

Unbundling, deep ISOs and Network Investment

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Abstract: Further unbundling measures are currently implemented in the European energy markets. One option is the “deep independent system operator” (deep-ISO). An ISO splits the system operator from transmission ownership, which can remain integrated with generation assets, if so desired. This construction avoids violation of constitutional law, but does not address the “strategic-investment-withholding” argument. Therefore, a “deep”-ISO receives the competence for transmission investment decision making and can if necessary order a transmission owner to make the investment. This construction creates an uneasy governance split between decision-maker and risk-bearer. In this paper, we discuss the scope of the deep-ISO and the role of third parties in decentralised transmission investment, in particular “tendered transmission investment”, to address the above mentioned governance problem.

1 Introduction

After the publication of the Sector Inquiry of the gas and electricity markets in January 2007, the European Commission expressed its vision to strengthen vertical unbundling of the European energy companies in the publication of the third legislative package in September 2007.² Two issues are of particular importance. First, in the opinion of the

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² The provisions for the electricity sector can be found in “Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/54/EC concerning common rules for the internal market in electricity” COM(2007) 528, 19.09.2007

European Commission the development of competition in the European energy markets is disappointing. Second, the relative scarcity of network capacity poses further threats to competition and supply security. These two issues are addressed by the proposed unbundling regulations. The Commission stresses the argument of, which we call, *strategic investment withholding*; this argument claims that a vertically integrated utility (VIU) does not have adequate incentives to expand interconnector capacity, as this would increase the competition against its own generation businesses, and would thus hurt the interest of the group as a whole. This argument will play a key role in this paper.

After controversial debate between various member states, the political compromise regarding unbundling which entered the concluding directives leaves a choice between three options:³

- Full ownership unbundling
- Deep Independent System Operators (deep-ISOs)
- Effective and efficient unbundling (EEU), also known as the “third way”

The rules concern both gas and electricity but concern the (high voltage and long distance) transmission networks only. The distribution networks are subject to administrative unbundling following the 2nd energy directives (2003). Unbundling of the distribution networks was largely excluded from the debate.⁴ The “third way” basically implies a strengthening of legal unbundling as we know it but would not require structural changes. In effect this means, that no member state is forced to change the market rules in the member states and therefore formally the situation stays largely at “business as usual”. Nevertheless, the debate alone achieved a lot and changes have been set into motion and we may expect that an irreversible movement towards more and stronger unbundling has been initiated. The question really is how this will look like? In the paper, we study the second option: the deep-ISOs.

In section 2 we first characterise the investment problem which we call *strategic investment withholding*. We argue that an ISO may address several competition problems with vertical integration, but does not in every case adequately address the

³ Current state of legislation is that the Council on 25 June accepted all amendments proposed by Parliament in April. Therefore the Directive is final, although not yet published in the Official Journal.

⁴ With the developments towards smart distribution networks the debate may gain momentum.

problem of strategic investment withholding. The “deep”-ISO repairs this as it gives investment decision competence to the ISO which can subsequently order the responsible network owner to make the investment. This, however, creates a split between decision-maker and risk-bearer. Section 3 gives a brief overview of ISOs in practice and goes into some depth to illustrate the ISO PJM which is located at the US East Coast. Section 4 discusses the use of decentralised investment models to address the problem of the decision-making versus risk-bearing split. We see potential for what we call *tendered transmission investment*. The idea is that the deep-ISO might identify investment opportunities and then tender off the investment itself. The eligible transmission owner may participate but needs not participate and thus would not be subject to an obligation to invest. This approach seems promising and the way forward is to demarcate which investments can usefully be tendered and which not. Moreover, this approach fits well into a current regulatory discussion on what is known as *efficient infrastructure investment*. In that discussion tendering is one option to secure some efficiency, but this option ideally requires something like an ISO to identify the possible projects. Section 5 gives concluding remarks.

2 Vertical Unbundling: The investment issue

2.1 Transmission System Operator – Three models

In order for a transmission network operator to function, it needs to fulfil two fundamentally distinct tasks: system operation and network maintenance.

1. **System operation** is in essence the perpetual real-time match between electricity supply and electricity demand, the provision of balancing energy and other ancillary services. This function is taken up by the *System Operator (SO)*.
2. **Network maintenance** includes all physical tasks on the network: servicing, maintenance, and setting up of new network connections, among others. In a broader sense this includes all measures to maintain the resource adequacy of the network. This is the responsibility of the *Transmission Owner (TO)*.

Besides system operation and maintenance, there are other important obligations, such as congestion management within the own network, operation of interconnectors to neighbouring networks, and above all the planning and implementation (including

financing) of network expansion investments. In a liberalised market, all this takes place under the oversight of a regulatory authority and with the expectation that the TSO will assist with the development of competition in the electricity market through turning its network in a “marketplace” on which new and incumbent electricity generation companies, national and international, can compete for the supply of small and large customers with the least possible physical limitations.

