LECG

Implementing the Third Energy Directive in Ireland: Options for the transmission network

Final

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1 Introduction and Executive Summary

1.1 Directive 2009/72/EC requires all EU Member States to ensure appropriate vertical separation of its electricity transmission network, by choosing from one of the following options:[1]

- *Full ownership unbundling (OU)*: complete separation between the ownership of electricity transmission networks and supply/generation activities.
- *Independent System Operator (ISO)*: the vertically integrated company retains the ownership of their network assets, but the network is managed and controlled by an independent company, the ISO.
- *Independent Transmission Operator (ITO*): the vertically integrated company retains the ownership of their network assets but organisation and governance measures ensure that the activities of the transmission network are separate from generation and supply.
- *Other option*: a member state is entitled to continue with arrangement in place at the time of the regulation, if these arrangements are more effective than the ITO option in guaranteeing the independence of the transmission system.

1.2 The Irish government is in the process of transposing Directive 2009/72/EC and is assessing these options, with a particular focus on the choice between, on the one hand, the ISO arrangements currently in place, and, on the other hand, full ownership unbundling, which was official policy of the Government prior to the last election. Under the current arrangements, which are largely or wholly consistent with the Directive's requirements for an ISO, EirGrid acts as the ISO and ESB as the Transmission Owner (TO). We understand that full OU would involve the transfer of ESB's transmission assets to EirGrid, which would remain in public ownership.

1.3 In that context, the ESB Employee Share Ownership Plan (ESOP) has commissioned LECG to undertake an independent study of the merits of ownership unbundling for the Irish transmission network, relative to the status quo arrangement.

[1] Directive 2009/72/EC, Article 9(1), 9(8), 9(9).

Our Approach

1.4 We assess these different options against the goals of the EU's Third Energy Package (the "Third Package"), of which the Directive forms a key part, and against the broad goals of Irish energy policy as laid out in the Energy White Paper[2].

1.5 With regard to the Third Package, we focus in particular on the concerns expressed by the European Commission (EC) during the debate that led up to the completion of the Third Package. Drawing in particular on the findings of the Energy Sector Inquiry,[3] the EC concluded that vertical integration between, on the one hand, transmission and, on the other hand, generation and or supply could result in the following outcomes:

- Under-investment in grid assets – particularly with regards to interconnection with adjacent markets, which could increase competition in the local generation and supply markets.
- Anti-competitive discrimination – with risks of discrimination in (for example) the procurement of and charging for ancillary services, the dispatch of generation and the setting of transmission charges. Such discrimination could adversely affect competition in generation and supply markets.
- Barriers to regional integration – the EC was concerned that vertically integrated operators would impede efforts to foster regional integration between Member States, by failing to invest or to integrate system and market operations.

1.6 With regards to ISOs, the EC's initial view was that they could be effective in addressing many of the problems of vertical integration, but that they could encounter problems in fostering appropriate levels of investment in transmission, and also that the administrative arrangements could be costly and difficult to operate.

2 *Delivering a sustainable energy future for Ireland,* Government White Paper, Department of Communications, Marine and Natural Resources, 12 March 2007.

3 EC, "Energy Sector Inquiry", January 2007.

1.7 The Irish Government sets out three strategic goals in the 2007 Energy White Paper[4]. They state that "*Ireland supports the development of a European Energy policy which delivers a sustainable energy future for Europe through measures to tackle climate change ensure energy security and enhance competitiveness*". Security of supply includes having robust and reliable networks, while the delivery of the all-island market is emphasised with reference to enhancing the competitiveness of energy supply.

1.8 On the basis of the material above, we have identified four key criteria to use in comparing the ISO and OU options:

1. appropriate levels of investment in transmission, including to connect large amounts of new renewable generation capacity;
2. avoiding discrimination and ensuring a level playing field for all market players;
3. fostering regional integration; and
4. avoiding excessive and unnecessary costs

1.9 These criteria reflect the underlying concerns that motivated the relevant aspects of the Third Package. They are also closely linked to Irish government energy policy goals: new investment for renewables is an essential element of Ireland's climate change mitigation strategy, avoiding discrimination is key to developing competition and competitiveness, and will also help regional integration, which itself is important for both competitiveness and security of supply.

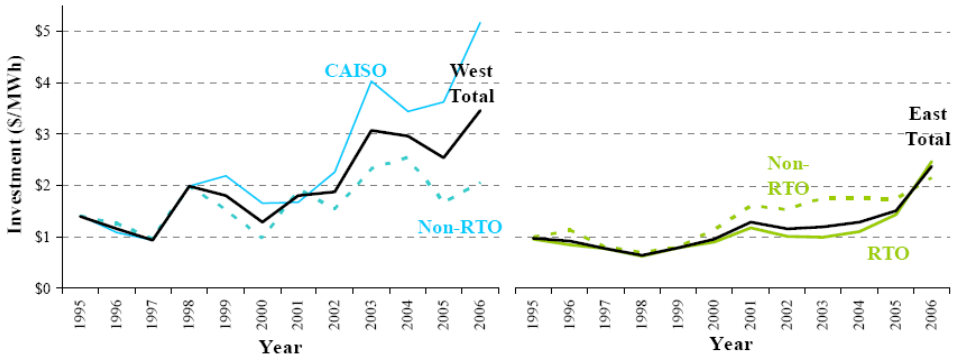
1.10 Our approach has been to examine experience to date in Ireland with the ISO model, and also international experience, in order to assess the likely costs and benefits of full OU relative to the ISO arrangement currently in place in Ireland. We have focused in particular on the United States, which provides a number of examples of the operation of ISOs in various regional markets (so called Regional Transmission Organisations, RTOs), and on Great Britain, where National Grid acts as the ISO while the transmission grid belongs to three different companies: National Grid in England & Wales, and two vertically integrated energy companies (Scottish and Southern Energy and Scottish Power) in Scotland.

[4] Executive summary, *Delivering a sustainable energy future for Ireland,* Government White Paper, Department of Communications, Marine and Natural Resources, 12 March 2007.

Investment

1.11 International experience, in particular from the US, shows that the ISO model is consistent with high levels of transmission investment. While the early years saw low levels of investment in some RTO regions, reforms introduced in the mid-2000s reversed this trend, and more recent evidence confirms that the levels of investment are comparable in RTO and non-RTO regions, as shown in the figure below.

Figure 1-1: Investment in transmission by US utilities



Source: Figure 1, *Independent System Operators for power transmission: evidence based assessment,* the Brattle Group, April 2008.

1.12 In addition, the US experience demonstrates that other factors are also important in determining the level of investment. A lengthy planning process will delay or deter investment. The right economic regulation also has to be in place to offer the right incentives for the new transmission assets to be built.

1.13 In Scotland there have been concerns about the level of investment. However, here again, a lengthy planning process has delayed investment. Some parties argue that regulation around connection pricing has also acted as a barrier to investment. These issues are being addressed by Ofgem through its (TAR)[5] and by the Government with the Infrastructure Planning Commission (IPC). But in any case, with regards to investment incentives it is not sensible to compare the British and Irish ISO models, because the British model is very 'shallow', i.e. it has almost no ability to influence investment. In contrast, EirGrid is already a very 'deep' ISO, responsible under regulatory supervision for all transmission planning and investment decisions in Ireland.

[5] Transmission Access Review – Final Report, Ofgem and BERR, 26 June 2008.

1.14 Recent experience in Ireland suggests that the current ISO arrangement is enabling appropriate levels of transmission investment. Transmission investment of €4bn is planned in Ireland in the period to 2025 to meet the challenge of rising demand and ambitious growth plans for renewable energy. Under PR2 the full capex programme approved by CER for €520m will be delivered by ESB Networks.

1.15 Under the Third Package ISO proposals, EirGrid would also be able to finance new investments if ESB as TO was unwilling to do so. As evidence for the practicality of such an arrangement, we note that EirGrid is already financing new assets in the form of the East-West interconnector.

1.16 Successful outcomes for investment require the alignment of an effective planning process and appropriate regulatory investment incentives. This appears to be true of the Irish market, and of the US market after the reforms.

1.17 Finally there is the specific issue of investment in transmission for renewables. Ireland has an ambitious plan for the development of renewable generation, which will bring important benefits in terms of reduced carbon emissions. Developing the transmission system to accommodate large-scale penetration of renewables raises important new challenges. We believe that an effective ISO like EirGrid is as well placed to address these issues as a fully unbundled TSO. The discussion above indicates that a deep ISO with appropriate regulatory incentives can foster high levels of investment. Moreover, there is specific experience in the US of ISOs providing major new investments to connect new renewable generation[6]. Implementing ownership unbundling in Ireland could even hamper the renewables expansion programme, for example, if it created a delay in investment during the transitional period.

1.18 We conclude that in terms of promoting transmission investment in Ireland, the current arrangements are working well and there appears to be no material benefit from full ownership unbundling, and possible harm to investment at least during the transition period.

[6] See for example the Tehachapi decision of the California ISO (CAISO) (CAISO press release www.caiso.com/1b70/1b70eeda42890.pdf).

Competition and discrimination

1.19 The fundamental aim of an ISO regime is to prevent discrimination by a vertically integrated TO against other generators/suppliers. One possible form of discrimination relates to investment, as discussed above. Other possibilities include:

- procurement and charging of ancillary services to favour the incumbent;
- discriminatory charges for transmission; and
- operating the system in a way that restricts competition from cross-border imports by "pushing congestion to the boundaries" of the grid.

1.20 By definition ISOs try to address these issues by having independent decision making. Under the Irish model, the TO has no influence over any of the decisions described above. They are all made by EirGrid, and moreover are subject to strong regulatory oversight by CER.

1.21 International experience confirms that the ISO model is effective in addressing risks to competition from discrimination by the transmission owner in favour of its vertically integrated generation and supply businesses. We have discussed the evidence on discrimination in terms of transmission investment above. With regards to other potential areas of concern, Britain and the US are like Ireland in that the relevant decisions are either determined by the regulator or subject to close regulatory scrutiny. In the US, the governance structure of ISOs provides broad representation of industry interests and ensures that vertically integrated transmission owners do not have the opportunity to discriminate. In sum therefore, the transmission owner under an effective ISO system has no material ability to discriminate in favour of its affiliates.

1.22 The evidence from current arrangements in Ireland suggests that market participants are not unhappy with current arrangements. We are unaware of any complaints to CER or to ESB about discrimination in relation to transmission. We also note EirGrid itself in its Grid25 plan does not suggest a change in ownership of the transmission assets is required for delivery of its proposals.

1.23 Moreover, we note that competition is rapidly developing in the Irish and all-island electricity markets. At the generation level, the divestment of ESB generation assets consistent with the CER-ESB Asset Strategy means that ESB now has a

market share in the all-Island market of around 45%[7] in 2008, estimated to be falling to 42% in 2009, and faces competition from a number of significant players, including one of Europe's largest utilities (Endesa), as well as Bord Gáis, Viridian and Airtricity.

1.24 Competition is also rapidly emerging in retail markets. In residential retail, as of February 2010, 300,000 former ESB customers had switched to Bord Gáis and 150,000 had switched to Airtricity.[8] ESB's market share in the market for large energy users, where competition was established earlier, is lower – approximately 50%[9].

1.25 We conclude that in terms of promoting competition in the Irish market, current arrangements are working well and there appears to no benefit from full ownership unbundling.

Regional Integration

1.26 Regional integration between member states requires both investment in physical transmission capacity to connect networks and development of common market and system operation arrangements. The development of the single all-island market (SEM), introduced in November 2007, provides evidence of effective regional integration under the Irish ISO model .[10] The SEM Committee recently concluded that the market was developing as expected. Harmonised procurement of ancillary services has recently been implemented and the SEM Committee plan to review auction rules for intraday trading and to consider modification of rules in advance of the East-West interconnector in 2011 to promote integration with market in Britain[11]. In addition, EirGrid submitted a planning application for a further interconnection between the Republic of Ireland and Northern Ireland in December 2009[12].

1.27 Integration of the all-island market with the British and French market would require investment in physical connections. EirGrid is currently in the process of

7 Including the generation activities of ESB International. CER, Annual Report, 2008 with adjustments to allow for ESB wind generation.
8 Around 25% of electricity customers in Ireland. http://www.examiner.ie/business/bord-gais-on-way-to-reaching-customer-target-112741.html viewed on 23 April 2010.
9 Factsheet: competition in electricity supply, CER.
10 CER, Annual Report 2008, page 28.
11 CER/NIAUR, "SEM Committee Strategy Day Information Paper", March 2010.
12 http://www.eirgrid.com/transmission/cavan-tyrone/projectactivity/ viewed on 23 April 2010.

constructing the East-West interconnector and is assessing interconnection options with France.

1.28 Regional integration is certainly possible under full ownership unbundling. However, an ISO arrangement is superior for regional integration, because it allows for more rapid progress and avoids certain political sensitivities that arise if there is a perception that government may be relinquishing or pooling its ownership of transmission assets.

1.29 The evidence from the US is that the ISO model has been very effective in facilitating the development of regional markets. RTOs include the assets of a number of transmission owners. Indeed, a key driver of the ISO model in the US has been to facilitate the development of regional markets. In Scotland, an ISO model has been used to integrate the market in England and Wales with Scotland.

1.30 We conclude that current ISO arrangements in Ireland are effective in facilitating regional integration, and that ownership unbundling would probably delay and could add additional complexity to the integration of the Irish market with its regional neighbours.

Cost issues

1.31 Ireland has an established deep ISO model. Moving to ownership unbundling will require the transfer of €1.2bn to €1.6bn of assets and the transfer of over 200 staff from ESB to EirGrid. There will be a range of one-off and ongoing costs from the transfer of assets and staff such as compensation payments to staff under TUPE provisions and legal and transaction costs of the asset transfer. There will be a loss of economies of scope between ESB Networks' distribution network and transmission requiring the establishment of new systems by EirGrid. The costs associated with this transfer require detailed study. Based on a preliminary analysis of the costs by ESB, we estimate the net present value of quantifiable costs to be in the range of €103m to €151m. However, we note that this estimate relies heavily on information provided to us by ESB. In the short time frame allowed for this consultation process it has not been possible for us to undertake a full independent assessment of the costs

1.32 In addition, there are significant non-quantifiable costs such as the distraction of senior management and Board attention at ESB and EirGrid from developing the transmission network to managing transition issues.

