Securing Grids for a Sustainable Future: Case Studies

Interconnector and Transmission Investment

Interconnection in Europe is currently developed on a fully regulated basis, with the exception of "merchant-exempt" projects. However, the European Commission's (EC) decision to cap returns in BritNed's exemption decision, has increased the risk of the merchant route. In order to overcome the risks of the exemption process, Ofgem and the Belgium regulator CREG developed a "cap and floor" approach as a compromise between the merchant-exempt and default regulated approaches. New cost allocations initiatives are also being considered or undertaken in North America, which may have relevance in the European transmission and market structures.

NEMO Project, Cap and Floor Regime[1]

- NEMO Project is a 1,000 MW seabed interconnector between Zeebrugge in Belgium and Richborough, Kent in Great Britain. National Grid International and Elia, Belgium's Transmission System Operator, are the project developers and future owners.
- Ofgem and CREG, the British and Belgian regulators, sought to overcome regulatory risk (revealed in BritNed's exemption decision, where the EC imposed a cap on returns) and balance the relationship between the risk supported and the return expected by the investors.
- Cap and Floor regime is a regulated approach that sets returns within the bounds of a pre-set cap and floor. Returns above the cap are passed back to the transmission system operator (TSO) and are offset against national transmission tariffs. When returns are below the floor, interconnector owners will be compensated by the TSOs, who will recover costs through national transmission tariffs.
- The model ensures that developers are exposed to the market's valuation of interconnector capacity, allowing the developers to choose the appropriate size, timing, location, and technology of the interconnector; consumers are protected from the cost implications of excessive returns or market power; and developers can earn returns that are commensurate with the levels of risk to which they are exposed.

[1] (Ofgem & CREG, 2011)

NorNed Interconnector, Symmetrical Cap and Floor[2]

- This project links the Netherlands and Norway with a 700 MW sub-sea high voltage direct current (HVDC) cable. The costs, EUR 600 million, were shared equally between the Dutch and Norwegian TSOs.
- The project started as a merchant initiative in 1994; when the second energy package of 2003 came out, the agreement could no longer be maintained. NorNed was reinitiated, adapting to the new legislation, and classified as a project of common interest, allowing it to obtain EUR 3 million in funding from TEN-E.
- A symmetrical application implies that if X is the expected returns of the project, the cap at X+3% and X-3% would be introduced.[3]
- The regime includes an incentive mechanism that assumes the cable will be available 95.62% of the time and EUR 400,000 per 1% availability is available as a penalty or reward, with a maximum of EUR 1.2 million per calendar year to be retained or compensated.[4]

Tehachapi Renewable Transmission Project, Transmission for Location Constrained Resources[5]

- Tehachapi Renewable Transmission Project consists of 250 miles of HV transmission being constructed in US state of California by Southern California Edison.
- The line is being built to fully exploit a region that has a large wind development potential, but which is a great distance from load, and it is unlikely and unreasonable to expect that a single developer will build one line large enough the serve the whole region.
- The state has provided a mechanism addressing the financing of transmission lines that are large enough to serve the full wind development potential of a region by creating a category of transmission lines under Federal Energy Regulatory Commission, whose costs can be socialized if they serve "location constrained" resources. These facilities are referred to as Location Constrained Resource Interconnection Facilities (LCRI).
- Under the LCRI regime, all ratepayers share in the initial cost and risk of building a transmission trunk-line to location constrained renewable resource areas. As projects are developed in the location constrained area, the renewable energy developer pays

[2] (Kafpp & Pelkmans, 2010)
[3] (Ofgem & CREG, 2011)
[4] (Ofgem & CREG, 2011)
[5] (Conant, 2009)

for its proportional share of the cost based on the capacity of the line that it uses until the capacity of the line is filled and fully paid for.

- Location constrained resources are identified through the California Independent System Operator's planning process.

Hydro-Quebec Intertie to New England[6]

- Phase I of the project links the Hydro-Quebec system to the New England Power Pool (NEPOOL), which was the coordinated power pool for the six New England states (replaced by ISO New England), through a 690 MW line passing through the state of Vermont.

- The cost of the line as well as participation in the line was spread among all of the NEPOOL companies on the basis of the utility's share of NEPOOL.

- The public in Vermont, whose load represented 5% of NEPOOL, argued that the state should not be the corridor for a project that serves primarily the needs of the southern New England states. To compensate the state, NEPOOL allowed Vermont to be entitled to participate in the project up to 10%.