Joskow (2005) differentiates between three main models of organisation of the network operation:

- a) **VIU: Vertically Integrated Utility:** this model is characterised by the vertical integration of system operation, transmission ownership, generation, wholesale and retail marketing. In liberalised markets, the fully integrated TSO has an inherent conflict of interest because its transmission network operating, maintenance and investment decisions affect the value of its generation portfolios and marketing businesses, while at the same time it is required not to discriminate against third parties, which comes at the expense of the other business segments.
- b) **ITC: Independent Transmission Company (Transco):** This model is characterised by a complete separation of transmission network functions (system operation and maintenance) from generation and power marketing functions. In this model, system operation, maintenance, investments and asset ownership are fully integrated and can be managed by the TO in a coordinated manner. The management of the ITC can concentrate on the provision of optimal transmission services. This institutional design would result from full ownership unbundling.
- c) **ISO: Independent System Operator:** this model is characterised by the separation of system operations (SO) from transmission facility ownership (TO), investment and maintenance, as well as from ownership of generation and marketing businesses. Yet, ownership of transmission and generation assets can be integrated. The ISO does not own or maintain transmission assets, but is responsible for scheduling and dispatching generation and load. It manages and enforces rules for the allocation of scarce transmission capacity. It works with the transmission owners and other stakeholders on the coordination of

maintenance schedules and planning for new transmission investments to support changes in the demand for and supply of generation services. As the ISO has no direct interest in the financial performance of the owners of any of the assets that comprise or utilise the transmission network, it can be expected to be unbiased. The ISO-model thus splits the *transmission owner* (TO) from the *system operator* (SO).

Figure 1 summarizes these options.⁵ The dotted lines indicate ownership structures.

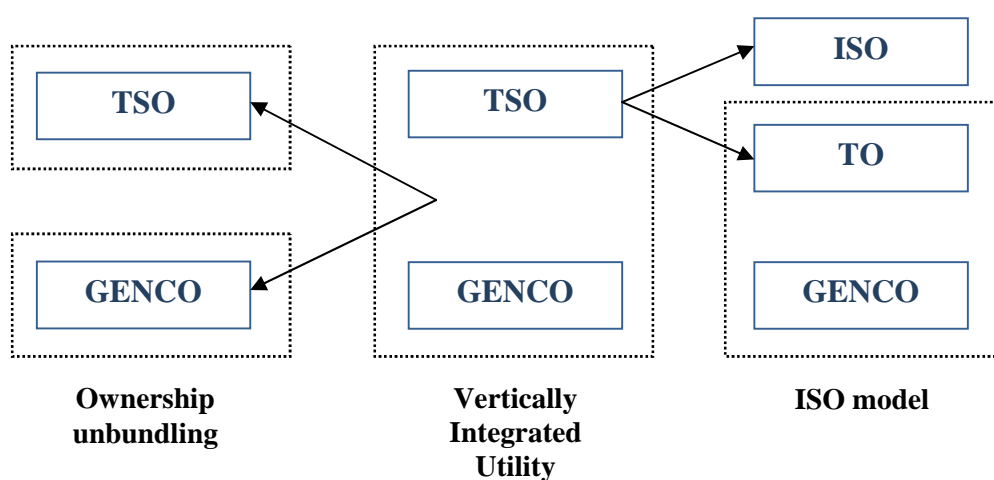


Figure 1: The governance structure of the ISO model in comparison to Ownership Unbundling

The two options full ownership unbundling and the (deep) ISO model will be included in the 3rd legislative package, next to a third option: the so-called “third way”, or also called *Effective and Efficient Unbundling* (EEU). This is in essence a continuation of the model of the VIU, but with a strengthening of the already existing rules and regulations on legal unbundling. The idea is that for two-board corporate governance systems (like in Germany), the supervisory boards of the network department (which is a legally unbundled subsidiary from the holding) does not contain members of the executive board of the holding, which is now normal. Moreover, in the EEU model, the regulator should have more authority to “guide” network investments.⁶

⁵ Figure 1 focuses on only the two stages in the value chain transmission network operation (TSO) and generation (GENCO). Therefore, we do not consider unbundling of distribution networks here.

⁶ For more detail to the EEU option, see Säcker (2008).

2.2 Vertical integration and strategic investment withholding

There are two main aims for vertical unbundling of the transmission networks. The first aim is a direct improvement of competition in generation, trade and retail by removing incentives to discriminate market participants and preventing cross-subsidising. The second aim is the improvement of the incentives to expand (cross-border) interconnector capacity (the “interconnector effect”). This in turn aims at three goals. Firstly, more interconnector capacity should improve competition, because it relieves cross-border congestion and thereby expands access to other markets. Secondly, more interconnector capacity should improve supply security or more precisely, increase network reliability. Higher network capacity will usually mean a lower probability of a network overload.⁷ Thirdly, more cross-border interconnector capacity improves the European internal energy market, which, of course is a main important goal of the EU commission.

The underlying rationale for the interconnector effect is the incentive for a VIU for, what we call, “strategic investment withholding”. The argument is straightforward. Assume areas A and B. Assume that A is a high price area and B a low price area and assume furthermore that there is a network constraint from B to A. Assume further a local vertically integrated utility with (local) monopoly power in A. Building a larger line to B increases import capacity into A and would allow third parties from B to supply demand in A and would thus intensify competition for the local supplier in A. Therefore, in order to protect its position in generation, the integrated TSO in A will have insufficient incentives to expand the interconnector capacity. Therefore we call this “strategic investment withholding”. In contrast, an unbundled TSO does not have an incentive to protect a local generation monopoly (as it does not gain directly from generation profits) and will therefore have stronger incentives to invest in interconnector capacity.