1.33 The Commission was concerned that an ISO arrangement would create significant administrative costs. However, evidence suggests that the ongoing costs of an ISO are modest. In Ireland, there would be few avoided costs from moving from an ISO arrangement to unbundling. The major avoided cost appears to be the removal of the Infrastructure Agreement governing the relationship between EirGrid and ESB. However, the savings from discontinuing this agreement are estimated by ESB to be €240,000 per year.

1.34 Finally, another cost-related concern that is sometimes expressed regarding the ISO model is that the light balance sheet of an ISO means it cannot bear the level of risk that is associated with regulatory incentive schemes for efficient operation. However, in the case of EirGrid we note that it will soon have a relatively large balance sheet, because of its investment in the East-West interconnector. We also note that it is unusual for state-owned firms to set the kind of strong management incentives that regulators have in mind when they set regulatory incentive schemes.

Conclusions

1.35 The current ISO arrangements in place in Ireland are working effectively to promote the goals of Irish energy policy, and are particularly well-suited to helping develop regional integration into the SEM and beyond. They are consistent with best international practice and with the requirements of the new EU Directive.[13]

1.36 Based on both Irish experience and international evidence, continuing with the current ISO arrangements in Ireland is a better policy than implementing full ownership unbundling. Full ownership unbundling would bring no material benefits in terms of investment, and might lead to a worse outcome, at least during the transitional period. It would bring no material benefit in terms of promoting competition. It would make regional integration slower and more difficult. It would also give rise to significant costs. If these costs are passed through to consumers, then this will result in higher electricity prices than

[13] Caveat: the Directive may require some minor changes in the arrangements, but there is no change required that is sufficiently material as to affect our conclusions.

otherwise would have been the case. If these costs are not passed onto consumers, then they will ultimately be borne by the Government, a significant cost in a time of fiscal constraint and economic difficulty.

1.37 Given the effectiveness of current arrangements and the cost involved with changing them, we therefore recommend that ownership of transmission assets remain with ESB and EirGrid continue to function as an ISO. Irish government policy as of the 2007 White Paper to opt for full unbundling may have reflected the then-prevailing circumstances and available knowledge. However, the debate has moved forward since 2007, and more recent experience with ISOs in Ireland and internationally, including the effective development of deep ISOs and the increasing importance of regional integration, supports a new policy based on retention of the ISO model.

2 Background

2.1 As discussed above, Directive 2009/72/EC requires all EU Member States to ensure appropriate vertical separation of its electricity transmission network. The Irish government is in the process of transposing Directive 2009/72/EC and is assessing the options it provides for vertical separation, with a particular focus on the choice between, on the one hand, the ISO arrangements currently in place, and, on the other hand, full ownership unbundling, which was official policy of the Government prior to the last election. The ESB ESOP has commissioned LECG to undertake an independent study of the merits of ownership unbundling for the Irish transmission network, relative to the status quo arrangement.

2.2 We assess these different options against the goals of the Third Package, of which the Directive forms a key part, and against the broad goals of Irish energy policy as laid out in the Energy White Paper. In particular we have identified four key criteria to use in comparing the ISO and OU options:

1. appropriate levels of investment in transmission, including to connect large amounts of new renewable generation capacity;
2. avoiding discrimination and ensuring a level playing field for all market players;
3. fostering regional integration; and
4. avoiding excessive and unnecessary costs.

2.3 Our approach has been to examine experience to date in Ireland with the ISO model, and also international experience, in order to assess the likely costs and benefits of full OU relative to the ISO arrangement currently in place in Ireland. We have focused in particular on the United States and on Great Britain.

ISOs

2.4 There are a range of potential options for the role of an ISO and its relationship to the asset owner. These range from 'shallow' ISOs with responsibility for dispatching generation and the day to day management of the transmission network to 'deep' ISOs with responsibility for planning transmission investment. The ISO arrangements in Scotland are an example of shallow ISO, while arrangements in Ireland and the US are a deep ISO. The Commission's

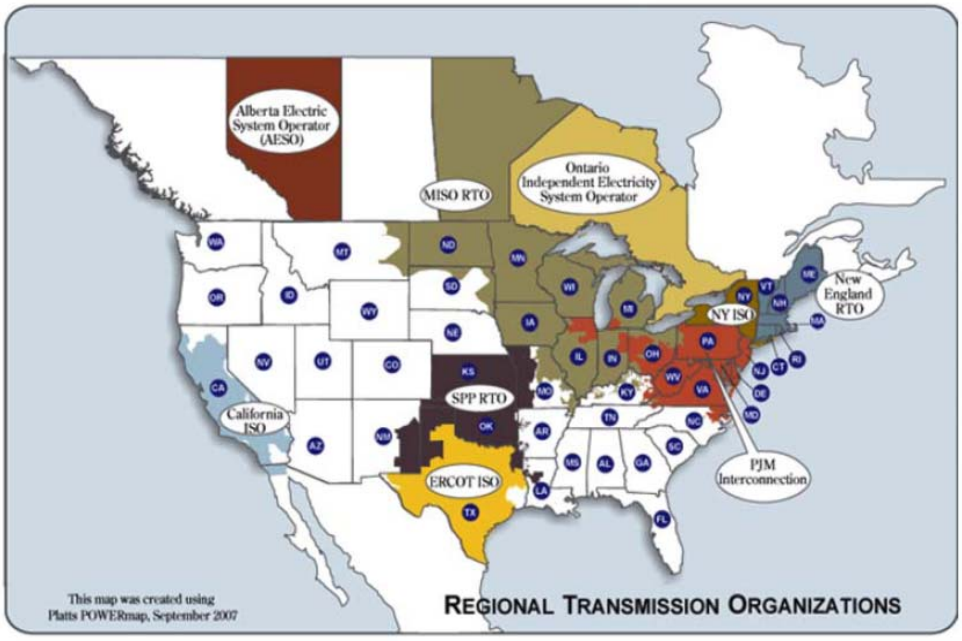
proposed ISO is a deep ISO with the addition of responsibility for procuring and detailed planning of investment that is currently undertaken by ESB.

2.5 The structure of the US electricity industry is diverse. There are vertically integrated companies, pure transmission companies, merchant generators and private and municipally owned companies. Almost all transmission is owned by vertically integrated companies.

2.6 A significant proportion of US transmission companies are members of Regional Transmission Organisations (RTOs) or ISOs, where the operation of the system and network investment decisions are carried out by an entity distinct from the Transmission Owner. The ISO has no other interests in the energy sector via direct ownership or cross-ownership. As we discuss later, an RTO is an ISO (in the sense used in discussion in Europe), with a key distinguishing feature that it covers an area with many distinct transmission owners.

2.7 The figure below shows the location of ISOs/RTOs in North America.

Figure 2-1: Location of ISOs/RTOs in North America



Source: Figure 9, *Independent System Operators for power transmission: evidence based assessment*, the Brattle Group, April 2008.

2.8 National Grid is the TO and SO in England and Wales, while Scottish and Southern Energy (SSE) and Scottish Power are the TOs in Scotland through

Scottish Hydro-Electric Transmission Ltd. (SHETL) and Scottish Power Transmission Ltd. (SPTL) respectively.

2.9 In Scotland, National Grid is a shallow ISO. Its role in transmission investment consists essentially in monitoring TO plans, and it has no ability to require or incentivise investments by the two Scottish TOs.

Irish Government Policy

2.10 The Irish Government's Energy White Paper in March 2007 set out the policy framework for the Irish energy sector for the period 2007-2020. This paper set out a range of proposals for the electricity market including:

- to establish EirGrid as the National Transmission Grid Company by the end of 2008 and transfer to EirGrid the ownership of transmission assets;
- to progress the scope for an all-island single Transmission System Operator, following the establishment of the SEM;
- to ensure the progressive reduction of the ESB's market share in power generation to around 40% in all-island market context by 2010 through the CER-ESB Asset Strategy Agreement;
- proposal to oversee the successful introduction of the SEM in 2007 and to ensure the completion of the North-South Electricity Interconnector by 2011; and
- to achieve 33% of electricity consumption from renewable sources by 2020 and 15% by 2010.

2.11 In March 2008, the Energy Minister announced that an independent analysis would be undertaken of the costs and benefits of the structure of ownership of transmission assets in the context of the development of the all-island SEM and EU developments since 2007. The Department of Communications, Energy and Natural Resources have commissioned Frontier Economics to report on their analysis of this matter by mid-summer 2010[14].

[14] Department of Communications, Energy and Natural Resources website, http://www.dcenr.gov.ie/Energy/Electricity+Corporate+Division/Electricity+Transmission+Assets+Analysis.htm viewed on 23 April 2010.

Market developments

2.12 In August 2004, a memorandum of understanding was signed between CER and the Northern Ireland Authority for Utility Regulation (NIAUR) to establish a series of principles for the development of a single wholesale market[15]. In June 2005, an additional memorandum of understanding was signed between ESB National Grid (now EirGrid) and System Operator Northern Ireland (SONI), the ISO for Northern Ireland. The agreement to establish the market was approved by the regulatory authorities on 10 June 2005. This established the Single Electricity Market Operator (SEMO). In 2008, EirGrid purchased SONI from Northern Ireland Electricity[16] and thus has full ownership of SEMO.

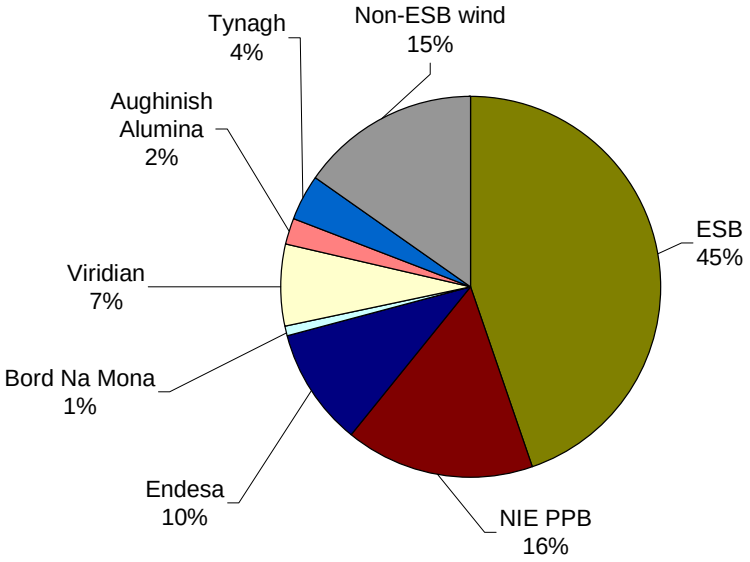
2.13 Currently, there is one major interconnector between the Republic of Ireland and Northern Ireland, the 275kV double circuit between Louth and Tandragee and two 110kV standby support circuits[17]. On 18 December 2009 EirGrid submitted a planning application for a new 400kV North-South interconnector between Cavan and Tyrone, strengthening the all-Ireland market[18].

2.14 The CER-ESB Asset Strategy Agreement provided for ESB to divest or close about 1,500MW of capacity and the sale of a number of generation sites[19]. In January 2009, the ESB and Endesa finalised the sale of a number of ESB plants with a capacity of about 1,000MW (approximately 10% of capacity) as part of the CER-ESB Asset Strategy Agreement to reduce ESB's market share below 40%[20].

2.15 The market share of the participants in the all-island market in early 2009 is set out in the figure below. This shows that ESB (including ESBI and ESB's wind generation) had a market share of 45%. ESB Power Generation had 35% market share. ESB ESOP estimate that ESB's total market share has now fallen to 42%.

15 http://allislandmarket.com/about/ viewed on 23 April 2010.
16 http://www.independent.ie/business/irish/eirgrid-to-buy-transmission-network-soni-for-e376m-1461679.html viewed on 23 April 2010.
17 Tyrone to Cavan Interconnector Fact Sheet.
18 http://www.eirgrid.com/transmission/cavan-tyrone/projectactivity/ viewed on 23 April 2010.
19 CER, Annual Report 2008, page 26.
20 CER, Annual Report 2008, page 26.

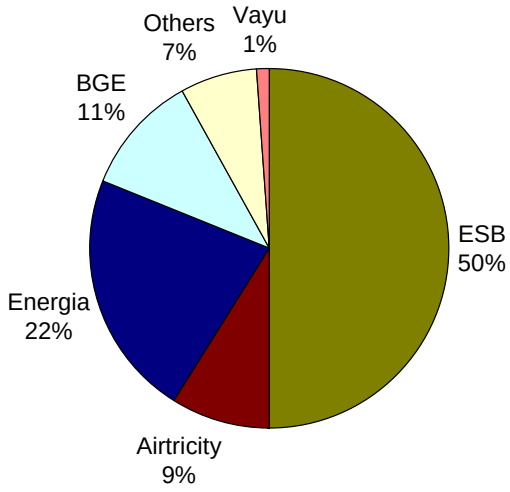
Figure 2-2: All-island market share by installed capacity January 2009



Source: CER, Annual Report 2008, Figure 7.0. Adjusted to include ESBI and ESB wind capacity in the aggregate market share of ESB.

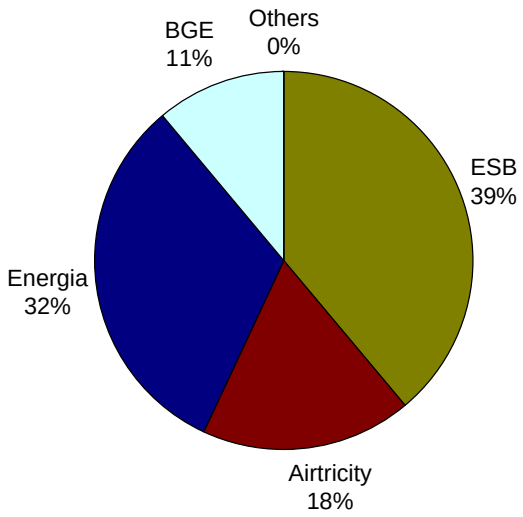
2.16 The retail market share of the participants in the Irish market in the fourth quarter of 2009 is set out in the figures below. This shows that ESB (including ESB Customer Supply and ESB Independent Energy) faces strong competition in all market sectors apart from the domestic market where ESB retain a dominant position.

