

## **Transmission grids with multiple owners: International experiences**

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Abstract:

*On the 1<sup>st</sup> April 2005, the England and Wales electricity arrangements, NETA (New Electricity Trading Arrangements) changed to amalgamate Scotland into the arrangements under the title of BETTA (British Electricity Transmission and Trading Arrangements). On the face of it, little has changed for generators and suppliers in England and Wales, but underlying the augmented market lie radical new arrangements for transmission. A system with one vertically unbundled network owner-operator had to be extended to a system with multiple network owners. In this article we review international experiences with multiple network owners and examine implications for future developments in Germany and Europe.*

*We conclude that if BETTA is shown to work in the long-term, then it could provide a positive example of a competitive market under multiple grid ownership, particularly within a single country. Instead of requiring a single transmission owner, countries such as Germany can simplify the market rules for generators and retailers, and reduce the number of balancing areas, by integrating the transmission assets under a single ISO, while allowing the incumbent companies to retain ownership and the income on their transmission assets.*

*Ultimately, these types of arrangements could also allow supranational electricity transmission markets in Europe with a single independent SO controlling a number of*

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*national grids, although the need for a single regulatory regime provides the greatest stumbling block to such international grid integration on a European-wide level.*

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## **Moving from NETA to BETTA: Moving from a single transmission grid owner to a multiple owners**

When the electricity industry was privatised in 1990 two radically different market structures were introduced due to the then limited interconnection between England and Scotland and the excess of capacity within Scotland.

England and Wales was split horizontally into separate firms for generation, transmission and distribution and supply. Electricity was traded through the Pool trading arrangements, which was a compulsory market for physical product. This Pool was replaced in 2001 through a bilateral contracts market with a residual balancing power market, called NETA (New Electricity Trading Arrangements). Through the introduction of NETA, Ofgem was hoping to increase wholesale market competition.

From 1990 to 2005, the England and Wales market was transformed through new entry in generation and retail, vertical integration of the major generators with suppliers and the introduction of NETA in 2001, while the Scottish market remained largely unchanged until now.

In Scotland, privatisation created two vertically integrated companies, Scottish Power and Scottish Hydro (now Scottish and Southern) each of which owned generation, transmission, distribution and supply within distinct areas. New entry into the Scottish market has been limited, partly because of the structure of the market and partly due to the over-capacity in generation inherited at privatisation. For new entrants, the need to balance their position in Scotland, without recourse to their trading position in England and Wales, has made new entry difficult and financially risky. Little new entry has occurred and effectively Scotland has remained a duopoly market.

Ofgem (Office of Gas and Electricity Markets), the industry regulator decided to reform the market and in 2001 proposed extending the NETA England & Wales trading and transmission

arrangements into Scotland. This change was so significant, it required new primary legislation. The Energy Act 2004 provided the necessary legislation to implement BETTA.

Apart from the need for primary legislation, extending the England and Wales trading arrangements into Scotland, where the industry structure is entirely different, has provided a number of obstacles. The most difficult aspect of the integration has been transmission issues. First, the structures are entirely different. In England and Wales, transmission is owned and operated by NGT (National Grid Transco). NGT holds no other interests in the electricity market and as such is able to operate the trading arrangements such as balancing without any conflict of interest with other areas of its business. Its subsidiary, Elexon, administrates the trading arrangements and settlement under the Balancing and Settlement Code (BSC). In Scotland, Scottish Power and Scottish and Southern own and operate the transmission networks for their respective regions. These activities include planning and maintaining the assets as well as balancing their respective systems and procuring ancillary services as required. As they also own generation and supply, their transmission license requires the transmission assets to be ring-fenced from the generation and retail business to prevent discrimination.

There were three possible solutions to allow the grid to become integrated into Scotland:

- (1) **Force the Scottish companies to divest their grid assets to a third party to make a single grid owner:** It would be questionable whether a suitable owner could have been found who also did not, or would not, have a conflict of interest by owning either generation or retail assets. In addition, this route would have been strenuously opposed by the two Scottish parties.
  
- (2) **Allow each network owner to retain balancing control for their own areas** as is the case, for example, in Nordpool: Under Nordpool, the financial and physical traded markets cross national boundaries, the transmission arrangements remain with each

national transmission owner. For example, although power is traded across frontiers, in Norway, Statnett SF is the only party responsible for balancing the network on a minute by minute basis, procuring ancillary services, planning the network and managing maintenance. Likewise, in Sweden, this role is carried out by Svenska Kraftnat.

Crucially in all the national markets covered by Nordpool, the same commercial and administrative rules apply regarding the procurement, pricing and supply of balancing power. Furthermore all the national network operators have clear administrative and commercial co-operation procedures.

Since Ofgem was aiming to achieve an integrated and liquid electricity market in the UK, it was unlikely to allow two separate balancing areas in Scotland and England & Wales, with separate imbalance markets. Historically that model had resulted in insufficient new entry in Scotland since 1990 due to Scotland's relatively small size. A persistence of these arrangements would hence not have provided enough liquidity in separate Scottish wholesale and balancing power markets.