Note that the argument of strategic investment withholding does not hold for all transmission investment. Strategic investment withholding aims to retain transmission

⁷ Unfortunately, although this is likely to be the general case, it need not be the case. Additional line capacity will work out on network flows and can increase congestion elsewhere and can thus worsen network reliability.

scarcity to protect market power in the generation sector. Many transmission investments will not have a straightforward effect on the market position of generators; in these cases, the argument does not apply. In practice, the argument seems to apply mostly to transmission investments that reduce cross-border congestion, roughly speaking the interconnector capacity.⁸

The argument is convincing, but has limits. Firstly, vertically integrated utilities may be long or short in generation as compared to their retail liability. If own production is short compared to retail, then on aggregate the firm may have an interest to increase interconnector capacity to broaden the options to purchase power. Secondly, integrated utilities with excess capacity and low variable costs will want to export their power and therefore need interconnector capacity. Thirdly, even if the strategic investment withholding argument may hold in principle, in practice there are of course other investment limitations, in particular siting. Permission to build new lines is a legal hurdle; the procedures are long and public opposition is strong. Fourthly, interconnector capacity can lead to more imports or to more exports; if the interconnector capacity is used predominantly for more exports, we find that competition actually decreases locally and convergence of prices with the neighbouring country might subsequently even lead to a price increase in the low price country. Globally, competition is likely to increase, but in an area considered in isolation competition may actually decrease.

Brunekreeft (2008) and Özdemir et al. (2009) examine the effects on and of additional interconnector capacity for the case of Germany and with the help of a locationally differentiated electricity market model.⁹ The social cost benefit analysis in Brunekreeft (2008) applies the concept of the residual supply index (RSI) to model the competitive behaviour on the market (conjectural variations).¹⁰ The key notion of this concept is to relate competitive conduct to the relation between available generation capacity and market demand. If generation capacity relative to demand is abundant, then competition is strong. If generation capacity relative to demand is scarce, then we find that competition gets weaker and prices start to go up. Therefore, any changes of available

⁸ We note that due to loopflows cross-border congestion reducing transmission investment does not actually have to physically cross a border.

⁹ In this case, the ECN model COMPETES which was updated to a 10-node representation of the German electricity market. See for details, Hers and Özdemir (2009).

¹⁰ For a technical analysis of the RSI concept cf. Newbery (2008).

generation capacity will affect competitiveness of the market. Since additional interconnector capacity affects effective available capacity, it also affects market competitiveness. Clearly, however, it matters whether additional interconnector capacity is used for imports or exports. If additional interconnector capacity leads to more imports, then available generation capacity increases (*ceteris paribus*) and thus competition improves. In contrast, if additional interconnector capacity implies more exports, in effect, available generation capacity decreases (or equivalently, demand goes up) and thus competition (on the exporting market) weakens. If we take into account both sides of the line, we of course expect a net improvement of global competition. What the argument made above says is that the incentives to invest in additional transmission capacity depend, among other things, on whether the firm will use it for imports or exports.

Running the calculations for Germany, we find that the net effect depends on whether Germany will run into a situation where generation capacity is scarce or abundant (cf. Brunekreeft 2008; and Özdemir et al. 2009). Due to the nuclear phase-out, decommissioning of old coal plant and especially legal problems facing new generation investment, generation capacity scarcity is a scenario projected by some parties (cf. DENA 2008, and BDEW 2007).¹¹ In effect, if generation capacity is scarce, wholesale prices in Germany are likely to be relatively high, and therefore more interconnector capacity would lead to increased imports, which in turn would increase competitiveness of the market. The argument turned the other way round also holds. If available generation capacity turns out to be adequate (which is projected by eg. Matthes and Ziesing, 2008), low prices on the German market imply that Germany increases exports, meaning that additional interconnector capacity decreases competitiveness of the German market.

Scarcity of interconnector capacity is a big issue in both Europe and the USA. In Europe, cross-border congestion is substantial and the EU commission declared many projects as transeuropean networks (TEN) priority projects (cf. eg. EU website and

¹¹ There are opposing projections (cf. Matthes and Ziesing 2008). The problem is that the discussion on the existence of a generation gap in Germany is heavily ridden with ideological and political motives. According to ENSTO-E data the German net electricity export in 2008 was more than 20 TWh with two nuclear power plants (Krümmel, Brunsbüttel) not generating at all.

