UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

Developing a Cost Effective Framework for Offshore Grids

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Theory

- Demsetz, 1968, ‘Why Regulate Utilities?, *Journal of Law and Economics.*

- Baumol et al., 1982, ‘Contestable Markets: an uprising in the theory of industry structure’, *American Economic Review.*

Rising transmission costs

- Project Discovery *(Ofgem, 9/10/09, pp.94-5)*: E+G Distribution and Transmission investments to 2025 are £47 to £53.4bn
- Electricity transmission and distribution charges rise £49-53 per customer (or 60%), more than proportionately.
- Offshore transmission alone could be £15+bn to 2020 (more than current onshore RAV).
- Cost of capital and competitive sourcing key.

Key questions for regulatory regime

- What ensures transmission investments are necessary?
- What ensures transmission investments are delivered at least cost?

A competitive process

- Still need a proposer of investments?
- Tendering processes expensive (vs regulation)
- May lead to duplication of assets
- Capital adequacy problems and non-delivery risks

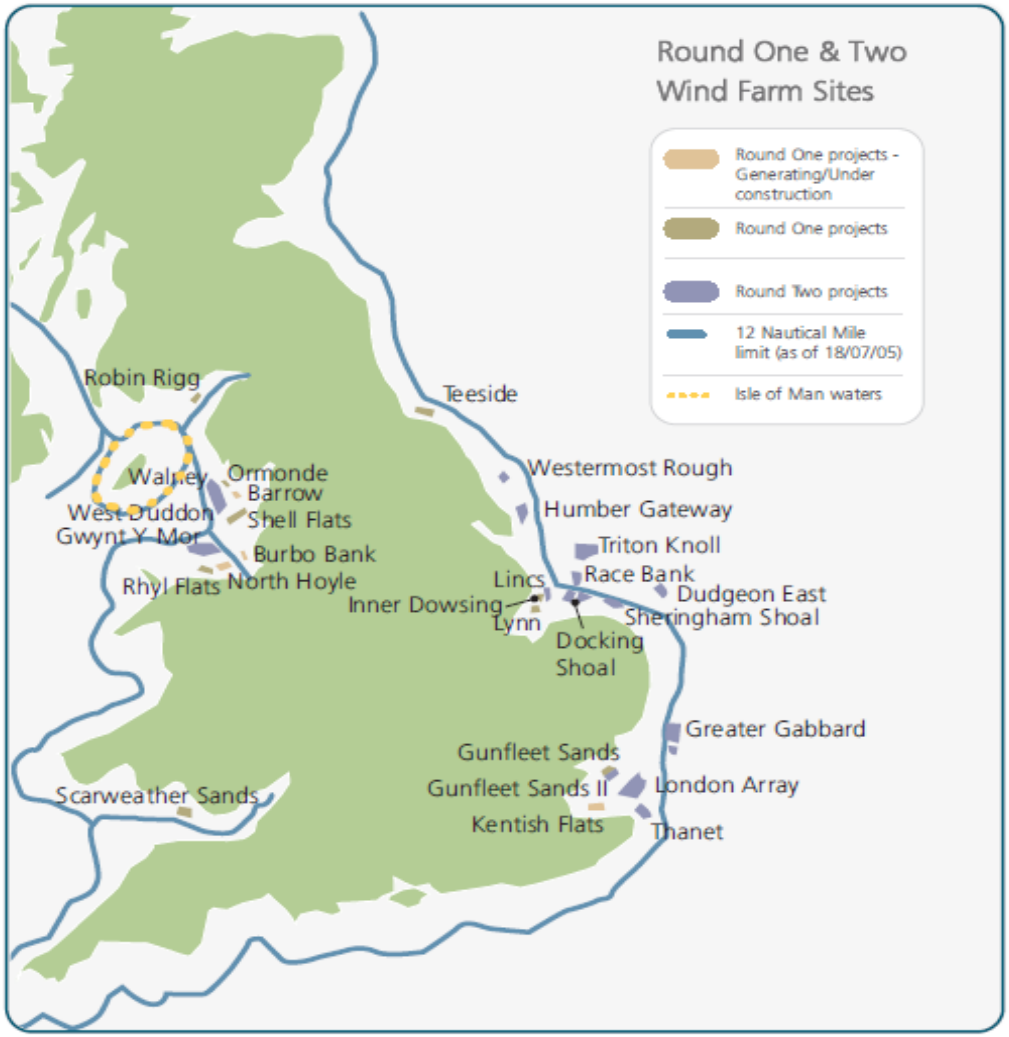
Are things changing?

- Investment needs rising sharply
- SO/TO split possible; ISO/ITO model successful elsewhere.
- Scottish arrangements and rise of offshore transmission raise issue about ISO-ITOs.

UK Offshore Transmission Regime

- 20 year contract, indexed to RPI, de-risked of actual energy flow and existence of wind park
- Round 1 and Round 2 tenders - transitional regime.
- Round 1, projects already built or being built. £1.1bn transfer value.
- Round 2, underway.
- Subsequent rounds - enduring regime (BFOO) or (FOO).