Figure 2-3: Large energy user market share in Q4 2009



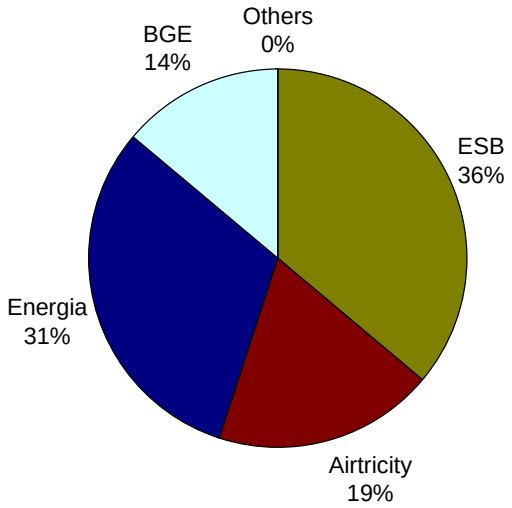
Source: CER, Factsheet: competition in electricity supply.

Figure 2-4: Medium sized business market share in Q4 2009



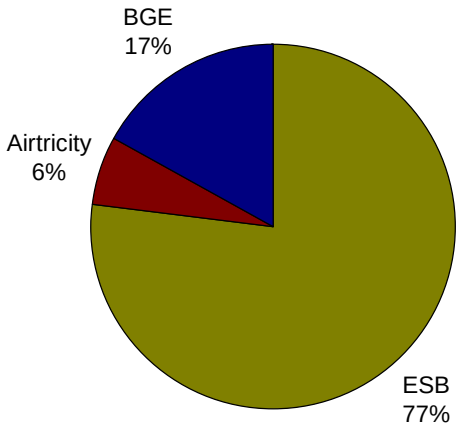
Source: CER, Factsheet: competition in electricity supply.

Figure 2-5: Small sized business market share in Q4 2009



Source: CER, Factsheet: competition in electricity supply.

Figure 2-6: Domestic market share in Q4 2009



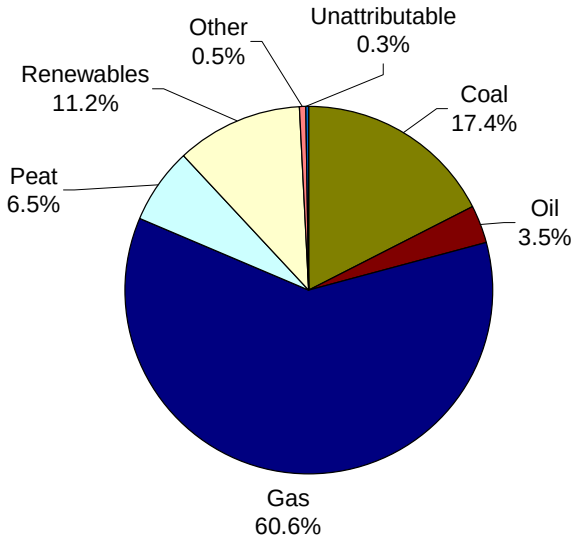
Source: CER, Factsheet: competition in electricity supply.

2.17 The total dispatchable capacity in 2009 was 6,171MW in the Republic of Ireland[21]. The Irish Government aims to increase generation from renewable energy to 33% of electricity consumption by 2020[22]. In 2007, the majority of Ireland's generation came from gas fuelled plants, while renewables accounted for only 11%. The figure below sets out Ireland's fuel mix by fuel type in 2007.

21 Page 35, Generation adequacy report 2010-2016, EirGrid, November 2009.

22 Paragraph 3.4.6, *Delivering a sustainable energy future for Ireland,* Government White Paper, Department of Communications, Marine and Natural Resources, 12 March 2007.

Figure 2-7: Ireland's overall fuel mix by fuel type in 2008



Source: CER, Fuel mix and CO_2 emission factors disclosure 2008, Table A.

Transmission

2.18 Historically, ESB was a vertically integrated electricity entity responsible for generation and supply of electricity and construction and operation of the network. Since 2000, the Irish electricity market has gradually being opened to competition. In 2006, EirGrid became the ISO and market operator for Ireland, with responsibility being transferred from ESB National Grid to EirGrid[23]. Since then, EirGrid has acquired SONI, the ISO and market operator in Northern Ireland. EirGrid also owns SEMO - the market operator for the island of Ireland.

2.19 ESB remains the owner of transmission assets and manages the transmission network in a subsidiary – ESB Networks. There is a legal agreement between ESB and EirGrid (the Infrastructure Agreement) which sets down the terms of the services provided by ESB to EirGrid[24]. As discussed above, EirGrid is a 'deep' ISO; it has broad responsibilities for operation and development of the grid.

2.20 The EirGrid ISO appears to conform to most or all of the requirements for the ISO under the Third Package. We are aware of two possible exceptions, neither of which is significant in policy terms, although the first is relevant to assessing the cost associated with implementing ownership unbundling in Ireland (see later discussion). First, at present ESB commissions and constructs new transmission

[23] EirGrid, Annual Report 2006.
[24] ESB website, http://www.esb.ie/esbnetworks/about_us/index.jsp viewed on 23 April 2010.

investment once EirGrid has received planning approval for the investment. This involves the detailed network planning and arrangement of the procurement process. Article 13(4) of the Directive requires that the ISO be responsible for "construction and commissioning" of new infrastructure[25]. It is unclear to us whether this requires any change in the current arrangements, but we understand that some parties believe it may do so. Second, the EC ISO option requires the transmission owner to agree to financing of transmission investment by the ISO or a third party, which is not currently the case[26]. However, current arrangements do require ESB to finance investments requested by Eirgrid and approved by CER,[27] so this "back-up option" does not appear to be a major issue.

2.21 In 2008, EirGrid published its Grid25 strategy setting out a plan to invest €4bn by 2025 on major upgrade of the network to meet expected increase in demand and the rapid expansion of renewable and in particular wind generation[28].

25 Directive 2009/72/EC.
26 Directive 2009/72/EC, Article 13(5).
27 Statutory Instrument No. 445, 2000, Part 4, 19(a).
28 EirGrid, *Grid25*, 2008.

3 Investment

3.1 The impact on investment is a key issue in assessing alternative arrangements for transmission governance. New transmission assets are required to connect new generation, including renewable generation, to relieve congestion and to facilitate regional integration through interconnectors.

3.2 Lack of investment, or discrimination in transmission investment, can also damage competition. Investment decisions could favour the vertically integrated incumbent by prioritising connections to the incumbent's new generation plants or by failing to relieve congestion.

3.3 As discussed above, the European Commission's Impact Assessment (IA) for the Third Package argued that there was the potential for a lack of investment in the transmission network under an ISO arrangement, and that this was a major weakness of ISOs.

3.4 However, the Commission's IA was quite heavily criticised during the Third Package proceedings. With regards to the assessment of ISOs and investment, some parties argued that the Commission's assessment was based on partial and insufficient evidence, and did not take into account the importance of other factors (e.g., incentives, or the shallow/deep ISO distinction). Other studies (discussed below) have come to rather different conclusions concerning investment and transmission governance arrangements.

3.5 In this section of the report we therefore examine both international experience and recent experience in Ireland with investment under an ISO arrangement. We also consider the impact on transmission investment for renewable energy specifically.

United States[29]

3.6 There is some evidence of underinvestment in the early years of the ISO/RTO arrangements in the US. Pollitt (2007) for example highlights the lack of investment to relieve congestion costs. He found that the Pennsylvania-New Jersey-Maryland Interconnection's (PJM) congestion costs are "*significantly*

[29] The discussion here draws on Dr Moselle's 2008 paper with the Brattle Group, *Independent System Operators for power transmission: evidence based assessment*, April 2008. Given the very short timeframe for submissions to the ongoing review, it has not been possible in this report to update the analysis in that paper.

greater than the total cost of transmission service" and they had only belatedly announced (at the time of Pollitt's paper) a programme of major new transmission investments to reduce PJM's congestion costs.

3.7 These findings were a major driver for the EC's Impact Assessment conclusion that "*generally, the ISO models in the US suffer from a lack of investment in generation and transmission*".

3.8 However, most analysts now accept that these early problems of underinvestment were due to a poor regulatory framework for investment, including a lengthy planning process[30]. This doesn't explain why RTOs seem to have performed less well on investment than non-RTOs in the Eastern US. This may have been due to adverse selection as those areas with the greatest need for investment became RTOs.

3.9 Since 2007, subsequent reforms by the Department of Energy enabled transmission corridors to be designated corridors of national interest, which eased siting and planning permission requirements. The Federal Energy Regulatory Commission (FERC) also began to provide explicit monetary incentives for transmission investment and a regional planning process led by the RTOs was introduced[31]. As a result, $5bn of transmission upgrades have been approved in PJM in 2007 alone, more than the total investment approved between 1997 and 2006[32].

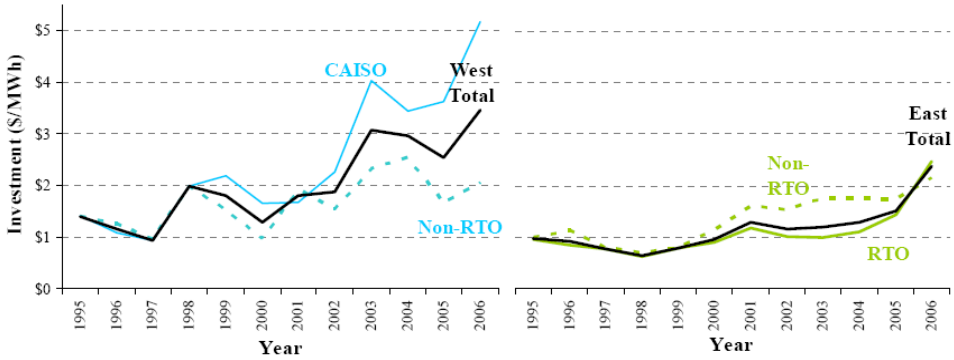
3.10 Following these changes in the regulatory environment, transmission investment in RTO regions appears to have risen to levels at least as high as non-RTOs. Dr Moselle's 2008 paper with the Brattle Group cited above finds that more recent evidence does not support the Commission's claim about under-investment by RTOs. They compare investment in transmission by US utilities (as measured by gross additions to transmission plant in service that are reported to FERC) in RTO and in non-RTO regions, distinguishing between the Western and Eastern US. Their findings are summarised in the figure below.

30 Page 144, Léautier, Thomas-Olivier and Thelen, Véronique, *Optimal expansion of the power transmission grid: why not?,* Journal of Regulatory Economics, Vol. 36, No. 2, October 2009.

31 Page 145, Léautier, Thomas-Olivier and Thelen, Véronique, *Optimal expansion of the power transmission grid: why not?,* Journal of Regulatory Economics, Vol. 36, No. 2, October 2009.

32 Ibid.

Figure 3-1: Investment in transmission by US utilities



Source: Figure 1, *Independent System Operators for power transmission: evidence based assessment,* the Brattle Group, April 2008.

3.11 As the figure shows, in the Eastern US investment was lower than in non-RTO regions, but investment in RTOs was rising faster than in non-RTOs and had reached a similar level as non-RTOs by 2006. In the Western US, the California ISO (CAISO) saw investment levels well above average.

3.12 Although there appears to be low investment in the PJM ISO in the east, CAISO and the New England ISO (ISO-NE) have seen the highest levels of transmission investment and the highest increase in transmission investment in the US.

3.13 However, gross investment does not mean effective investment. A metric of the effectiveness of the investment, such as congestion reduction, might be preferable.

3.14 Léautier and Thelen (2009) looked into the reasons for the lack of expansion of transmission networks[33]. They found that what was most important for reducing congestion in the transmission network were specific regulatory incentives for investments. Vertical separation alone did not appear sufficient to reduce congestion, and was only effective in reducing congestion alongside specific incentives. The US ISO model delivered mixed results on congestion reduction, but this was due to environmental constraints, mixed incentives and the split roles and responsibilities in planning and executing grid upgrades. From this analysis it appears that the choice of alternative transmission governance is of secondary importance to having the appropriate regulatory incentives for investment in

[33] Léautier, Thomas-Olivier and Thelen, Véronique, *Optimal expansion of the power transmission grid: why not?,* Journal of Regulatory Economics, Vol. 36, No. 2, October 2009.

place. They believe that the 2007 reforms to US RTOs may resolve the problems causing a lack of investment in congestion reduction.

3.15 Congestion has been falling dramatically in PJM post reform: 8% of billing in 2006, 6% in 2007 and 2008 and 3% in 2009. However, it is not clear whether all of this reduction is due to the market reforms, or whether it is due in part to declining demand during the US recession.

3.16 It is clear that the situation is complex. However, it appears that with appropriate regulatory incentives in place, an ISO arrangement can ensure appropriate levels of investment.

Great Britain

3.17 In Scotland there is some evidence of a possible lack of transmission investment. National Grid estimate that the cost of internal Scottish constraints will rise by more than 350% from 2009/10 to 2010/11, and was initially forecast to rise by more than 250% in 2011/12[34]. National Grid launched an informal consultation in September 2009 looking into potential incentives for TOs for grid connection and the minimisation of constraint costs. They confirm that constraint costs have risen "significantly" in recent years[35].

3.18 There are recognised problems with the planning process, which have delayed investment in new transmission assets. For example, the upgrade to the Beauly Denny power line was approved on 6 January 2010, over four years after the initial planning application on 28 September 2005[36]. In response to the difficulty of gaining planning permission for infrastructure projects in the UK, the Government set up the IPC as an independent body to decide on applications for nationally significant infrastructure projects. The IPC has been "switched on" to receive applications from 1 March 2010.

34 Table 2.3, *National Grid Electricity Transmission System Operator incentives from 1 April 2010,* Ofgem, 11 March 2010. The revised forecast for 2011/12 did not separate internal Scottish constraint costs from the Cheviot constraint costs (i.e., constraints on the England-Scotland border). Note that it is beyond the scope of this paper to assess the efficiency of investing to reduce these constraint costs.