CESI et al. 2005). Moreover, the Regulation for Cross-border Exchanges¹² states that revenues of auctioning scarce cross-border interconnector capacity should be used to re-invest in the network to resolve existing congestion (or, if this is not feasible, should be used to decrease network charges). Also, the European Commission now aims at a stronger cross-border market-coupling to improve efficient dealing with network congestion. The interconnector problems in the USA are worse. In the USA, the networks historically have been much more fragmented and the interconnector capacity has been smaller than in Europe. Especially pressing in that respect is the problem of congestion management in the USA, and above all at the borders between the network areas (“seams issues”). This highly complex set of problems (coordination of the SOs and a better network regulation, for example through a nodal pricing system) is a typical challenge that almost inevitably implies the establishment of centrally operating ISOs. These differences between Europe and the USA have implications for the political drivers behind reforms. In Europe, the main drivers for promoting interconnector capacity are the development of the internal European energy market and the promotion of effective competition. In the USA, the main driver for network interconnectors is system reliability or supply security. The federal regulator FERC has made horizontal cooperation across network areas and investment to expand the interconnector capacity its highest priority.

3 “Deep”-Independent System Operator

3.1 What is a deep-ISO?

In an ISO-model, the system operation is separate from the rest of the VIU and the SO is transformed into an independent entity: the ISO. The network assets remain the property of the previous owner, usually the VIU, while the SO does not own any substantial assets. Thus, there is no considerable property relocation, and therefore any expropriation of (private) assets by forced divestiture can be avoided. This is the main reason why the ISO model is in the discussion. It avoids a violation of constitutionally protected property rights. These reasons hold for Europe as well as the USA. The debate on the design of the ISO-model centres around two central issues:

¹² Regulation 1228/2003/EC on conditions for access to the network for cross-border exchanges in electricity of 26 June 2003.

- Who decides upon investments and who carries them out?
- Who is the ISO and what should the governance structure be like?

The Commission adopts a definition for a deep-ISO with far-reaching competences. Article 13 of the proposed directive contains the provisions applicable for ISOs:

- The ISO is “responsible for granting and managing third party access, including the collection of access charges [...] for operating, maintaining and developing the transmission system, and for ensuring the long term ability of the system to meet reasonable demand through investment planning.”
- When developing the network, the ISO is responsible for “planning (including authorisation procedure), construction and commissioning of the new infrastructure.”
- The VIU as being the transmission owner (TO) is required to cooperate with the ISO and provide all necessary information.
- The TO finances “the investments decided by the independent system operator and approved by the regulatory authority, or give its agreement to financing by any interested party including the independent system operator.” The latter part, known as ‘tendered transmission investment’, will be discussed further in section 4.2.
- The TO has to “provide for the coverage of liability relating to the network assets, excluding the liability relating to the tasks of the independent system operator” and to provide guarantees to facilitate the financing of network expansions.

The first bullet point grants the ISO the authority to decide on investment and thereby creates the “deep-ISO”. The first part of the fourth bullet point requires the designated transmission owner (TO) to undertake the investment or at least to make way for another interested investor. Therefore, the governance system creates a split between investment decision-maker (the deep-ISO) and the investment risk-bearer (the TO). To ease up this uneasy tension, the directive allows the possibility of tendering the transmission investment, which practically means that the designated TO will not have to make the investment if another party would take over. This is the second part of the fourth bullet point.

There is an important reason for this rather unfortunate construction. As mentioned above, the “strategic investment withholding” argument plays an important role in the unbundling debate. The argument claims that the VIUs have inadequate incentives to expand interconnector capacity, as this might increase competition on their own market. This assumption forms the basis of the arguments of the Sector Inquiry. The investment issue is part of the ISO design. In case the investment decision lies with the TO and not with the ISO, the investment withholding problem will not be addressed adequately, because there is still a direct link between transmission and generation assets. Thus, we conclude that a “non-deep ISO” does not address the problem of strategic investment withholding sufficiently.

Governance structure of an ISO

An ISO would normally face a trade-off between two main objectives. On the one hand, it is the promotion of non-discriminatory competition and on the other, the setting and coordination of different stages of the value chain (SO and TO). A central issue is thus how much of an influence over the TO should an ISO be allowed and vice versa. For the governance of the ISO, the following two options typically are discussed:

1. A “club” approach with all stakeholders and actors involved as members on equal standing
2. The establishment of an independent company, authorized through contracts with the actors involved

The club approach has its roots in the large economic literature on “clubs”, which was developed to deal with the area between private goods and pure public goods: the private provision of public goods (cf. Buchanan, 1965 and Sandler.& Tschirhart, 1980). Interested stakeholders in a ”public good” will soon realise that collective action may be mutually beneficial and will form and stabilise a club with members, as long as the group is not too large. Thereby, groups of varying sizes form subgroups in society providing goods and services with public good aspects without involvement or enforcement of the state. Furthermore, any form of an ISO is of course subject to state regulation. Practical experience with ISOs so far suggests that under the club approach, where state agencies are integrated as stakeholders, state regulation seems to be weaker than in the case of a completely independent company. This can be explained by the fact

that in the first case the early involvement in the decision-making process leaves little to be solved by ex-post intervention.

Besides the question of how the ISO is organised, a critical issue for the ISO design is also the decision-making scope of the ISO, especially with regard to investments. It happens in many cases that the decision-making competence and the financial risks lie with different parties. A club approach as pursued in the USA is aimed at resolving this tension through involving – although indirectly – the risk bearer. In other words, the TOs can be members of the club and thereby are indirectly involved in investment-decision making processes.