- (3) Ofgem's third option was **to have a single operator controlling the grids owned by other parties**. Ofgem chose the third approach. Ofgem's approach with Betta was hence to create a single system operator and a single balancing power market to ensure an integrated electricity market in England, Wales and Scotland.

**Diagram 1:**

**Structural options for expanding NETA to Scotland**

		Network Ownership	Network Operations
Option 1	Scottish Power	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Scottish & Southern	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	NGT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Option 2	Scottish Power*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Scottish & Southern*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	NGT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
*Only Generation and Retail			
Option 3	Scottish Power	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Scottish & Southern	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	NGT*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

**PJM Arrangements: Example of an established system with a single network operator and multiple owners**

The BETTA arrangements bear stronger resemblance to the PJM (Pennsylvania, New Jersey and Maryland) market in the USA than to other European markets. The PJM market serves around 45 million people with a peak demand of 110.7GW. In 1997, a single Independent System Operator (ISO) was established, and the wholesale market operation supervised by the PJM ISO started in April of that year. The ISO carries out a number of roles. It manages the wholesale market for electricity, including locational marginal pricing to manage transmission constraints. It controls physical flows over the network, it manages the minute by minute system balance and is responsible for planning the network and for the procurement of ancillary services.

The transmission network itself, which covers around 50,000 miles (approximately 80,000 km) is maintained and owned by a multitude of owners. The transmission owners are not responsible for balancing their portion of the network. Instead, they effectively lease their wires to the ISO. PJM is expanding as other regions join into the PJM market. In addition, PJM market is the model that FERC, the national electricity regulator, wishes to introduce across the USA.

**German transmission arrangements: The competition problems raised by multiple owners and multiple operators in an intermeshed system**

Experiences in Germany provide a good example of the potential difficulties with multiple arrangements in an interconnected system. In Germany wholesale market participants can trade across the network area of the supra-regional network operators (RWE, E.ON, EnBW and Vattenfall) on a day-ahead basis. Traders have to have balancing power contracts with every network operator across whose network area they trade. Any discrepancies between outturn values and day-ahead schedules are resolved via the balancing power markets.

Between 2001 and 2003 merger conditions and market power abuse proceedings by the Federal Cartel Office<sup>2</sup> led to RWE, E.ON, EnBW and Vattenfall Europe establishing auction based balancing power markets within their network areas. However, these separate balancing power markets remain fragmented and illiquid. Increases in balancing power prices of up to 150% since the introduction of individual balancing power markets have led to market power abuse investigations by the Federal Cartel Office.<sup>3</sup>

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<sup>2</sup> BkartA (2000): B8-U-309/99, RWE/VEW, BkartA (2000): B8-40200-U 132/00- E.ON/ HeinHas/HEW, BkartA (2001): Pressemeldung vom 30.10.2001: Missbrauchsverfahren gegen Bewag, EnBW, HEW und VEAG wegen unbilliger Abrechnung von Regelenergie, BkartA (2002): Pressemeldung vom 21.02.2002: Missbrauchsverfahren gegen EnBW im Bereich Regelenergie eingestellt. BkartA (2002): Pressemeldung vom 19.08.2002: Missbrauchsverfahren gegen Bewag, HEW und VEAG im Bereich Regelenergie eingestellt

<sup>3</sup> Pressemeldung vom 26.02.2003, Bundeskartellamt leitet Missbrauchsverfahren gegen RWE- und E.ON- Unternehmen wegen überhöhter Regelenergie- Preise ein

Establishing four separate balancing power markets in a highly intermeshed system was the result of historical factors, rather a reflection of network constraints.<sup>4</sup> This fragmentation entails, however, that liquidity in each separate balancing power market is low, a factor which is compounded by complex market access rules, high transaction costs for market participants and lack of transparency. Incumbents justified the high price levels in the balancing power markets with scheduling errors made by new market participants, the retirement of old power station capacity and an increase in wind generation.

It is particularly difficult for market participants to supply balancing power from power stations which are not located within a given supra-regional network, i.e. to trade balancing power between network areas. Such trades would require co-operation from the network operators in the network area in which the power station is located and in the network area into which the balancing power is to be exported. For example the supply of minute reserve presupposes short-term changes to dispatch schedules which are not currently allowed for in the rules governing day-ahead trading. An agreement between all supra-regional network operators regarding uniform commercial and administrative rules and procedures governing the supply of balancing power between network areas are a precondition for developing greater commercial integration between the various German balancing power markets. For a while it looked like the creation of such uniform rules was going to be forced by a draft of the new Energy Law<sup>5</sup> since at one point in time it contained provisions in §12.4 for the creation of a Germany-wide balancing power market. However, in its final version the law only suggest that network operators should co-operate with the aim acquiring balancing power in joint auctions.

Market size considerations indicate that had a Germany-wide balancing market been introduced under the new Energy law, there would have been the need to adopt a Betta style

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<sup>4</sup> The technical security of the system is ensured through long-standing technical co-operation between network operators, which is, however, not market based.

