UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

UK Regulation and Commercial Framework for Offshore Grids

Michael Pollitt

Judge Business School

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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).

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.
- 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 on offshore regime

- 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.***

Principles of Auction Design

(Klemperer, 2002)

- Key is to attract sufficient bidders and avoid collusion, as per standard industrial economics
- Even small bidding costs deter bidders
- Sealed bids better than ascending auction
- Structured negotiation can be used where too few bidders or large information costs
- Practical design 'local circumstances matter and the devil is in the details'
- Need to worry about legitimacy of alternatives

Experiments with Auctions

- Experimental auctions a very good idea (used for UK 3G auctions)
- Experiments in electricity markets – tend to demonstrate that risk aversion of participants matters (e.g. Baumgartner et al. 2007)
- Can be played with students or with market participants
- Literature focuses on the commodity rather than the infrastructure (e.g. Rassenti et al., 1994)

Combinatorial Auctions

- Bidders bid for packages (Crampton et al. 06)
- Vickrey-Clarke-Groves – all packages
- Iterative Combination Auctions
- Proxy Auctions – bid on behalf
- Simultaneous Ascending Auctions
- Clock Proxy Auctions
- Etc

Multi-attribute auctions (Keeney and Raiffa, 93)

- Bid offering differing quality combinations
- Quite common in industrial procurement
- Solution methods:
  - Threshold levels and weighted additive scoring functions
- Need to worry about information that can be inferred by bidders and collusion in all auctions, particularly complex ones.

Research Agenda

- Need to analyse benefits of the emerging offshore regime and lessons using SCBA
- Key questions:
  - What are the sources of benefit and are they genuine savings (not just tax related)?
  - To what extent / to what boundary should owners of offshore wind parks be allowed to built own networks?
  - Once built what access rules should apply to offshore networks, for new wind parks?
  - Need to examine network security standards and whether these are economically optimal offshore?

Research Agenda

- Need to consider governance arrangements for offshore transmission:
  - Current governance arrangements for transmission appear unsatisfactory
  - Need to examine the transaction costs of ISO/ITOs and the benefits of separation
  - Also need to consider role of regulator relative to the ISO and what the regulated charges need to look like to incentivise optimal availability (and utilisation)

Research Agenda

- Need to consider combinatorial / multi-criteria auction (see Crampton et al., 2006) for radial network and interaction of this with ISO:
  - How would auction be designed?
    - Specified by ISO
    - Open ended bids
    - Information to be released at each stage
  - Who would run this auction?
  - How would it interact with ISO planning?
  - Fit with merchant international transmission links?
  - Need to run experimental auctions to test designs, preferably with informed participants

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