3.2 Examples of ISOs around the World

In order to separate network ownership and operations, in recent years ISOs have been founded worldwide. The following table shows several examples of the current usage of the ISO approach.

Table 1: The ISO model around the world

North America	South America	Europe	Australia
USA with 7 ISOs: <ul style="list-style-type: none"> • CAISO • ERCOT • ISO NE • MISO • NYISO • PJM • SPP Canada with 2 ISOs <ul style="list-style-type: none"> • AESO • IESO 	Argentina <ul style="list-style-type: none"> • CAMMESA Brazil <ul style="list-style-type: none"> • ONS 	Scotland <ul style="list-style-type: none"> • NG Ireland <ul style="list-style-type: none"> • EirGrid Bosnia and Herzegovina <ul style="list-style-type: none"> • NOS BiH Switzerland <ul style="list-style-type: none"> • Swissgrid 	AEMO (since July 2009)

USA and Canada

The US and the Canadian ISOs are similar in many important features and are shaped primarily by state regulation. They are normally organised as deep-ISOs. However, it should be mentioned that the VIU in the US participate in the ISOs on a voluntary basis (although incentivised by the federal regulator). This implies that the VIU could withdraw from the ISO in case of serious disagreement. In practice, this is highly

unlikely and, to our knowledge, has not happened. ISOs are either organised as associations (“clubs”), involving all stakeholders, or as completely independent companies that are not related to any other market players. Their task is primarily to secure the non-discriminatory access of all market players to the network. Furthermore, they take the responsibility of network operation, long-term network planning, the settlement and operation of various markets for electricity and related products.

Argentina

The Argentinean network operator CAMMESA is also responsible for the operation of the transmission network and of the electricity markets. The generation companies, TOs, distribution utilities, large users and the state all have a share of 20% each.

Brazil

ONS was founded in 1998 as the Brazilian network operator and is responsible for the operation of the transmission network and the dispatching of power plants. Its members include generation companies, network owners, distribution companies, traders, and large-scale users, as well as the Ministry of Energy, consumer organisations, decentralised producers, and small-scale distributors.

Scotland

With the enlargement of the English electricity market over the Scottish network area, National Grid (NG) was turned into an English-Welsh network operator and owner (TSO), and an ISO for the Scottish network region, while the previous two Scottish TSOs assumed the role of TOs. Strictly speaking, NG is non-deep ISO in Scotland as competence for investment decisions is for the Scottish network owners. In practice, cooperation on a voluntary basis is highly appreciated and failing to do so will certainly lead to a reference to the regulator or competition commission.

Ireland

EirGrid is state owned and since 2006 has been operating the transmission network. EirGrid’s responsibility is basically the operation of the network, of the wholesale markets and the long-term network planning. Development and maintenance of the lines is carried out by the TO.

Bosnia and Herzegovina

NOS BiH, as the country's ISO is primarily responsible for the reliable operation of the network, the organisation of the market and the development of regulations. The owners of the network are the Federation of Bosnia and Herzegovina and Republika Srpska.

Switzerland

Since December 2006, Swissgrid is the only transmission network operator for Switzerland, founded by the seven network companies in anticipation of upcoming legislative requirements. The ownership of the network remains with the Swiss network companies, who are at the same time the only shareholders of Swissgrid.

Australia

Since July 2009, the "Australian Energy Market Operator" (AEMO), is a single, industry-funded national energy market operator. The National Transmission Planner (NTP) is part of the AEMO; it was founded on initiative by the Ministerial Council on Energy (MCE) and joins together the tasks of six founding entities NEMMCO, VENCORP, ESIPC, REMCO, GMC and GRMO. NTP is 60% state owned and 40% industry owned. The regulator (AER) is not directly involved. The six founding entities are ISOs.

3.3 Independent System Operators: the case of PJM¹³

The ISOs from the US East Coast are often used as prototypical representatives of their "kind". Especially interesting is the network operator PJM. PJM was established already in the 1920s, initially by three companies, and has since then expanded through the integration of further actors. Until 1998 PJM had the character of a power pool, but from being a cost-based pool turned progressively into a supply-oriented spot market, and is currently one of the leading ISOs in the USA. A decisive factor for the development of ISOs in the USA was above all the *Federal Energy Regulation Commission* (FERC). As a starting point one can identify the heavily fragmented and loosely integrated electricity network, dominated by vertically integrated companies, as

¹³ The correct label for PJM is actually not ISO but RTO (Regional Transmission Organization). According to US law, RTOs are ISOs that operate across state borders and thus fall under the jurisdiction of the Federal Energy Regulation Commission (FERC).

well as the need for dealing with the resulting transmission bottlenecks at the borders of the individual networks.

PJM Interconnection LLC (as the official name of the ISO) operates, according to its own account, the largest high-voltage transmission network in the world (it is situated at the US East Coast and comprises (parts of) 13 states and the District of Columbia, see figure below) and the associated markets for electricity, balancing energy and transmission rights. PJM is organized as an association and acts on the behalf of and under the oversight of its nearly 450 members. Such are all the power generation companies, transmission network owners, electricity distribution companies, electricity marketers and large-scale users from the PJM domain, as well as consumer protection advocates and federal and national regulatory agencies.