<sup>5</sup> Entwurf des Bundesministeriums für Wirtschaft und Arbeit zur Neufassung des Energiewirtschaftsrechts (EnWG-Novelle) vom 26.02.2004

approach with a single network operator (but multiple owners) and a single national balancing power market. This issue might still raise its head, should regulatory or competition policy investigations in the future arise which examine the effectiveness of the co-operation between network operators required under the final version of the EnWG.

Hence we discuss next the generic problems encountered when separating out network ownership and operations by creating a single transmission system operator although there are multiple owners.

### **Generic issues arising when network ownership and network operations are separated out**

In both PJM and BETTA has a single independent system operator controlling flows over the transmission network, while the transmission owners are responsible for maintenance. The ISO<sup>6</sup> is responsible for the operation of the market, which in the case of BETTA is a residual balancing market with bilateral physical contracts between players. It is also responsible for settlement through its subsidiary Elexon. Unlike PJM, the ISO under Betta is not responsible for planning and expanding the transmission assets in the entire system: In both Scotland and England & Wales the transmission network owners remain responsible for network planning and expansion.

Separating network operations from network ownership leads to several potential incentive, regulatory and organisational problems. So although the PJM market provides an example of a single SO and multiple grid owners, what are the issues that Ofgem has encountered in designing a new transmission operating regime under BETTA? We provide a non-exhaustive list of some of the generic problem areas which can be identified:

- One area of potential conflict arises from mismatched interactions between the financial incentives for the system operator and the transmission owners under their

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<sup>6</sup> The ISO for BETTA is NGT

respective price controls. In particular, there was concern that a mismatch in incentives could undermine the operation and maintenance of the system.

- Information exchange between the system operator (SO) and the transmission owners (TO) regarding the systems in particular to co-ordinate unscheduled maintenance, as well as knowledge transfer between parties prior to operational handover.
- The incentives on the TO to maintain their systems and make assets available to the SO.
- The incentives on the SO to operate the system, particularly if it has an impact on maintenance and/or asset lives of the TO's network.
- Co-ordination of network planning, maintenance and network expansion, including the rules for handing over assets to and from the SO's control (eg for maintenance purposes).
- Emergency procedures on the network and particularly the division of responsibility between the TO and SO.
- Disputes between the TO and SO and how these can be arbitrated and resolved.
- Payments, financial liability and the potential for financial default between the TO's and the SO.

The resolution of most of these problems relies on establishing clear regulatory, administrative, commercial and operational procedures and interfaces from the outset.

The question whether a separation of ownership and operation is compatible with efficient network investment incentives remains a core issue which will only receive a definite answer over the longer-term. In this context the PJM approach of procuring new transmission

capacity on a merchant basis and using ‘cost of service’ price regulation seems to have proven successful. In the PJM the ISO plans the network and decides where new investment should occur (including generation) and then parties can compete to build the lines and power plants, providing for competition in the construction of new capacity. Lines built by the regulated utilities include the asset into their regulatory asset base and receive their cost of service. Merchant power lines receive the payments from the fixed transmission rights.<sup>7</sup> Due to the maturity of the regulatory regime network owners then face a low degree of regulatory uncertainty regarding the future income stream associated with their investments.

### **Additional challenges faced when introducing BETTA**

When designing BETTA Ofgem faced some additional technical and regulatory issues, such as:

- Different voltages are classed as transmission in the different areas: over 132kV in E&W, including 132kV in Scotland. This meant there was no clear definition of which assets should be included in the SO control areas and which should be retained in the distribution businesses.
- Price controls were calculated differently, which has led to difficulties setting uniform arrangements in Scotland and England & Wales.

However, the most difficult issues relate to the incentives between the TO’s and SO’s, as suggested by our exploration of the generic issues raised by the separation of network ownership and operations above. Although Ofgem separated the income under the price controls between TO and SO a number of years ago, so parties are relatively accustomed to the separation of the two roles, they were still within one company. Now the impact of TO and SO decisions can affect the finances of another company ie operational decisions by NGT

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<sup>7</sup> In other US markets fixed transmission rights are known as financial transmission rights

as SO within Scotland can affect the maintenance schedules and hence costs of the Scottish TO's. Rules have been put in place to set incentives and responsibilities between all parties. However, time will tell whether the current rules will continue to incentivise investment in transmission assets and the efficient operation of the networks.

## **Conclusions**

If BETTA is shown to work in the long-term, then it could provide a positive example of a competitive market under multiple grid ownership, particularly within a single country. Instead of requiring a single transmission owner, countries such as Germany can simplify the market rules for generators and retailers, and reduce the number of balancing areas, by integrating the transmission assets under a single ISO, while allowing the incumbent companies to retain ownership and the income on their transmission assets.

Ultimately, these types of arrangements could also allow supranational electricity transmission markets in Europe with a single independent SO controlling a number of national grids. The US experience, where PJM comes under the remit of the national regulator rather than the individual state regulators due to its multistate coverage, indicates that such arrangements would only work if a single regulator had oversight. Arguably the need for a single regulatory regime rather than diversity in grid ownership provides the greatest stumbling block to grid integration on a European-wide level.