- Although NEPOOL labelled the additional 5% allowed to Vermont as a bonus, the State disagreed with the label and considered the increased share a "minimal recognition of the responsibilities and risks undertaken by a lead participant in a major project."

Estlink, Merchant Transmission Model[7]

- Estlink is a 350 MW HVDC cable project connecting the Baltic and Nordic electricity markets owned by AS Nordic Energy Link. It was the first interconnector built on a commercial basis after the issue of the EU Regulation 1228/2003 on Cross-border exchanges.

- The authorities attached a temporal condition to the approval of Estlink's exemption, allowing the cable to be owned and operated on a merchant basis, with capacity being used by the owners conditional to the use-it-or-lose-it principle, until 2013. Then, depending on the completion of the Fennoskan-2 project, the ownership of the interconnection would be transferred to the Finnish and Baltic TSOs.

[6] (Vermont Public Service Board, 1983)
[7] (Vandezande, Meeus, & Belmans)

Basslink, Merchant Transmission Model

- Basslink is a 600 MW line that connects the Tasmanian and Victorian systems in Australia.[8] It is currently the only unregulated electricity transmission network in Australia.[9]

- In Victoria, asset ownership (SP AusNet owns the state's transmission assets) is separated from planning and investment decision making (carried out by the Australian Energy Market Operator). However, in Tasmania, common ownership occurs in distribution and retailing.[10]

- In 1999, the government of Tasmania called for bids for the interconnector and named National Grid as the developer, though the project has since been purchased by City Spring Infrastructure Trust (Singapore).[11]

- Hydro-Electric Corporation, owned by the State of Tasmania, has a 25 year contract for capacity on the line through the Basslink Services Agreement. Hydo-Electric pays facility fees that make up most of the line's revenue.[12]

Interconnector and Transmission Planning

In addition to the priorities of the new Regulation on Energy, further initiatives may need to be pursued to ensure that interconnection and other transmission development is delivered in the most cost-effective fashion, including a more centralized approach to investment planning. The United States has recently undertaken steps to move toward planning processes that better incorporate interregional planning and provide transparency on the planning and cost allocation methodologies.

Federal Energy Regulatory Commission (FERC) Order No. 1000, Interregional Planning[13]

- In July 2011, FERC, which regulates the interstate transmission of electricity in the US, issued its Order No. 1000 on electric transmission planning and cost allocation requirements for public utility transmission providers.

- The Order requires public utility transmission providers to develop and participate in a regional planning process that produces a regional transmission plan as well as

[8] (Lawrence Berkeley National Laboratory, 2008)
[9] (Australian Competition & Consumer Commission, 2010)
[10] (Australian Competition & Consumer Commission, 2010)
[11] (Australian Competition & Consumer Commission, 2010)
[12] (About Basslink)
[13] (Reese, Smith, & Winmill, 2011)

participate in an interregional planning process that produces an interregional transmission plan with each of its neighbouring regions.

- Regions must also develop methods of cost allocation for regional and interregional cost allocation methods for regional and interregional transmission projects. These methods must allocate costs in a manner that is at least "roughly commensurate" with estimated benefit and the regional and interregional cost allocation methods may differ.
- The Order requires that public utility transmission providers consider state and federal public policy requirements (i.e., renewable obligations) in the planning process.
- The Order also eliminates the Right of First Refusal (ROFR) of incumbent transmission owners. This allows non-incumbent transmission developers to have the same opportunity as incumbent transmission developers to have costs allocated through regional cost allocation methods.

Southwest Power Pool (SPP) Planning Process, Balanced Portfolio Approach[14]

- The SPP region needs extensive regional transmission development to access its wind resources. SPP is a Regional Transmission Organization with members in nine US states including Arkansas, Kansas, Louisiana, Mississippi, Missouri, Nebraska, New Mexico, Oklahoma, and Texas.
- SPP's Cost Allocation Working Group, which began working with stakeholders in 2005, issued a concept paper outlined the Balanced Portfolio approach in 2007. SPP's Regional Tariff Working Group then developed language incorporating the Balanced Portfolio into SPP's planning process under FERC Order 890, which required planning at a regional level.
- Under the Balanced Portfolio Approach, SPP evaluated portfolios of economic transmission upgrade projects based on the following criteria that the portfolio be cost beneficial over a ten year period and that the portfolio be balanced, meaning that the portfolio must be cost beneficial for each individual zone over the ten year period.
- The cost of Balanced Portfolio economic projects will be recovered 100% through SPP's regional postage-stamp rate.
- In 2010, SPP integrated the Balanced Portfolio with its Priority Projects (for expedited implementation) and Transmission Expansion Plan (STEP) to create the Integrated Transmission Planning (ITP) process. The ITP involves a three year iterative process that includes**: a**n annual reliability assessment; a triennial 20-year assessment used to

[14] (Fink, Porter, Mudd, & Rogers, 2011)

develop 300 kV and above backbone facilities; a triennial 10-year assessment used to identify 100 kV and above facilities that will be needed within 10 years; and an annual near term assessment that focuses on SPP's obligations with respect to reliability and local transmission planning.