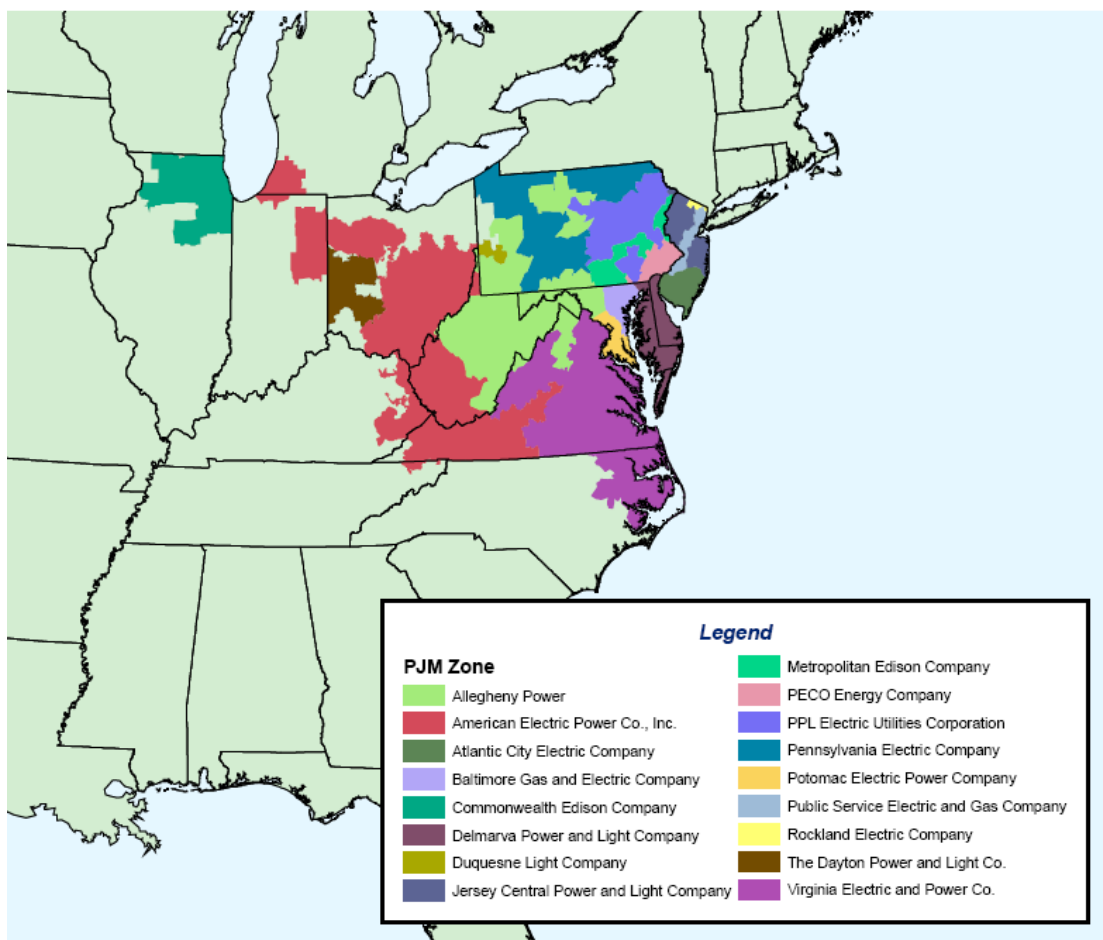


Figure 2: PJM's network system

Source:: www.pjm.com

PJM is a deep ISO, as it has far-reaching competences on investment decision making.

PJM's functions can be classified basically into three pillars:

- Operation of the transmission network and power plant dispatching
- Operation of the wholesale market and the capacity credit market, regulation and financial transmission rights (FTR)
- Investment planning

3.3.1 PJM's Governance Structure

PJM is a typical example of a comprehensive "club" approach. PJM resembles an association and each stakeholder, whether a network owner or generator marketer or consumer, is represented as a member. Each member is entitled to representation at the various committees even though there is a differentiation between members with and without voting rights. Related companies have altogether one vote, as the ruling principle is of *one party-one vote*. Furthermore, there are also ex-officio memberships without voting entitlement that are usually reserved for regulatory authorities and consumer protection organisations. Figure 3 provides the governance structure in overview.

PJM's two-tier governance structure of Members Committee and Board of Directors ensures the independence and neutrality of the decision making process and guarantees that no member or group of members could gain a dominant influence over PJM. The central decision making authority is the Board of Directors, elected by the Members Committee, the Board members by no means are allowed to have personal, professional, or financial interest in any of the actors involved. The network owners also have no particular privilege over other members of PJM.