Offshore Transmission



Source: Ofgem.

Bidders in Round 1 (Ofgem, 23/09/10)

- Round 1: The bidders that qualified to proceed to the Qualification to Tender stage were (12):

- ABN Amro Infrastructure Capital Management Ltd; Balfour Beatty Capital Limited **(BBCL);** DONG Energy Sales and Distribution A/S **(DESD)**; Equitix (a consortium of Equitix and AMP) **(GET);** ESB International Limited; Frontier Power Consortium (a consortium of Frontier Power Limited and Infracapital Partners LP); 7. Imera Limited; Macquarie Capital Group Limited **(MCGL);** National Grid Offshore Limited **(NGOL);** RWE Npower plc; SSE Offshore Transmission Limited; A consortium of Stakraft UK Limited and StatoilHydro UK Holdings Limited; Transmission Capital Partners (a consortium of International Public Partnerships Limited, Transmission Capital Limited and Amber Infrastructure Limited) **(TCP).**

- *6 Financial; 2 UK incumbents; 3 International energy firms; 1 engineering firm.*

Shortlisted in Round 1 (Ofgem 14/12/09)

- 6 shortlisted bidders (of which 1 engineering firm, 1 UK incumbent, 3 financials, 1 international energy firm)

Project/MW	Shortlist for each project
Barrow 90 MW	BBCL; DESD; MCGL; TCP
Greater Gabbard 504 MW	GET; MCGL; NGOL; TCP
Gunfleet Sands 1&2 164 MW	BBCL; DESD; MCGL; TCP
Ormonde 150 MW	BBCL; GET; MCGL; TCP
Robin Rigg 180 MW	GET; MCGL; NGOL; TCP
Sheringham Shoal 315 MW	BBCL; GET; MCGL; TCP
Thanet 300 MW	BBCL; GET; MCGL; TCP
Walney 1 178 MW	BBCL; DESD; GET; MCGL; TCP
Walney 2 183 MW	BBCL; DESD; GET; MCGL; TCP
Total MW 2,064	

Preferred bidders in Round 1

(Ofgem 06/08/10 + 28/10/10)

- TCP (4/8); MCGL (3/8), BBCL (1/8); 1 undeclared; i.e. financials guaranteed 7.
- TCP preferred on Ormonde.

Project/MW	Forecast Transfer Value (£m)	Preferred Bidders	Reserve Bidders
Barrow (90 MW)	36.5	Transmission Capital Partners (TCP)	Macquarie Capital Group (MCGL)
Gunfleet Sands 1&2 (164 MW)	48.2	TCP	MCGL
Robin Rigg (180 MW)	57.3	TCP	MCGL
Sheringham Shoal (315 MW)	182.2	MCGL	TCP
Thanet (300 MW)	163.1	Balfour Beatty Capital Ltd	MCGL
Walney 1 (178 MW)	101.8	MCGL	TCP
Walney 2 (183 MW)	105	MCGL	TCP
Ormonde (150 MW)	101.1	Preferred Bidder to be announced at a later date	
Greater Gabbard 504 MW	316.6	Preferred Bidder to be announced at a later date	

Lessons from Round 1

- Lots of interest (£4bn vs £1.1bn).
- Low interest rates (19y debt, +200bps).
- Savings of £350m est.
- Potential for greater savings with BOOT.

The Future – GB ISO?

- RAV of NGET = £7 bn
- RAV of SPT = £1 bn
- RAV of SHET = £0.4 bn
- RAV of Round 1: £1.1 bn
- RAV of Round 2: £2+ bn
- RAV of Enduring Regime: £15 bn?
- This implies we de facto have TO / ISO split emerging.
- This raises issues of NGET – ISO integration.

The Future – more complex networks?

- Offshore Auctions likely to work well for point-to-point transmission.
- Could have more complicated auctions (multi-criteria) auctions for radial links (f. Kenney and Riaffa 93, and Fang and Morris, 06)
- No evidence of major benefit from meshed offshore networks (e.g. Morton et al. 06).
- Merchant links already being built offshore?
- Storage with renewables?

Merchant Interconnection (Parail, 10)

- NorNed cable 700 MW.
- Investment in increments of 350MW.
- €11.5/MW/h gives IRR of 10% for NorNed investment with a 20 year life.
- Estimated socially optimal capacity is 3,850MW.
- Lumpiness may stop the last 350MW investment.
- Difference between socially optimal and profit maximising interconnection capacity <10%.

The Future –Allocating capacity?

- Firm financial transmission rights (FTRs) exist for projects which have initiated connection.
- As more assets exist may be opportunities to sell access to new offshore generation projects.
- May need to have process for allocating unused transmission capacity (Nodal pricing?).
- Large amounts offshore generation raise issues on shore (Nodal pricing?) (see Leuthold et al., 05)
- ISO to do planning for offshore network development and have role in anticipating capacity?

Conclusions

- Offshore transmission developing well.
- Auction results encouraging.
- Meshed offshore grids challenging and expensive.

- Seem to have a good way forward on cost front.
- Still issue on who decides on network configuration.

- ***Offshore costs still very high.***

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