- Costs of projects arising from the ITP will be funded through the Highway/Byway cost allocation methodology. Under the Highway/Byway model, the costs for transmission facilities with voltage level greater than or equal to 300 kV are assigned 100% to a regional postage stamp rate, the costs for facilities with a voltage level between 100 and 300 kV will be assigned 33% regional and 67% zonal, and the costs for facilities with a voltage level less than or equal to 100 kV will be assigned 100% zonal.

Competitive Renewable Energy Zones (CREZ), Planning for Renewables Transmission[15]

- In 2005, the US state of Texas passed a law requiring a minimum installation of renewable generating capacity of 5,880 MW by 2015. The law also required that the Utilities Commission designate CREZ throughout the state and develop a plan to construct transmission capacity necessary to deliver the output from renewable energy technologies in the CREZ. [16]
    - The Electric Reliability Council of Texas (ERCOT), the state's market and grid operator, released the CREZ Transmission Optimization Study in 2008 that identified and quantified transmission costs of four different CREZ scenarios previously chosen by the Utilities Commission. The costs estimates for the transmission plans ranged from USD 2.95 billion to USD 6.38 billion.
    - The Utilities Commission, which regulates utilities in the state, then granted approval for Scenario 2 at an approximate cost just over USD 5 billion and awarded the development of the transmission plan segments to several transmission entities.
- In 2007, California launched the California Renewable Energy Transmission Initiative (RETI) to identify CREZ and the transmission needed to access them.
    - First, RETI identified and ranked CREZs in the state and in neighbouring areas with significant renewable energy potential that could be developed in time to meet the State's renewable energy goal of 33% of energy supply by 2020.

[15] (Fink, Porter, Mudd, & Rogers, 2011)
[16] Texas Utilities Code §39.904(g)

  - Then, California established a new category of transmission projects, called "policy-driven," that are needed to meet state and federal policy requirements and directives.

  - The state will create a request window during which all parties would be able to submit proposals for the projects.

California Independent System Operator (CAISO) Planning[17]

- CAISO identifies, evaluates, and approves new transmission facilities through its transmission planning process.

- Transmission projects are characterized as reliability transmission projects, economic transmission projects, Location Constrained Resource Interconnection Facilities, Policy-Driven transmission projects, Long-term Congestion Revenue Right Feasibility Projects, and Merchant projects.

- Economically-driven projects include those where the economic benefits are expected to exceed costs and may serve to lower a region's energy production costs, reduce or eliminate congestion, or reduce capacity costs. The projects are evaluated through the CAISO Transmission Economic Assessment Methodology (TEAM). Proposed economically-driven projects that are found to be beneficial according to the TEAM evaluation are approved by CAISO.

- The Tehachapi Renewable Transmission Project is a prominent example of the economically-driven transmission projects approved by CAISO. The need assessment for the project included consideration of its role in supporting California's RPS goals. Tehachapi was designated as a Location Constrained Resource Interconnection Facility (LCRI), allowing its costs to be recovered through the transmission owner's revenue requirement until generators are interconnected, at which point they are responsible for paying a pro rata share of the going-forward costs of the line.

Independent System Operator New England (ISO NE), Regional System Plan[18]

- ISO NE, the Regional Transmission Organization serving the US states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, creates an Annual Regional System Plan (RSP) that analyses load, resources, and transmission needs for the next ten years.

[17] (Fink, Porter, Mudd, & Rogers, 2011)
[18] (Fink, Porter, Mudd, & Rogers, 2011)

- Through the RSP, ISO NE identifies projects that are classified as Reliability Upgrades or Market Efficiency Transmission Upgrades (METU), which are projects that provide a net economic benefit.

- METU projects and Reliability Upgrades rated at or above 115 kV are categorized as Regional Benefits Upgrades, which can be funded through a pool-wide postage stamp rate for Regional Network Service. Under this rate, the cost of a transmission project is allocated in proportion to each state’s peak electricity demand.

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