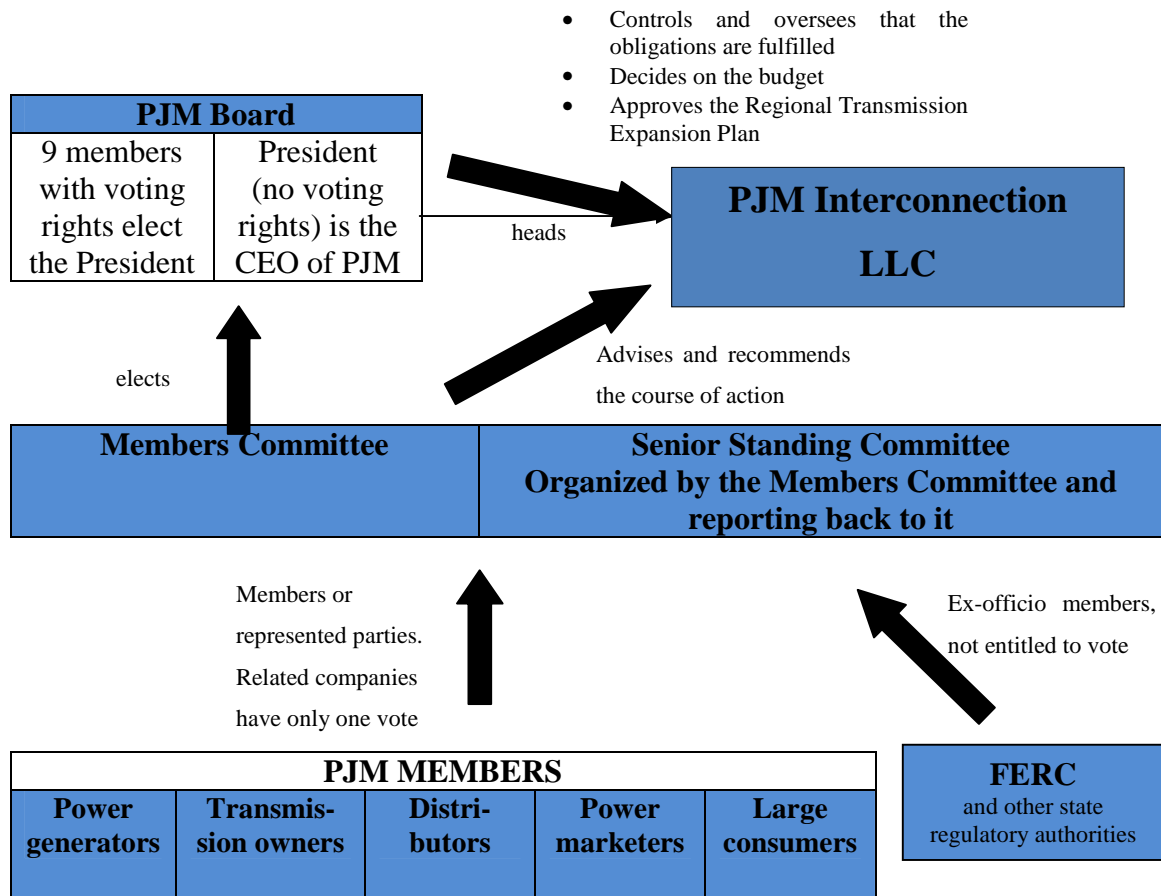


Figure 3: PJM’s Governance Structure
Source: own illustration

The Board – Governance Relationship

As common in the US context, the leadership of the ISO is the responsibility of the so-called Board of Directors, where this board is usually divided into executive and non-executive directors. The non-executive directors have the task of overseeing the company and controlling the executive directors whereas the executive directors are more involved in the management of the company. In PJM, the board is composed almost entirely of non-executive directors, and only the President/CEO, who is not entitled to vote in the Board, is responsible for the management of the company. Besides the president there are so-called *corporate officers*, the company’s top management.

First of all, the Board has to choose and overlook the management and decide over the proposed company budget. Furthermore there are other tasks, mostly in mediating among the members, between the members, PJM, and/or FERC, or renegotiating the ISO's underlying agreements. All board members, except for the President/CEO, have other professional engagements, such as attorneys, university professors, management consultants, etc. On the other hand, the President/CEO, together with the rest of the corporate officers, usually in the rank of vice presidents, forms the company's executive office. The vice presidents are usually responsible for their own business segment.

3.3.2 Investment decision-making power

As described above, one of the central issues in the vertical unbundling of the network sector is the investment issue. As explained above, the keyword in this debate is the so-called strategic investment withholding. PJM can be seen as a deep-ISO, an ISO that has the decision power over network investments, while the obligation to invest lies with the TOs. Essentially we can distinguish "reliability investments" and "economic investments":

1. Network expansion to maintain security of network and supply: "reliability investments"
2. Network expansion to deal with existing congestion problems: "economic investments"

In the case of network expansion necessary to maintain the security of supply, usually it is a matter of necessary developments for the fulfilment of stability and security criteria. They may be based on a shift of the load curve due to changing consumer behaviour, on the close-down or disconnection of old generation plants, or simply on the tightening of security requirements. Due to the blackouts in recent years, the so-called reliability investments have high priority in US ISOs' behaviour. Responsible for the establishment of security criteria is the North American Electric Reliability Corporation (NERC) on behalf of FERC. When these investments are included in the investment plan through a Board decision, the construction work can go on the same way as with new customer network connections. The investment is to be carried out by the TOs and thus goes into the regulatory asset base of the companies and as such is subject to the TO's network tariff regulation.