35 Potential enhanced electricity transmission owner (TO) incentives, National Grid, 18 September 2009.

36 http://www.scotland.gov.uk/News/Releases/2010/01/06141510 viewed on 23 April 2010.

3.19 Ofgem have also recognised the problems with current transmission investment. The TAR sets out enhanced incentives for transmission investment[37].

3.20 Although there have been problems in Scotland, the Scottish market has a shallow ISO structure, unlike Ireland. In our view, the problems in Scotland reflect the shallowness of the arrangements, as well as the problems with the planning regime. We do not believe that the Scottish experience can be used to draw negative conclusions about the Irish ISO arrangements.

Ireland

3.21 In Ireland, EirGrid is currently responsible for planning investment and making investment decisions up to the point that planning permission has been granted. ESB are then responsible for detailed network planning, procurement and construction.

3.22 There is a transmission approval process in place that provides a satisfactory basis for independent decision making about future investment. EirGrid provide a comprehensive investment strategy and a plan for future investment in their Grid25 strategy document and EirGrid publish a detailed Transmission Forecast Statement on an annual basis. ESB only design the details of the assets and undertake the procurement and building of the new transmission assets.

3.23 In 2008 EirGrid produced Grid25, which gave EirGrid's strategy for developing Ireland's transmission network up to 2025. Grid25 represented total investment of €4bn between 2008 and 2025. EirGrid describes Grid25 as a "*critical element in future-proofing Ireland's electricity needs by facilitating more sustainable, competitive, diverse and secure power supplies in support of economic and social development and renewable energy deployment*"[38].

3.24 In accordance with Section 38 of the Electricity Regulation Act 1999, EirGrid also publishes a Transmission Forecast Statement on an annual basis. This describes how Ireland's electricity infrastructure will be developed over the seven year period covered by the Transmission Forecast Statement and is more detailed than the strategic vision in Grid25.

[37] Ofgem, Transmission access review – enhanced transmission investment incentives: final proposals, 19 January 2010.

[38] Page 3, Grid25: a strategy for the development of Ireland's electricity grid for a sustainable and competitive future, EirGrid, October 2008.

3.25 For example, Section 4.1 of the 2010-2016 Transmission Forecast Statement gives the existing and planned grid-connected generation. In 2009, Lisheen wind farm had been connected to the grid as well as an increase in maximum export capacity (MEC) at Coomacheo wind farm and an increase in MEC at Coomegearlahy wind farm. Table 4-1 of the 2010-2016 Transmission Forecast Statement gives 19 contracts that had been signed as at 1 July 2009 agreeing to connect a further 2,117MW to the grid, due for completion between August 2009 and February 2014.

3.26 There has also been investment in interconnectors with Wales (the "East-West Interconnector") and Northern Ireland ("Cavan-Tyrone Interconnector"). As of March 2010, the East-West Interconnector is on course for completion in 2012, with the construction phase of the project about to commence in mid 2010[39]. The planning application for the Cavan-Tyrone Interconnector was submitted on 18 December 2009[40].

3.27 In 2009 EirGrid produced an Interconnection Economic Feasibility Report which looked into the feasibility of further interconnections with Britain (in addition to the existing Moyle Interconnector and the East-West Interconnector in progress) and an interconnection with France over the following 16 years[41]. They conclude that a third 500MW interconnector between the island of Ireland and Britain is economically feasible by 2020, with a fourth feasible by 2025. EirGrid also concluded that more detailed modelling was needed before a recommendation could be made on an Ireland–France interconnector.

Renewables

3.28 Ireland, like other countries, faces a major challenge to increase the amount of energy generated from renewable sources. The Government goal of generating 40% of electricity consumption from renewable sources by 2020 will require significant investment in the transmission network[42]. Moreover, distributed generation (notably wind) faces a specific issue that often the transmission company needs to invest "ahead of demand" to meet expected future demand for connection from many small owners of distributed generation.

39 http://www.interconnector.ie/projects/east-westinterconnector/buildingworksprogress/ viewed on 23 April 2010.

40 http://www.eirgrid.com/transmission/cavan-tyrone/projectactivity/ viewed on 23 April 2010.

41 Executive summary: interconnection economic feasibility report, EirGrid, November 2009.

42 http://www.eirgrid.com/renewables viewed on 23 April 2010.

3.29 If there were a problem with discrimination in transmission investment, this problem might be exacerbated with renewables. Much renewable generation tends to be from new entrants and small producers (as shown earlier, only 120MW of installed wind capacity in Ireland belongs to ESB, approximately 10% of the total installed wind capacity). High connection charges or investment favouring the connection of the TO's affiliate units could limit the investment in renewable generation.

3.30 Moreover, there is specific experience in the US of ISOs providing major new investments to connect new renewable generation, in CAISO's Tehachapi decision.[43] The Tehachapi Transmission project by Southern California Edison (SCE) is a major transmission project that consists of a series of 17 new facilities or upgrades that will come on line over a period of five years, beginning in late 2008. The total cost of the project is approximately $1.8bn. The upgrade will enable major new geothermal, solar and wind generation to be connected. The evidence presented earlier in this chapter demonstrates that an effective ISO arrangement need not lead to discrimination in investment. Consequently, the issues for renewable investment are largely the same whether the investment takes place under an ISO or an ownership unbundled firm. For example, both arrangements could suffer from lengthy planning delays, or from the difficulty of getting regulatory approval for big investments made with limited commitments from connectees.

3.31 Problems with connecting renewables to the grid will therefore generally be dependent on the incentive regime that the regulator operates, not by the transmission governance arrangements. For example, in Scotland, the TOs have been reluctant to invest in transmission lines to connect new generation before the new plants have permission to build. The answer to who pays for new transmission lines, and when, is a matter for the regulator to decide.

3.32 At the time of the TAR in 2008, Ofgem believed that "*further measures are necessary to help us prevent grid access and investment remaining a barrier to delivering our share of the EU 2020 renewable energy* target". Through the TAR, Ofgem provided an incentive to allow TOs to invest in capacity they believe will

[43] See CAISO press release www.caiso.com/1b70/1b70eeda42890.pdf. and California PUC Decision 07-03-012 1 March 2007.

be required without firm financial commitments from regulators by allowing higher rates of return if generators do book the additional capacity once constructed[44].

3.33 The move to ownership unbundling in Ireland could impede the upgrade of the network needed to meet the expected growth in renewables by diverting the focus of EirGrid to managing the transfer of assets rather than pushing ahead with grid investment. The transfer of grid assets and staff will be a significant challenge and require major capital investment and business process decisions about the operations of transmission assets such as IT systems, as discussed in Section 6. This is likely to require significant board and senior management time.

Conclusions

3.34 International experience, in particular from the US, shows that the ISO model is consistent with high levels of transmission investment, but that other factors are also important in determining the level of investment. A lengthy planning process will delay or deter investment. The right economic regulation also has to be in place to offer the right incentives for the new transmission assets to be built.

3.35 In Scotland there have been concerns about the level of investment. However, here again, a lengthy planning process has delayed investment. Connection pricing has also acted as a barrier to investment. These issues are being addressed by Ofgem with TAR and by the Government with the IPC.

3.36 In any case, the British ISO model involves a very shallow ISO that is not comparable to the Irish model (and the British model will require significant reforms to ensure compliance with the Third Package). Certainly, there is no evidence of discrimination in investment under the deep ISO arrangements. Successful outcomes for investment require the alignment of an effective planning process and appropriate regulatory investment incentives. This appears to be true of the Irish market and of the US market after the reforms.

[44] Page 3, Transmission Access Review – Final Report, Ofgem and BERR, 26 June 2008.

4 Competition and discrimination

4.1 The fundamental aim of an ISO regime is to prevent discrimination by a vertically integrated TO against other generators/suppliers. One possible form of discrimination relates to investment, as discussed in the preceding section of this report. Other possibilities include:

- procurement and charging of ancillary services to favour the incumbent;
- discriminatory charges for transmission; and
- operating the system in a way that restricts competition from cross-border imports by "pushing congestion to the boundaries" of the grid.

4.2 By definition ISOs try to address these issues by having independent decision making. Below we describe experience in Ireland and internationally, to assess whether ISOs succeed in avoiding discrimination in favour of the TO's affiliates.

United States

4.3 In the US there are a number of regional markets and there have been a number of studies on the benefits of RTOs.

4.4 In 1999, the New York ISO (NYISO) was created replacing an earlier power pool arrangement. Tierney and Kahn (2007) estimate that the net annual benefits of NYISO are significant[45]. They estimate system-wide benefits exceed budget costs from 2000 through to 2006 with annual benefits of about 5% of system-wide production costs, fixed operation and fixed maintenance costs in later years. They also claim that benefits scale with fuel costs, which rose over the period of their analysis.

4.5 PJM is the largest interconnected system in the developed world.[46] A 2004 study by Synapse Economics[47] looked at the effect the PJM becoming an ISO had on prices between 1999 and 2004. They found that over this five year period, wholesale prices were lower in each of the five years than a counterfactual scenario of a continuation of the regulatory system that existed in the mid-1990s.

45 Tierney, S. and Kahn, E. (2007), A cost-benefit analysis of New York Independent System Operator: the initial years, Analysis Group.

46 Energy Security Analysis, inc. (2005), *Impacts of the PJM RTO market expansion.*

47 Synapse Energy Economics (2004), Electricity prices in PJM: a comparison of wholesale power costs in the PJM market to indexed generation service costs.

4.6 A 2005 report for PJM by Energy Security Analysis, Inc. (ESAI) investigated the impact of PJM's expansion[48] on PJM and on the electric markets of the new PJM service areas[49]. They find that the reduction in energy price caused by the integration of new market areas into the PJM network gives aggregate savings of over $500m per year. They conclude that the five most important impacts of the expansion of the PJM that drives these savings are:

1. PJM's role as an "agent for change", for example in extending price transparency across a wider area and fostering new entry to the system;
2. the expansion of an electric forward market with efficient pricing (so that the forward price acts as en effective predictor of future spot prices);
3. the expansion of an effective set of economic incentives that motivate investment in generation, transmission and demand management assets;
4. the expansion of an efficient energy market, in which the "competitive struggle" is constantly present causing a decline in prices and forcing efficient investment in generation and transmission; and
5. substantial increases in electric trade.

4.7 In our view, impacts 2, 4 and 5 can be considered to be due to the increase in competitive pressures that PJM brings to the market. Impacts 1 and 3 can be considered as part of the improvements in investment that an ISO can bring.

4.8 Pollitt (2007) confirms that in the US ISOs provide "*pro-competitive short term system management*"[50], acting as "*significant and powerful players who ensure fair play in the wholesale market*"[51].

4.9 However, the size of the market does not guarantee competitiveness of the market. Transmission constraints mean that the market is in fact multiple sub-markets and local market power may occur. RTOs all have an independent Market Monitoring Unit (MMU) that conducts market power tests. For example,

48 Between 2002 and 2005, Allegheny power, Commonwealth Edison, American Electric Power, Dayton Power & Light, Duquesne and Dominion Power joined PJM.

49 Energy Security Analysis, inc. (2005), *Impacts of the PJM RTO market expansion.*

50 Pollitt, Michael, The arguments for and against ownership unbundling of energy transmission networks, 7 August 2007.

51 As we discuss in Section 3, Pollitt questions the ability of RTOs to manage long term congestion costs, but we believe that more recent evidence shows that they can effectively address the issue.

the 2009 report by Monitoring Analytics acting as the MMU for PJM concluded that the energy market, capacity market, regulation market, synchronised reserve market, day ahead scheduling reserve market and FTR auction market results were all "competitive"[52].

4.10 MMUs also have some tools to encourage firms to comply with the rules of their RTO and mitigate market problems. For example, the approach adopted by PJM's MMU can take the following escalating steps[53]:

- discussion of the issue/potential problem with the relevant market participants, which may lead to an informal resolution of the issue;
- issue a demand letter requesting a change in behaviour;
- recommend modifications to ISO rules, standards, procedures or practices to PJM and, if necessary, prepare regulatory filings to address the problem; and
- evaluate and consider additional enforcement mechanisms.

4.11 MMUs also use a process called Automated Mitigation Procedures (AMP). ISO MMUs screen the offer prices from generators and alter bids if an offer price exceeds a certain level. This allows ISOs to apply corrective actions quickly[54].

4.12 The lack of local market power may be because in many states incumbents were forced to divest their generation, thus ensuring that a number of suppliers exist locally. The CER-ESB Asset Strategy Agreement led to divestments of generation capacity by ESB, helping Ireland mitigate problems of local market power.

4.13 The governance structure of US RTOs is different to the ISOs in Ireland and Great Britain. For instance, PJM has an independent board of directors with a members committee comprised of representatives of power generators, transmission owners, electricity distributors, power marketers and consumers to provide advice to the board. Although this structure directly involves interested parties in the governance of the RTO, the member committee is made up of

52 Page 2, State of the Market Report for PJM, Volume 1: introduction, Monitoring Analystics, 11 March 2010.

53 Page 21, A review of market monitoring activities at US Independent System Operators, Goldman,C., Lesieutre, B., and Bartholomew, E,, January 2004.

54 Page 21, A review of market monitoring activities at US Independent System Operators, Goldman,C., Lesieutre, B., and Bartholomew, E,, January 2004.

players with conflicting views and incentives, which helps to ensure independence of decision making of the RTO. This structure is typical of other US RTOs. In Britain and Ireland, on the other hand, the ISO is run independently of other players in the electricity market, and with strong regulatory oversight.

Great Britain

4.14 As we discuss in Section 3, the shallow ISO in Scotland has suffered from some lack of investment and increasing constraint costs. Constraint costs are forecast by National Grid to continue to rise[55] and National Grid launched an informal consultation in 2009 to provide improved incentives for TOs to minimise constraint costs after having risen "significantly" in recent years[56]. This could be due to the lack of authority of the ISO in Scotland to require investment by the TOs.

Ireland

4.15 In Ireland, EirGrid carries out the System Operator function independently of ESB, with oversight provided by the regulator, the Commission for Energy Regulation (CER). CER also regulates the Transmission Use of System (TUoS) charges for use of the transmission system and ancillary services[57]. These are incurred in the provision of access to the transmission network to transfer energy for trade within the market. EirGrid is responsible for making connection offers to parties that wish to be connected to the transmission system through the Connection Offer Process. As noted earlier, there is a transmission approval process that provides a satisfactory basis for independent decision making about future investment.

