:

- **Project company (SPV)**:
  - Equipment supply and construction contracts
  - Operation & maintenance contract

- **Capital structure and funding sources**:
  - **Investor(s)**
  - **Lender(s)**
  - **Equity**
  - **Debt**

- **Contracting approach and risk allocation**:
  - **Finance**

- **Electricity sales**:
  - **Offtake contract (PPA)**

- **Operator (and contractors)**

- **Consents**
  - **Consent conditions may be significant if impact operational performance (e.g. limit running hours)**

- **Land rights and legal permissions**

- **Lease**
  - **The Crown Estate**

- **Some aspects of leases particularly pertinent to investor appetite (e.g. ability to expand project in future)**

- **Consent conditions may be significant if impact operational performance (e.g. limit running hours)**

- **Government**

- **Contractor(s), including tidal current turbine supplier**

- **Some aspects of leases particularly pertinent to investor appetite (e.g. ability to expand project in future)**
Once (non grant covered) costs are fixed, revenue support is the key determinant of financial viability.
Risk carriage by contractors is important, particularly turbine performance. Residual construction risks are likely to remain with project owner(s).

‘Bottom up’ model

Contractor(s), including tidal current turbine supplier

Equipment supply and construction contracts

Contracting approach and risk allocation

Carriage of turbine performance risks (availability, output) by turbine supplier important to investors and lenders

Multi-contract approach likely. Suppliers may be willing to price certain risks, but construction risks likely to remain with project owner(s)

Operator (and contractors)

Operation & maintenance contract

Operator (and contractors)