4.16 The SEM has established an MMU to monitor short and long term market outcomes and participant behaviour. The MMU is a group of analysts housed within CER and NIAUR. The 2009 public report of the MMU found that SEM has developed broadly in line with expectation and that the daily market price profile mapped to the British market and was strongly correlated with fuel prices[58].

55 Table 2.3, National Grid Electricity Transmission System Operator incentives from 1 April 2010, Ofgem, 11 March 2010.

56 Potential enhanced electricity transmission owner (TO) incentives, National Grid, 18 September 2009.

57 Statement of charges applicable from 1st February 2010 to 30th September 2010, EirGrid, 1 February 2010.

58 CER/NIAUR, "SEM Market Monitoring Unit Public Report 2009", 14 April 2009.

4.17 We have reviewed responses to the 2006 energy green paper[59] from the main new entrants in generation at that time (Viridian, E.ON and Bord Gáis). These market participants did not complain of discrimination in relation to the operation of or investment in the transmission network (albeit that Viridian complains of ESB's dominance of the generation market[60]).

4.18 Development of competition has also been fostered by the CER-ESB Asset Strategy Agreement, which aimed to reduce ESB's share of power generation in the island of Ireland to around 40%. This provided for ESB to divest or close about 1,500MW of capacity. In January 2009, ESB and Endesa finalised the sale of a number of ESB plants with a capacity of about 1,000MW, with ESB's share of the generation market about 42% of installed capacity after this divestment[61]. The divestment process is now complete.

4.19 There is also potential for increased competition from UK generators from 2012 onward, with construction of the 500MW East-West Interconnector. Together with the existing Moyle Interconnector between Northern Ireland and Scotland, this will bring 1,000MW of total interconnection capacity.

4.20 In retail, by February 2010 300,000 former ESB customers had switched to Bord Gáis and 150,000 had switched to Airtricity[62]. ESB's market share in the market for large energy users, where competition was established earlier is lower – approximately 50%[63].

4.21 On 15 April 2010, CER published a review of competition in electricity retail markets to determine whether the markets for large energy users, medium-sized business customers, small business customers and domestic customers fulfil the criteria for deregulation[64]. Currently CER places a price control and other restrictions on ESB Public Electricity Supplier. The criteria for deregulation are:

- there are at least three suppliers active in the relevant market;

59 *Towards a sustainable energy future for Ireland,* Department of Communications, Marine and Natural Resources, 1 October 2006.

60 Page 3, Response to the Green Paper from Viridian Group plc, Viridian Group, 1 December 2006.

61 Appendix A2.3, *Statement on Energy,* National Competitiveness Council, October 2009.

62 http://www.examiner.ie/business/bord-gais-on-way-to-reaching-customer-target-112741.html viewed on 23 April 2010.

63 Factsheet: competition in electricity supply, CER.

64 Review of the regulatory framework for the retail electricity market: competition review Q1 2010, CER, 15 April 2010.

- there are a minimum of two independent suppliers, each of which has at least 10% share of the load; and
- ESB's market share in each of the business markets is 50% or less or 60% or less in the domestic market.

4.22 In addition, for the domestic market switching rates must be greater than 10% and ESB must commit to rebranding of the ESB supply companies.

4.23 CER concluded that the criteria for deregulation of the large energy user, medium-sized business and small business markets had been met[65] [66]. They expect deregulation of these markets to take place on 1 October 2010. This suggests that CER view these retail market sectors are sufficiently competitive. They also expect that, at the current rate of switching ESB's market share in the domestic market will meet the threshold of 60% "*in the not-too-distant future*"[67].

Conclusion

4.24 It is unlikely that ownership unbundling will improve competition in the Irish market. Under the current ISO arrangements there is no suggestion of discrimination in system operation, charges for transmission or ancillary services as these are regulated by CER. EirGrid operates the system and has no incentive to minimise the opportunities to import power given that it is independent of ESB.

65 See Figure 2-3 to Figure 2-6.

66 Executive summary, Review of the regulatory framework for the retail electricity market: competition review Q1 2010, CER, 15 April 2010.

67 CER announces plans to end electricity price regulation, CER, 21 April 2010.

5 Regional Integration

5.1 As discussed earlier, development of the SEM, a wholesale electricity market operating in the Republic of Ireland and Northern Ireland, is an important goal of Irish energy policy. Ireland and its neighbours are also committed to pursue further regional integration. EU policy is to support further interconnection between power grids, leading to enhanced market integration, first at regional level but ultimately across Europe as a whole.

5.2 The European Commission set out its vision in its 2004 strategy paper "Medium term vision for the internal electricity market". They state that "*electricity should, as far as possible, flow between Member States as easily as it currently flows within Member States*"[68]. The Third Package contains a number of important provisions to foster regional integration.[69]

5.3 In spring 2006, the European Regulators' Group for Electricity and Gas (ERGEG) published the Electricity Regional Initiative (ERI). The aim of the ERI is to speed up the integration of Europe's national electricity markets. The ERI proposes a regional electricity market (REM) of France, UK and Ireland.

5.4 Connecting markets requires:

- physical connection;
- a system and market operator and market governance; and
- a regulatory framework and Government support.

5.5 Whether the market operates under an ISO or whether there is ownership unbundling is not directly relevant to regional integration, but can affect integration by:

- investment in transmission links to facilitate integration; and
- the ease of bringing together system operators under an ISO or sharing ownership of the transmission network.

[68] *Medium term vision for the internal electricity market,* DG Energy and Transport working paper, 1 March 2004.

[69] Directive 2009/72/EC, Article 6.

United States

5.6 ISOs in the US are associated with the development of large regional RTOs. In 1999, FERC encouraged the voluntary formation of RTOs to administer the transmission grid on a regional basis throughout North America (including Mexico and Canada)[70]. This enabled ISOs to operate over a wide region with the goal to promote efficiency in wholesale electricity markets and to ensure that electricity consumers pay the lowest price possible.

5.7 As shown in Figure 2-1, RTOs have spread across large parts of the US. CAISO extends into Mexico while the Midwest Independent Transmission System Operator (MISO) extends into Canada.

5.8 PJM is the largest interconnected market in the developed world and has continued to expand. Since PJM was designated an RTO in 2001, the following areas have joined PJM:

- Allegheny Power in 2002;
- Commonwealth Edison, American Electric Power and Dayton Power and Light in 2004; and
- Duquesne Lighting Co. (although it subsequently left to join MISO[71]) and Dominion Virginia Power in 2005.

5.9 FERC have encouraged a move toward a "postage stamp" charging mechanism. For example, it was mandated for PJM charges for extra high voltage assets[72]. Postage stamp charging could facilitate further regional integration through investment in high-voltage transmission. A postage stamp charging mechanism recovers the cost of transmission assets by using a flat component of the transmission charge applied to all customers within an RTO area. This contradicts with a "footprint" charging mechanism which recovers the cost using a charge applied only to customer within the TO area where the investment was made.

5.10 The postage stamp mechanism may ease the permitting process and reduce TO reluctance to invest in projects that will cause transit flows. This is only possible within ISO/RTO regions.

70 FERC Order No. 2000, 20 December 1999.
71 http://www.reuters.com/article/idUSN1745169820080117 viewed on 23 April 2010.
72 *Opinion No. 494,* FERC, 19 April 2007.

Great Britain

5.11 In Great Britain there exist three TOs, with National Grid owning the transmission network in England and Wales, SSE owning the SHETL grid in Scotland and Scottish Power owning the SPTL grid in Scotland.

5.12 England and Wales underwent ownership unbundling in the 1990s. National Grid became the owner and operator of the transmission system in England and Wales. In Scotland, SSE and Scottish Power remained vertically integrated companies. SSE and Scottish Power lost control of the transmission network in 2005 under the British Electricity Trading and Transmission Arrangements (BETTA). National Grid became the ISO for Scotland and, therefore, the SO for all of Great Britain. A wholesale market for all of Great Britain was also created by BETTA.

5.13 If, instead, Scotland had undergone ownership unbundling the ownership of the transmission assets would have to be transferred. For a common SO across Great Britain, National Grid would have to have purchased both SHETL and SPTL. National Grid may not necessarily have wanted to buy these networks. If Great Britain had had two (or even three) vertically unbundled transmission networks, market integration would have been more difficult.

5.14 However, the transmission owners in Scotland still have considerable influence on investment decisions under BETTA with National Grid as the ISO having little involvement in investment decisions. If National Grid had been prepared to purchase both SHETL and SPTL, investment decisions by National Grid would have had an incentive to invest in integration of the networks.

Ireland

5.15 EirGrid has helped to develop the all-island market. SEMO is a joint venture between EirGrid and SONI (the ISO in Northern Ireland), which itself is owned by EirGrid. Thus EirGrid is the ISO for all of the island of Ireland. Further integration will be supported by transmission investment. On 18 December 2009 EirGrid submitted a planning application for a new North-South interconnector, the 400kV Cavan-Tyrone Interconnector.

5.16 Currently, there is one major interconnector between the Republic of Ireland and Northern Ireland, the 275kV double circuit between Louth and Tandragee. There are also two 110kV circuits (Letterkenny-Strabane and Corraclassy-Enniskillen)

to provide standby support[73]. On 18 December 2009 EirGrid submitted a planning application for a new 400kV North-South interconnector between Cavan and Tyrone, strengthening the all-Ireland market.

5.17 There is currently some integration with the British market with the 500MW Moyle Interconnector between Northern Ireland and Scotland. EirGrid is building a further 500MW interconnector between Ireland and Wales known as the East-West Interconnector, bringing a total of 1,000MW of interconnection capacity with Britain. Ireland can in turn connect to continental Europe through Britain's interconnector with France. Planning approval was gained in September 2009 with construction to commence in mid 2010 and due for completion in 2012.

5.18 EirGrid also undertook an investigation into the economic feasibility of further interconnections with Britain and an interconnection with France[74]. They conclude that a third 500MW interconnector between Ireland and Britain is attractive by 2020, with a fourth 500MW interconnector feasible by 2025 in some scenarios.

5.19 Their studies also indicated a high capacity factor for an Ireland-France interconnector and a corresponding reduction in production cost. However, EirGrid concludes that more detailed modelling is needed before making any recommendations on France-Ireland interconnection.

5.20 EirGrid also plan in their Grid25 strategy document for extension of the network to Great Britain "*and in due course to the European Grid*" in order to participate in the European market[75].

5.21 The EC have a goal of achieving a France-Ireland-UK REM as a precursor to an all-EU energy market. An ISO arrangement also makes the development of a France-Ireland-UK REM easier. The current TOs can remain, with a common ISO operating across all three countries. Under ownership unbundling, the transmission assets would need to (a) be bought by one TO; or (b) some sort of shared ownership agreement would need to be in place; or (c) a regional ISO would have to be created. Merging system operation may involve less political sensitivities than merging ownership. Creating a regional ISO might be possible,

73 Tyrone to Cavan Interconnector Fact Sheet.
74 Executive summary: interconnection economic feasibility report, EirGrid, November 2009.
75 Page 3, Grid25: a strategy for the development of Ireland's electricity grid for a sustainable and competitive future, EirGrid, October 2008.

but it is hard to see what benefit there could be from implementing ownership unbundling now in Ireland, if a new ISO were to be set up in a few years time.

Conclusions

5.22 ISOs have a strong track record of fostering regional integration, and this is arguably their greatest strength. An all-island market has been created under SONI and EirGrid, while there is now a British wholesale market. As the phrase "Regional Transmission Organization" suggests, ISOs in the US are designed to expand and integrate markets, and they have succeeded in doing so.

5.23 Ownership unbundling is unlikely to directly impact on regional integration. However, ownership unbundling would mean that either ownership of assets would have to be addressed in any regional integration process, or a regional ISO would have to be set up. Transferring ownership of transmission assets might create difficulties, given the small size of the Irish market compared to France and Britain and the Irish Government policy of retaining ownership of those assets. Creating a regional ISO is possible, but it would appear perverse and inefficient to abolish the current ISO arrangements, especially given the quasi-regional ISO role already played by Eirgrid, only to re-impose similar arrangements within a few years' time.

6 Costs

6.1 This section considers the implementation costs of ownership unbundling from the current ISO arrangements. Firstly, we discuss the requirements of the asset transfer and the economic literature on the cost of unbundling. We then discuss our approach to the costing and the potential costs arising from the transfer. We also consider two other cost issues; the administration costs of an ISO and incentive issues.

Requirements

6.2 The key changes would be to transfer the transmission assets and the staff associated with maintaining these assets from ESB to EirGrid. These assets currently have a Regulatory Asset Value (RAV) of €1.2bn.[76] International experience suggests that their market value is likely to be significantly higher, since regulated assets typically trade at values significantly above their RAV. For example, one UK study found a market premium over the RAB value of 13% to 30% for gas distribution networks and water companies in a number of ownership transactions[77]. It is outside the scope of this report to attempt any valuation of the assets in question, but where necessary for estimating implementation costs we have assumed an illustrative range of €1.2bn to €1.6bn.

6.3 A key operational implication of the separation in Ireland is the separation of transmission from the distribution network. This will require the transfer of some of the 1,000 staff of ESB Networks who currently maintain and develop distribution and transmission networks. At present staff work across both transmission and distribution networks. The transfer of transmission assets will require separation of staff working on transmission from distribution. This is likely to result in less efficient operation as staff will be less well distributed across the country and will incur increased travel time. It will be also more difficult to maintain minimum required staffing levels on call on a 24 hour/7 day per week basis.

[76] CER, "2006-2010 Transmission Price Control Review Transmission Asset Owner (TAO) and Transmission System Operator (TSO)", 9 September 2005. The Regulatory Asset Base is valued on the basis of replacement cost.

[77] CEPA, "The allowed cost of capital: cost of equity section update Ofgem: GDPCR 2008-13", July 2007.

6.4 In future, EirGrid would be responsible for financing new investment and procuring assets, expected to be around €4bn by 2025. ESB Networks would retain ownership of distribution networks.

6.5 In the time available to prepare this report, we have unable to make independent estimates of the transition costs. We have drawn on preliminary draft cost information supplied by ESB, who at the time of writing this report were still developing their own cost estimates. While we have tried to be conservative, the cost estimates should be viewed as preliminary estimates only. It appears that there will be substantive costs of transferring transmission assets from ESB to EirGrid, but the amount and type of costs require further study.

Economic literature

6.6 The literature on the costs and benefits of unbundling energy networks discusses the administrative costs and the loss of economies of scope due to unbundling of energy networks. Obviously, these costs will depend on the nature of the unbundling and the circumstances of the country where the unbundling is taking place. Costs may vary due to a range of factors such as the size of the industry, the type of unbundling such as legal or ownership or electricity transmission or distribution, the existing industry structure and the employment law among other things. However, previous studies may provide some guidance on the order of magnitude of unbundling costs in other markets.

6.7 There are a number of studies on the unbundling of distribution networks and supply. A Deloitte study in the Netherlands estimated the one-off restructuring costs of unbundling distribution networks to be between €70m to €100m[78]. The costs were made up of IT, personnel, programme management, changing contracts and legal costs. However, a subsequent study which focused on the cost of moving from legal unbundling to ownership unbundling estimated the cost at €20m[79]. In New Zealand, PWC estimated the cost of unbundling distribution as NZ$30m (approximately €15m) for restructuring costs and NZ$140m (approximately €70m) for contracting costs.

[78] Deloitte, "Reorganisatiekosten Splitsing Energiebedrijven", April 2005, Deloitte, Amstelveen.

[79] De Nooij, M., and B. Baarsma, "An Ex Ante Welfare Analysis of the Unbundling of the Distribution and Supply Companies in the Dutch Electricity Sector" 2007, SEO Discussion Paper 52 and UNECOM DP 2008-02.

6.8 Based on these studies, a study of the costs of unbundling transmission operators in Germany estimates the one-off restructuring costs is €100m[80].

6.9 The loss of ongoing economies of scope between transmission and supply businesses has been widely discussed in the economic literature[81], but literature on loss of economies of scope from unbundling transmission and distribution network is less common. One study on the divesture of electricity distribution networks from US electricity utilities finds that divestitures mandated by regulators have resulted in a large and statistically significant adverse effect on efficiency[82]. Brunekreeft estimates a range of €50m to €250m for ongoing loss of vertical synergies for moving from legal to full unbundling of German transmission networks[83]. This is based on an estimate of unbundling causing a loss of efficiency equivalent to 5% of total sectoral costs and the move from legal to ownership unbundling accounting for just 10% of these costs.

Costs of implementing full ownership unbundling

6.10 We now discuss the costs of implementing full ownership unbundling. There are many potential cost categories, some of which we have been able to quantify based on available information and others which remain unquantified. The table below summarises the quantified costs, which we describe in more detail below the table. The costs shown are the costs to the ESB and EirGrid and to the Irish Government of going from the current arrangements to full ownership unbundling.[84]These costs will be borne by electricity consumers, if ESB and EirGrid recover these costs in charges to customers or by their shareholders, the Irish Government and ESOP for ESB. The net present value of the quantified costs that we have identified is between €103m to €151m.

80 Gert Brunekreeft, "Ownership Unbundling in Electricity Markets – A Social Cost-Benefit Analysis of the German TSOs", August 2008, UNECOM Discussion Paper.

81 Nemoto, J., and M. Goto, "Technological externalities and economies of vertical integration in the electric utility industry", *International Journal of Industrial Organisation*, 2004, Vol. 22(1).

82 John Kwoka, Sanem Ozturk and Michael Pollitt, "Divestiture policy and operating efficiency in the US electric power distribution", 2008, Cambridge Working Paper in Economics 0835, EPRG 0819.

83 Gert Brunekreeft, "Ownership Unbundling in Electricity Markets – A Social Cost-Benefit Analysis of the German TSOs", August 2008, UNECOM Discussion Paper.

84 We assume that the costs will be borne by ESB, Eirgrid and the Irish government, rather than passed through to consumers—alternatively, our figures can be viewed as the sum of costs to the Treasury (eventually, Irish taxpayers) and to consumers.

Table 6-1: Estimate of some of the costs of implementing ownership unbundling in Ireland

Description	Low NPV 2010 €m	High NPV €m
TUPE compensation	8.0	12.25
Asset transfer cost	4.0	8.5
Loss of synergy - operations	17.8	35.7
Loss of synergy – corporate services	1.9	2.2
Loss of synergy - systems	50	65
Loss of synergy - buildings	6	6
Restructuring cost	2.7	5.4
Physical unbundling	12	15
Finance	0.7	0.7
Sum of quantified costs	**103.1**	**150.8**

Source: LECG and ESB

6.11 The estimates in the above table are presented in terms of their net present value. The costs are a mixture of one-off and ongoing costs and the use of net present value enables them to be presented on a common basis[85]. Our cost estimates are based on the assumption that ISO arrangements in Ireland satisfy the criteria in the EU Directive. There is question about the ESB's role in procurement of new transmission assets. If this is required to be transferred to EirGrid, then there will be some costs associated with this transfer.

Compensation costs for transferring staff

6.12 Under Transfer of Undertakings Protection of Employment (TUPE) regulations employees attached to a business that is being transferred must transfer with the

[85] For ongoing costs, we have used a discount rate of 4.0% (Irish Department of Finance discount rate for cost benefit analysis) and a period of 10 years.

business and with the benefit of any relevant collective agreement. There is some difficultly in determining the number of staff who will receive TUPE compensation. Firstly, many staff work on transmission for relatively small proportion of their time and therefore may not be considered eligible for TUPE criteria. Secondly, staff working for ESB International (ESBI) may be transferred, however, it is not clear whether they would be entitled to the same level of compensation as ESB staff.

6.13 At the time of writing, ESB estimates that between 200 to 245 staff from ESB Network and ESBI must be offered the opportunity to transfer to EirGrid. In 2006, employees transferring from ESB to EirGrid received compensation payments of €40,000 per employee. We understand that half of this payment was net of tax and half included tax. ESB estimate that a compensation payment of around €50,000 per employee will be required to transfer staff in 2010.

6.14 In light of the uncertainty about the exact amount required for TUPE compensation per employee, we have assumed a range for the one-off compensation payment of €40,000 to €50,000 per employee. The lower bound is based on the 2006 TUPE payments and the upper bound on ESB's estimate of the current likely cost. The transfer of staff would amount to total costs in the range of €8m to €12.25m.

Asset transfer cost

6.15 The transfer of assets from ESB to EirGrid is a large transaction and will require expert legal and investment banking advisory services, advice to the Irish Government, ESB, ESB ESOP and EirGrid. ESB estimate that the costs involved are likely to between 0.3% to 0.5% of transaction value, based on discussions with investment banks and previous experience with transfer of assets. ESB note that commercial acquisitions involve fees of 2% to 3%, but in this case, fees are expected to be lower given it is a transfer between two state enterprises. They estimate legal fees to be in the range of €400,000 to €500,000.

6.16 Based on an advisory fee of 0.3 to 0.5% and a transfer value of €1.2bn to €1.6bn, we estimate an asset transfer cost €3.6m to €8.0m. The addition of legal fees takes this amount to €4m to €8.5m.

Loss of synergy between distribution and transmission

6.17 The separation of transmission and distribution will mean the loss of operational efficiency from being able to allocate network technicians to both transmission

and distribution tasks across Ireland. It is likely that EirGrid will not have the same dispersed presence as ESB Networks, due to the smaller scale of transmission activity and assets – about 20% of the current ESB Networks activity. This will mean additional travel time to field work. There will also be loss of efficiency in support for these staff. While EirGrid currently have a range of corporate functions, it will require new capacities to support the operational capability of transmission asset staff. It is likely to require investment in IT support services to manage transmission work, although we note that the operation of the East-West and North-South interconnectors will require some capability.

6.18 We have estimated the loss of operational synergy by applying a percentage loss of efficiency to ESB's Transmission Asset Operator allowed regulatory costs for network operations and maintenance. Assuming the loss of synergy could lead to increase in costs of 10% to 20% on allowed costs would cause an increase in annual costs of €2.2m to €4.4m or net present value of €17.8m to €35.7m[86]. It could be argued that EirGrid could contract out the network maintenance work to other parties including ESB Networks. However, we understand that ESB is not a service provider and would not therefore contract to provide the transmission maintenance services to EirGrid. We also understand that there are no providers of transmission maintenance based in Ireland and therefore contracting out would involve purchasing from overseas providers which is unlikely to be cost effective for baseline functions.

6.19 The TAO's allowed corporate costs excluding network rates, ESI levy and insurance are €4.7m per year. Allowing for a smaller reduction in efficiency of 5%-10% due to the greater scope for efficiency compared to maintenance from greater flexibility to contract out tasks. This would result in increased costs of €235,000 to €470,000 per year.

6.20 EirGrid is likely to need to establish new operational bases for maintenance staff to service the network. It is unlikely in their current role as ISO that they would have a suitable facility. ESB estimate the capital cost of providing a new central depot and three regional offices for operations would cost €6m. We have not

[86] Based on network maintenance costs of €21.3mand asset management costs of €0.9m in 2010. CER, "2006-2010 Transmission Price Control Review Transmission Asset Owner (TAO) and Transmission System Operator (TSO)", 9 September 2005.

included any additional cost for operating these offices on the basis that this will be reflected in the loss of operating synergies.

6.21 The transfer of transmission assets and staff will require new systems and processes for EirGrid. ESB Networks will retain current systems for its distribution network. EirGrid will need to develop new systems and processes to manage the ownership and maintenance of the assets and the interface between these systems and its existing business systems. The systems required include asset management, procurement and work management. ESB estimate that the development of the new systems will require one off costs of €20m to €25m and the net present value of the associated ongoing costs (assuming a 7 year life) of €30m to €40m. We note that EirGrid's projected IT capex for its ISO function in the 2006-2010 period was €31.7m including €19.3m for Enterprise applications[87]. This suggests that ESB's estimate of capital investment required for asset owner function is plausible.

Business restructuring costs

6.22 The transfer of transmission assets from ESB Networks will result in a loss of contribution to overheads that are currently recovered from the regulated transmission charge. We assume that ESB will be able to make changes to its business operations to redeploy these staff on other activities or dispose of surplus assets and staff over time. However, we accept that it is not likely to be possible to make immediate changes. We have assumed that the company wide and corporate affairs charges allowed in the TAO price determination continue for a period of one to two years. This would be a one off cost of between €2.7m to €5.4m.

Physical unbundling

6.23 We understand from ESB that EirGrid have already decided to physically separate substations at the 110kV level, where facilities are shared between transmission and distribution. While such an arrangement does not appear to be required by the EU Directive, it is reasonable to recognise this cost as it arises from EirGrid policy in event of the transfer of assets. This cost would not be incurred if the transmission assets remain with ESB. ESB estimate the cost of

87 CER, "2006-2010 Transmission Price Control Review Transmission Asset Owner (TAO) and Transmission System Operator (TSO) - A Decision Paper", September 2005.

physical separation of new 110kV substations as a net present value of €12m to €15m[88].

Finance costs

6.24 We do not have information on how EirGrid propose to finance the acquisition of transmission assets and whether the Irish Government propose to inject equity into EirGrid to fund the transaction. EirGrid are not currently an asset intensive company and their financing arrangements reflect this nature. EirGrid's current equity capital is €38,000 with most funding from capital reserves (€49m) and bank borrowings (€29m)[89]. In contrast, ESB has an equity capital of €2bn and non-current borrowings of €1.9bn[90].

6.25 Clearly, it would be possible for EirGrid to finance some of the asset acquisition from debt. CER has assumed a gearing of 50% in its determination of the regulatory cost of capital for transmission assets[91]. This appears to be broadly consistent with ESB finance structure. EirGrid may prefer to finance a higher proportion of the acquisition cost from borrowing.

6.26 The cost of funding the assets in EirGrid is not necessarily an incremental cost to unbundling as ESB would be required to finance these assets under the status quo. However, there will be transactional costs associated with EirGrid raising large volumes of debt for the first time, such as bank fees and the cost of acquiring a credit rating. It is also possible that markets may demand a higher rate of interest on EirGrid debt compared to ESB debt, due to EirGrid's lack of track record in the debt market and smaller size.

6.27 In a recent regulatory determination the UK Competition Commission estimated the transaction costs for issuing debt as 10 basis points (0.1%) on the amount of debt issued[92]. Based on a debt issue of €700m (assuming 50% leverage and mid point of asset transfer value), transaction fees would therefore amount to €0.7m.

88 We understand that ESB has revised this calculation to €24m to €30m following the preparation of this report.

89 EirGrid, "Annual Report and Accounts", 2008. However we note EirGrid will acquire significant assets with the construction of the East-West Interconnector.

90 ESB, "Annual Report and Accounts", 2008.

91 CER, "2006-2010 Transmission Price Control Review Transmission Asset Owner (TAO) and Transmission System Operator (TSO) - A Decision Paper", September 2005.

92 Competition Commission, "Stansted Price Control Review Final Determination Appendix L", 4 November 2008.

6.28 There is a question whether EirGrid's ongoing cost of borrowing will be higher than ESB, due to a lack of track record. Semi-state companies' debt is not guaranteed by the Irish state and is issued at a premium to Government debt.[93] Even a relatively small mark up on the cost of borrowing could have a significant impact. For example, each 0.1% higher cost of debt would cost €0.7m on an ongoing basis. EirGrid will require additional debt to finance the €4bn Grid25 transmission investment programme.

6.29 We have not included such an additional ongoing cost of debt in our transition cost analysis due to the high level of uncertainty around the market response to the asset transfer and EirGrid issue of debt. However, we note that EirGrid will be required to issue significant amounts of new debt as well as requiring an equity injection.

Other costs

6.30 In addition to the administration costs described above, there are significant non-quantifiable costs such as the distraction of senior management and Board attention at ESB and EirGrid from developing the transmission network to managing transition issues. This is at a time of rapid and substantial change to meet the challenge of increasing demand and need to connect significant renewable generation.

6.31 We have not allowed for any additional cost to ESB Networks (aside from business restructuring costs) for the loss of operating efficiency in regards to its distribution business, although we acknowledge that the transfer of assets and staff is likely to result in significant changes to operations and may adversely impact on operating efficiency. This is an issue which will need to be considered in more detail by ESB and CER, if the asset transfer were to go ahead.

6.32 Finally, another cost-related concern that is sometimes expressed regarding the ISO model is that the light balance sheet of an ISO means it cannot bear the level of risk that is associated with regulatory incentive schemes for efficient operation. However, in the case of EirGrid we note that it will soon have a relatively large balance sheet, because of its investment in the East-West interconnector. We also note that it is unusual for state-owned firms to set the kind of strong

[93] ESB 10 year bonds issued in January 2010 at an interest rate of 6.5%, while Irish Government 10 year bonds issued in February 2010 at an interest rate of 5.0% (Bloomberg).

management incentives that regulators have in mind when they set regulatory incentive schemes.

ISO costs

6.33 In its Impact Assessment of the options for vertical separation, the Commission argued that co-ordination costs between ISO and the transmission owner create costs and require detailed regulation. However, one paper quantifies the cost of the ISO/TO interface as £1.5m for Great Britain and that an upper bound figure on the additional costs due to co-ordination failure is £5m, although actual costs are much less[94]. The total British system operator costs at the time were around £520m, compared with total costs of €114m in Ireland in 2010. We would expect the interface cost for a smaller network like Ireland to be much less.

6.34 We note that much of the cost of establishing an ISO in Ireland is sunk with the establishment of EirGrid. A move to ownership unbundling will not save or avoid these costs. ESB have estimated that a move to full unbundling could save a net present value of €2.4m from removing the Infrastructure Agreement interface which currently governs the relationship agreement between EirGrid and ESB. Based on this analysis, the ongoing costs of maintaining the current ISO arrangement are modest.

Conclusions

6.35 The transfer of responsibility for owning and maintaining Ireland's transmission assets will have significant costs. This is due to the scale of the transfer and the significant change in business activity for EirGrid. Further work is required to estimate the likely cost of the transfer, but a preliminary estimate suggests that the net present value of quantifiable costs to be in the range €103m to €151m. This estimate is consistent with the economic literature, which estimates that there are significant one-off and ongoing costs with ownership unbundling. There are also a range of non-quantifiable costs associated with the move to ownership unbundling such as delays to the transmission investment programme. While this cost might be worth incurring, if significant gains in the performance of the Irish electricity sector were to result from the change, the analysis in the previous sections suggests that there is likely to be little or no gain over current ISO arrangements.

94 The Brattle Group, "Independent System Operators for power transmission: evidence based assessment," April 2008.

Appendix 1: International Experience with ISOs

United States

A1.1 In this section, we consider the evidence of the experience with ISOs in the US. In particular we consider the record of ISOs in regard to:

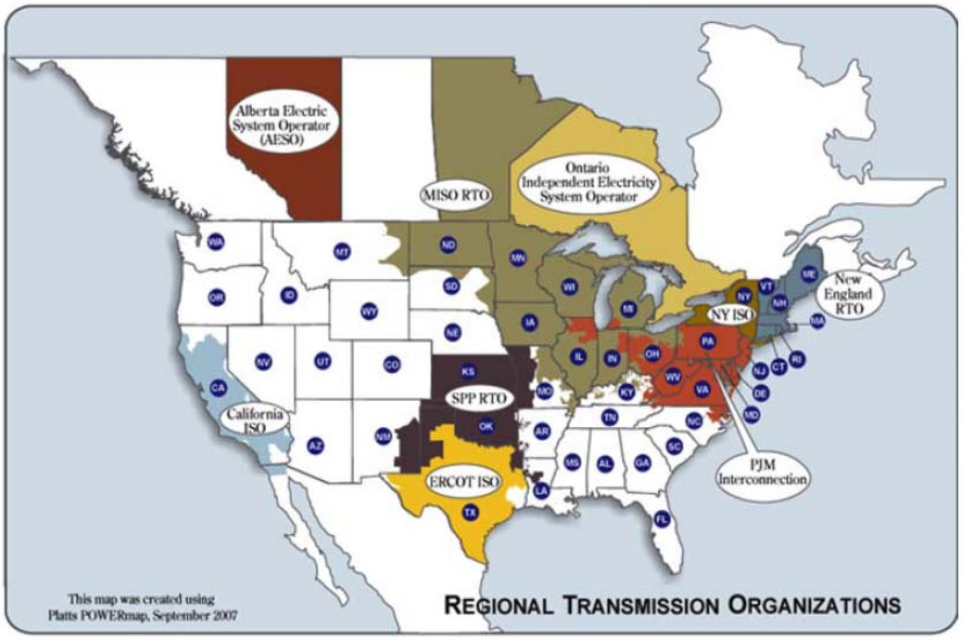
- competition;
- investment; and
- regional integration.

The US electricity market

A1.2 The structure of the US electricity industry is diverse. There are vertically integrated companies, pure transmission companies, merchant generators and private and municipally owned companies. Almost all transmission is owned by vertically integrated companies.

A1.3 A significant proportion are members of RTOs or ISOs, where the operation of the system and network investment decisions are carried out by an entity distinct from the Transmission Owner. The ISO has no other interests in the energy sector via direct ownership or cross-ownership. The figure below shows the location of ISOs/RTOs in North America.

Figure A1-1: Location of ISOs/RTOs in North America



A1.4 The table below lists the development milestones of ISOs/RTOs in the US.

Table A1-1: Development milestones of US ISOs/RTOs

RTO/ISO	2006 Peak Demand (MW)	Key Milestones
PJM	144,644	November 1997 – FERC approves ISO status April 1998 – Cost based energy locational marginal pricing (LMP) markets open April 1999 – Bid-based LMP markets open 2002 – adds Allegheny power to footprint December 2002 – FERC approves RTO status 2004 – adds ComEd, AEP, and Dayton to footprint 2005 – adds Duquesne and Dominion to footprint
MISO	116,400	September 1998 – FERC conditionally approves MISO formation December 2001 – FERC approves RTO status February 2002 – Transmission service begins under tariff April 2005 – LMP-based markets to be opened
ERCOT	62,339	September 1996 – ERCOT becomes first US ISO July 2001 – Zonal balancing market opens January 2009 – LMP-based markets to be opened
CAISO	50,270	September 1996 – CA legislature authorises creation of CAISO April 1998 – Bid based zonal markets open January 2001 – California PX closes 2001 – California implements regional transmission access charge April 2008 – LMP-based market to be opened
SPP	42,227	1998 – SPP begins administering regional transmission tariff October 2004 – FERC approves RTO status February 2007 – Real-time market opens
NYISO	33,939	June 1998 – FERC conditionally authorises NYISO establishment November 1999 – Bid based LMP markets open
ISO-NE	28,130	July 1997 – ISO-NE created to manage wholesale markets May 1999 – ISO-NE implements wholesale markets March 2003 – ISO-NE adds day-ahead market March 2004 – FERC conditionally approves RTO status

Source: Table 3, *Independent System Operators for power transmission: evidence based assessment,* the Brattle Group, April 2008.

Competition

A1.5 PJM is the largest interconnected system in the developed world and created and introduced nodal pricing. Vertical integration still exists, however there is a large wholesale market. PJM has an independent board of directors with a members committee comprised of representatives of power generators, transmission owners, electricity distributors, power marketers and consumers providing advice to the board.

A1.6 Two studies into PJM (Synapse Economics, 2004[95] and Energy Security Analysts, 2005[96]) find very significant benefits for consumers from the extension of the wholesale market into a regional ISO. However, Pollitt (2007) reports that there have been "*some local market power problems and concerns about the lack of incentive for new investment in transmission*", which he suggests may be due to the lack of full separation between transmission and generation.

A1.7 In New York State, NYISO replaced a power pool arrangement. Tierney and Kahn (2007)[97] estimate that the net annual benefits of the NYISO relative to the power pool arrangement are significant, representing roughly 5% of system-wide production costs and fixed operation and maintenance costs in later years.

A1.8 In Texas, the ERCOT ISO along with some voluntary ownership unbundling of transmission and distribution from generation and retail has been, according to Pollitt (2007) [98], a "*highly successful reform*" Competition is now preceding along UK lines. However, the situation in Texas is a particular setup, highly competitive with particularly extreme competition in retail. The regulated rate during the transition period was very high to facilitate new entry by new suppliers. Texas is also an 'electric island' and is not synchronised with the rest of the US.

A1.9 Pollitt (2007) finds that ISOs in the US deliver pro-competitive short term system management. However, this is because the US has large regional markets (PJM being the biggest) with many players. ISOs are powerful players in the US who

95 Synapse Energy Economics (2004), Electricity prices in PJM: a comparison of wholesale power costs in the PJM market to indexed generation service costs.

96 Energy Security Analysis, inc. (2005), *Impacts of the PJM RTO market expansion.*

97 Tierney, S. and Kahn, E. (2007), A cost-benefit analysis of New York Independent System Operator: the initial years, Analysis Group.

98 Pollitt, Michael The arguments for and against ownership unbundling of energy transmission networks, 7 August 2007.

can ensure fairness in the wholesale market. European ISOs, on the other hand, are smaller and have a small number of large incumbents.

A1.10 Size itself does not guarantee competitiveness of power markets though. Due to transmission constraints, the market is in fact multiple submarkets, and local market power may occur (i.e. while there is globally overcapacity, locally a producer can exert market power). However, RTOs all have an independent market monitoring unit (usually an outside consulting firm) that conducts multiple market power tests. These tests usually confirm that no market power exists (global or local). However, this is a specificity of the US: in many states, incumbents were forced to divest generation. As a result, tens of firms compete to generate electricity in the Eastern RTOs.

Investment

A1.11 Most US ISOs include transmission planning as a central responsibility and qualify as RTOs under FERC's guidelines for independence, operational control, planning functions, and regional geographic scope. They conduct regional planning with input from TOs, although RTOs cannot force TOs to build the assets called for in the plan. If a TO refused to invest in the transmission assets the RTO has planned, then this would be opened up to other firms to invest. In practice, the TOs accept the RTOs plans and invest in order to receive a regulated rate of return.

A1.12 The European Commission's Impact Assessment looked at the ISO models in the US[99]. They found that "*generally, the ISO models in the US suffer from a lack of investment in generation and transmission*". Pollitt (2007) also cites the question mark over the ability of ISOs to manage long term congestion costs. PJM's congestion costs are "*significantly greater than the total cost of transmission service*" and they had only belatedly announced (at the time of Pollitt's paper) a programme of major new transmission investments to reduce PJM's congestion costs.

A1.13 Since 2007, subsequent reforms by the Department of Energy enabled transmission corridors to be designated corridors of national interest, which eased siting and planning permission requirements. FERC also began to provide

[99] Brussels, YYY, SEC (2007) 1179, Commission Staff Working Document Accompanying the legislative package on the internal market for electricity and gas COM(2007) 528 final, COM(2007) 529 final, COM(2007) 530 final, COM(2007) 531 final, COM(2007) 532 final, SEC(2007) 1180, Impact Assessment.

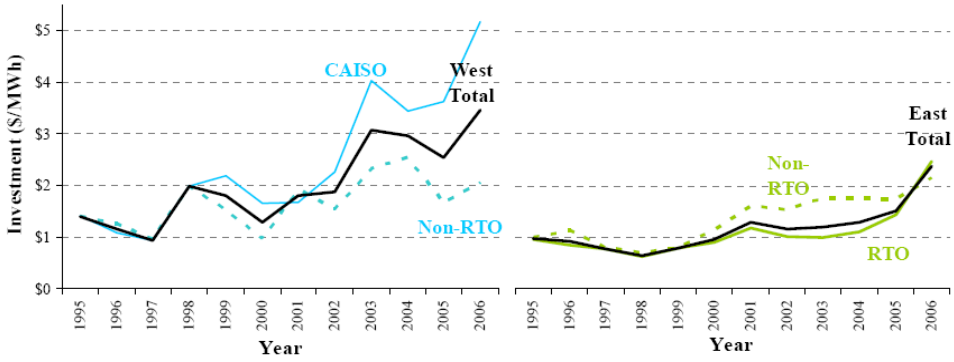
explicit monetary incentives for investment and a regional planning process was introduced led by the RTOs.

A1.14 Congestion has been dramatically reduced in PJM: 8% of billing in 2006, 6% in 2007 and 2008, and 3% in 2009. However, it is not clear yet whether this is due to the reforms or declining demand during the US recession.

A1.15 Dr Moselle's 2008 paper with the Brattle Group[100] does not find evidence to back the Commission's claim. The Figure below show's the Brattle Group's estimate of investment in transmission by US utilities (as measured by gross additions to transmission plant in service that are reported to FERC) that do and do not belong to RTOs.

A1.16 They have split their data into Western US and Eastern US RTOs because of significant practical and institutional differences between the two. In fact, the east and west are two separate systems. ERCOT in Texas is also a separate system, but was included in the Brattle Group's paper in the Eastern group for the purposes of comparison.

Figure A1-2: Investment in transmission by US utilities



Source: Figure 1, *Independent System Operators for power transmission: evidence based assessment,* the Brattle Group, April 2008.

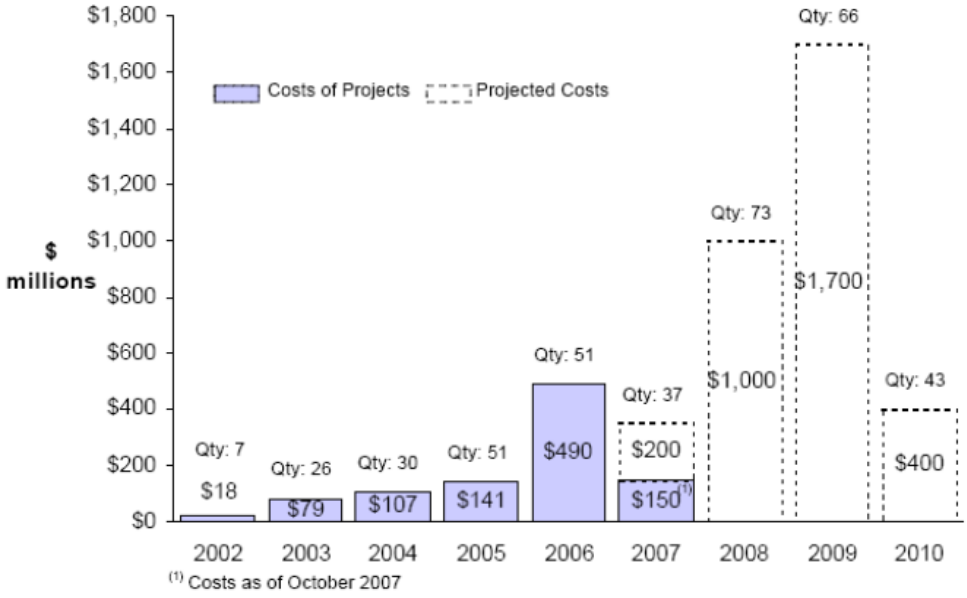
A1.17 As Figure A1-2 shows, in the Eastern US, although utilities in RTOs have invested less than average in the past, some Eastern RTO regions show significantly higher investment levels that in other Eastern RTO and non-RTO regions in recent years.

100 The Brattle Group, Independent System Operators for power transmission: evidence based assessment, April 2008.

A1.18 Although there appears to be low investment in the PJM ISO in the east, other ISO's in California (CAISO) and New England (ISO-NE) have seen the highest levels of transmission investment and the highest increase in transmission investment in the US.

A1.19 ISO-NE has enjoyed very high growth in investment, a trend that it believed (at October 2007) would continue to 2010. This is shown in the Figure below.

Figure A1-3: ISO-NE Transmission Investment



Note: Numbers above bars represent project quantities.

Source: ISO-NE, *Regional Transmission Project Update,* October 2007. Note: the data is for specific projects and do not capture additions on pre-existing facilities.

A1.20 The Brattle Group believe that transmission investments within CAISO and ISO New England have been facilitated by specific RTO features such as regional planning processes, transmission charges and cost recovery mechanisms.

A1.21 The Brattle Group also looked at the share of total investment by private companies in ISOs/RTOs in 2006. They found that the share of investment by private companies was significantly greater than investment in private companies outside ISOs/RTOs when normalised by retail sales. By this metric, firms within ISOs/RTOs invested significantly more in transmission assets than firms in non-RTOs. This is shown in the Table below.

Table A1-2: 2006 investment compared to 2006 retail sales

	Share of total investment	Share of total retail sales	Ratio of investment to sales
RTO	73%	68%	1.07
Non-RTO	27%	32%	0.84

Source: Table 1, *Independent System Operators for power transmission: evidence based assessment,* the Brattle Group, April 2008. Based on FERC Form 1 and EIA Form 861 data compiled by Global Energy Decisions, Inc., The Velocity Suite.

A1.22 Transmission investment could be driven by a number of factors, such as load growth and the need to replace existing assets. If the load growth of RTOs was growing faster than non-RTOs, the increase in transmission investment could be misleading. The Brattle Group compared levels of investment with load growth and the existing stock of transmission assets. No clear correlation emerged.

A1.23 Planning constraints can have an impact on investment. It could take years from improved investment incentives from the ISO/RTO model to impact investment due to the time taken to plan and obtain permits for transmission assets. Investment in ISO/RTOs has increased since about 2003; around 5 years after the RTOs were established.

A1.24 The Brattle Group expect that it is possible further improvements in transmission investment in ISO/RTO regions will appear as the planning process evolves. Initially, RTOs worked in tandem with TOs to plan projects needed to maintain reliability and interconnect new generators to the network. More recently RTOs have begun to look for investment opportunities to reduce congestion costs, facilitate trading and enhance regional integration. Also, in February 2007, FERC Order 890 made significant changes to the regulatory rules on transmission planning.

Regional integration

A1.25 As Figure A1-1 shows, RTOs have spread across a large swathe of the US, extending into parts of Canada and Mexico. PJM is the largest interconnected system in the developed world. Therefore, it appears that ISOs have helped to foster regional integration in the US.

A1.26 In the US, a move toward a "postage stamp" charging mechanism (encouraged by FERC) could facilitate further regional integration through investment in high-voltage transmission. A postage stamp charging mechanism recovers the cost of transmission assets by using a flat component of the transmission charge applied to all customers within an RTO area. This contrasts with a "footprint" charging mechanism which recovers the cost using a charge applied only to customer within the TO area where the investment was made.

A1.27 The postage stamp mechanism may ease the permitting process and reduce TO reluctance to invest in projects that will cause transit flows. This is only possible within ISO/RTO regions, which can explain why investment is high in CAISO and ISO-NE, but is only more recent in PJM.

Great Britain

A1.28 In this section, we consider the evidence of the experience with ISOs in Britain. In particular we consider the record of the Scottish ISO in regard to:

- competition;
- investment; and
- regional integration.

The British electricity market

A1.29 The British transmission network is split into a single transmission network in England and Wales and two networks in Scotland with an interconnection at the border.

A1.30 In England and Wales, full unbundling has occurred with National Grid owning and operating the transmission network.

A1.31 In Scotland, two vertically integrated firms, SSE and Scottish Power, lost control of the operation of their transmission network in 2005 under BETTA. National Grid became the SO for a single system incorporating the three transmission networks as well as the interconnector between Scotland and England, while SEE and Scottish Power continue to own their transmission networks. National Grid therefore, became the ISO for the Scottish system.

Competition

A1.32 The introduction of a Britain-wide SO facilitated expansion of the wholesale market to all of Great Britain. Such a wholesale market would have been difficult to develop without an ISO to co-ordinate the operation and development of the various networks.

A1.33 BETTA effectively consisted of extending the New Electricity Trading Arrangements (NETA) to Scotland. Under NETA the TSO was the "residual energy balancer", maintaining the quality and security of supplies. Therefore, BETTA could only have been introduced with the creation of a single ISO for all of Britain.

A1.34 Had the status quo in Scotland remained, the two vertically integrated Scottish utilities would have been reluctant to co-operate in a nationwide wholesale market. Had unbundling occurred (and had National Grid not purchased the transmission assets in Scotland) the new TSO may also have faced incentives that weren't aligned with creating a wholesale market across Britain as its incentives would be focused on Scotland.

A1.35 The Scottish transmission firms SPTL and SHETL remain part of vertically integrated firms, despite being legally unbundled from Scottish Power and SSE respectively. According to a 2007 paper by Dr Moselle with the Brattle Group[101], there is a "widespread perception" that vertical integration in Scotland has caused problems for the ISO. SPTL and SHETL control when their networks are maintained and how they are developed. Therefore, they can time works to maximise the revenues that their generation plants earn from transmission constraints through both constrained-on and constrained-off payments. This problem is made more acute as SSE and Scottish Power have regional monopolies in generation.

Investment

A1.36 National Grid is a shallow ISO in Scotland. Its role in planning investment consists of monitoring TO plans. In practice, investment decisions are made during the price control reviews every five years as a result of negotiation between the TOs and the regulator, Ofgem.

[101] The Brattle Group, Regulating unbundled TSOs: rules, incentives or an ISO?, November 2007.

A1.37 Planned investment for the five years from 2007 is forecast to be more than 250% greater than investment over the preceding five-years[102]. A key driver of this investment is the development of renewable energy in Scotland. This suggests there has not been a problem with investment.

A1.38 Dr Moselle's 2008 paper with the Brattle Group considers that a shallow ISO model is likely to encounter problems in inducing transmission investment[103]. They point to evidence that some necessary investment is being delayed. For example constraints led to a further 45% increase in costs for Scottish constraints for 2006/7[104] while investment to relieve these constraints was not planned to happen until 2009.

A1.39 In the first year of BETTA in 2005/6, National Grid as the ISO submitted two requests to Ofgem for additional allowances under its SO incentive scheme. One related to constraint payments due to limited transfer capacity on the interconnector between Scotland and England. This was because if the excess of generation capacity in Scotland compared to demand. The other request was on a transmission line.

A1.40 The Brattle Group suggest that as of 2007, these constraints were continuing to cause problems. Despite this, SHETL had no plans to upgrade the interconnector between Scotland and England before 2009. However, a deeper ISO, such as that in Ireland, could have instructed SHETL to have upgraded the interconnector earlier. Levels of investment are also rising rapidly since Scotland ceased to be an integrated TSO.

A1.41 The ISO model also increases the transparency of constraint costs. The transparency of constraint costs can also be brought to bear on TOs to undertake investment to relieve constraint. Previously constraint cots were estimated by Ofgem using information from National Grid. Actual costs in 2005/6 were 65% higher than National Grid's estimate and 180% higher than Ofgem's. National Grid requested an allowance of £17 million to manage internal Scottish constraints during the first year of BETTA. Ofgem considered this to be excessive and allowed for £10 million. Actual costs were more than £28 million.

102 Transmission Price Control Review, Final Proposals, Table 2.3, Ofgem (2006).

103 The Brattle Group, Independent System Operators for power transmission: evidence based assessment, April 2008.

104 National Grid Electricity Transmission System Operator Incentives from 1 April 2007, (Ofgem 2007).

Regional Integration

A1.42 The ISO arrangements in Scotland have enabled the National Grid to operate as the SO for all of Britain. Had Scotland taken an alternative approach of vertically unbundling Scottish Power and SSE, Britain could have had two or even three transmission firms as National Grid may not have been prepared to purchase the transmission assets in Scotland.

A1.43 This alternative approach could have hindered regional integration. Voluntary cooperation between National Grid and a Scottish TSO may also not have lead to a co-ordinated approach to investment planning.

A1.44 However, the transmission owners in Scotland still have considerable influence on investment decisions under BETTA with National Grid as the ISO having little involvement in investment decisions. This distorts the investment decisions in the interests of SSE and Scottish Power, especially as Scottish generation is highly concentrated between SSE and Scottish Power. Therefore, there is limited scope for National Grid as ISO to promote a co-ordinated national approach to transmission investment.

A1.45 National Grid as the ISO in Scotland and the TSO in England and Wales enabled the development of a Britain-wide wholesale market. Such a market would have been difficult to implement with two vertically integrated firms in Scotland or with an unbundled TSO in Scotland (that is assuming National Grid would not have purchased the Scottish transmission assets).

Appendix 2: About the authors

A2.1 LECG is a global expert services and consulting firm with approximately 1100 experts and professionals in 39 global locations. LECG earned revenues of $263 million in 2009. In Europe, we have offices in Brussels, London, Madrid, Milan, Paris and Toulouse. In Europe, we have over 150 full time professional staff comprising of accountants, economists, statisticians, MBAs, and industry experts, including former partners and directors from the "Big 4" accounting firms specialising in regulation, litigation support and valuation.

A2.2 LECG's energy team is made up of highly experienced economists with expertise in energy and environmental policy, competition economics, regulatory economics, market and network modelling, accounting and finance, econometrics and statistics, valuation, arbitration and damages. Their previous experience encompasses senior roles in major utilities, energy regulators and competition authorities across Europe.

A2.3 LECG's European energy practice advises clients across a broad range of issues, drawing on the firm's unique combination of expertise in the key disciplines required to address regulatory and commercial issues in energy markets. Our experts have been involved in almost every major merger and antitrust investigation in the energy sector in recent years. We have provided advice to companies and/or national authorities in Australia, Belgium, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Spain and the UK. We also apply our expertise in damages and valuation to provide advice and expert witness testimony in energy industry disputes and arbitrations.

A2.4 LECG is a member of the current consultancy panels for Ofgem, Ofwat, Ofcom, ORR, CAA, NIAUR, FSA, the Water Industry Commission for Scotland, and the Competition Commission.

Boaz Moselle, Director, LECG

A2.5 Dr. Boaz Moselle is a Director of LECG. He is an economist and former regulator who provides qualitative and quantitative analyses of regulatory and competition-related issues, with a particular focus on energy markets. He frequently advises private and public sector clients on competition, regulatory and commercial issues including analysis of mergers, assessing allegations of competitive abuse,

estimating antitrust damages, developing policies to foster competition in liberalized markets, estimating the cost of capital for regulated infrastructure, and developing low-carbon technologies.

A2.6 He has analysed many EU utility mergers including Gas Natural-Union Fenosa, GdF-Suez, Gas Natural-Endesa, and Nuon-Essent. He has also provided analysis and expert witness testimony on a variety of antitrust matters outside of the energy industry, including testimony submitted to the Court of First Instance. He was previously a Managing Director at the UK energy regulator Ofgem, where he was responsible for Ofgem's work on security of supply, the environment, and EU regulation. He was closely involved in the work of the European Regulators' Group for Electricity and Gas (ERGEG), in particular in relation to the development of the Guidelines for Good Practice on Storage System Operation (GGPSSO).

A2.7 Dr. Moselle holds a Ph.D. in Economics from Harvard University, and an M.A. and Ph.D. in Mathematics from the Universities of Cambridge and London. He has taught economics and statistics at Northwestern University, published a textbook on statistics, and written numerous articles on a range of economic and regulatory matters. He has also testified before a number of parliamentary committees in the UK.

David Black, Senior Managing Consultant, LECG

A2.8 David Black is senior managing consultant at LECG. He is an economist who specialises in providing advice on the energy, communications and transport sectors. David has a Masters degree in economics and a degree in economics and finance.

A2.9 He has 14 years of experience in the UK and internationally advising businesses, regulators and government departments. His experience includes advice on regulatory frameworks, market definition and competition assessment, pricing of regulated services, cost benefit analysis and the cost of capital. He has experience at both the "big picture" policy level and with the detailed workings of electricity transmission regulation and energy markets.

A2.10 David has advised on a range of electricity transmission issues including transmission investment approval and the design and terms of transmission contracts. He recently advised Ofgem in the context of its RPI-X@20 review on

ex ante and ex post regulation of energy networks and whether consumers should have a right of appeal against price control determinations.

A2.11 David has worked an economist at Oftel (now Ofcom) and for the New Zealand Treasury on energy policy issues. While a principal consultant at M-Co New Zealand, he was the lead economic advisor to the New Zealand Electricity Commission on their transmission work programme.

Martin White, Associate, LECG

A2.12 Martin White is an Associate at LECG. He joined LECG in 2007 as a Research Analyst in the London office. As a member of LECG's Financial and Accounting Services division, Martin specialises in providing support and analysis in the energy and communication sectors, contentious litigation cases and contentious IP disputes. Martin has a degree in economics from St. Catharine's College, University of Cambridge and has passed all three levels of the CFA examination.