Economic investments aim to reduce network congestion. For this purpose, PJM collects data on congestion costs. These allow the estimation of whether a new line would be economically feasible and whether the accruing costs cannot be covered by other means, such as Financial Transmission Rights (FTR). Investments identified as economic in a first step are made public and within the time frame of one year it is possible for private investors to submit investment proposals. If an investment is not undertaken by a merchant investor the identified network expansions can still be included in the investment plan; in that case they have to be carried out by the local TOs. Such economic investments are compensated through issuing financial transmission rights (FTRs)¹⁴ to the investor. If the investment decided by PJM is declined by the TO, the dispute settlement shall be brought by FERC as the responsible regulatory authority. As the ones carrying out the investment (and thus bearing the risk) the TOs are subject to an obligation to invest.¹⁵

4 Deep-ISO and “tendered transmission investment”

As explained, a “non-deep” ISO does not effectively address the problem of strategic investment withholding (as explained in section 2.1.). The alternative is to establish a deep ISO, where the investment decision making competence is transferred to the ISO. In short, the deep ISO prepares an investment plan containing the necessary network extensions. Then it is the task of the TO to carry out the investments. In case of doubt, the investments can even be ordered against the will of the TO. The TO would thus have an obligation to invest which implies a forced separation between the decision-maker and the risk-bearer. A way out of this dilemma is offered by the active involvement of third party investors.

One alternative would be to facilitate fully decentralised investment decisions. There are several ways to do so:

- First, we may think of truly merchant investors. Third party investor would be allowed to build transmission facilities, which would be financed on a

¹⁴ To be more precise in the case of PJM by Auction Revenue Rights. As the FTRs are auctioned off, the investors are allocated (part of) the auction revenues and not the FTRs themselves.

¹⁵ As the membership in PJM is voluntary, at least formally, as ultima ratio there is the option of leaving the ISO. However, in practice, this option seems highly unlikely and the authors are not aware of any such cases.

commercial basis. Investors are seldom pure third parties, but stakeholders with more than a purely financial interest, e.g. power companies or even the adjacent TSOs. Merchant investments would leave investment possibilities to the market and would be financed basically out of the arbitrage between different market prices.¹⁶ There are several difficulties with this approach. First, nothing guarantees that the commercially viable investment is economically efficient (cf. Bushnell & Stoft 1996 and Joskow & Tirole 2005). There are two main reasons for this. On the one hand, to the extent that the investment contains a monopoly element the commercial investor will invest in less than optimal capacity. On the other hand, a commercially viable line may actually be detrimental for social welfare due to the network effects caused by loop-flow problems. Second, to facilitate merchant investments locationally differentiated network pricing is required. In most parts of the world this is not implemented. Third, where merchant investments can have a role and do take place, we observe that investors' interest is limited. The main reason is that transmission revenues based on future price differences is highly risky. Nevertheless, there are examples of pure merchant investment. In Australia, we have seen a couple of merchant projects, e.g. the well documented cases of Directlink and Murraylink (cf. Littlechild 2004); in Europe Estlink and BritNed are examples; lastly, there are some bigger projects in the USA (e.g. Neptune RTS, or Empire Connection).

- A second fully decentralised option might be a system like the Public Contest Method (PCM) in Argentina (cf. Littlechild 2008, and Littlechild and Skerk 2008). Under the PCM any party could propose a network expansion. A model called “area of influence” would then calculate cost and benefits and more importantly calculate the allocation of the cost and benefits to different users. With the so-determined allocation of cost and benefits, a voting determines whether the expansion goes ahead; if (more than) 30% of (weighted) votes are against the expansion, the investment does not go ahead.¹⁷ This is an interesting approach, which indeed decentralises the investment initiative. However, we note that the outcome depends crucially on the allocation of cost and benefits are thereby on the area of influence model. In a meshed AC network, this is a

¹⁶ More detailed information on merchant transmission investments can be found in Brunekreeft (2005) and Brunekreeft, Neuhoff & Newbery (2005).

¹⁷ This relates to the large literature on public goods.

controversial issue. Application of the approach seems to be restricted to systems where users can be identified more or less unambiguously, such as radial systems (like in Argentina).

- A third option is the use of so-called open season procedures. These are used predominantly for the long-distance gas network but can be found also in the USA for electricity transmission expansions. T(S)Os open such procedures and ask other parties (users) to participate in the process. If sufficient users are willing to commit themselves to firm capacity bookings (and pay for this), apparently there is sufficient demand and the investment can go ahead. Usually, the regulator may settle the process by determining the allowed rate of return; all else is then cost allocation by private negotiation. This does work relatively well for gas¹⁸, but is clearly more difficult for meshed AC electricity networks as users are not readily identifiable. This problem can be solved in systems with locationally differentiated prices and the allocation of financial transmission rights to investors. In that case the committing parties would be more or less like shareholders of a third party investor, but with the project taking place under the control of the already existing T(S)O.

To conclude, fully decentralised investment decisions can be very appealing in a subset of cases, but for genuine meshed AC electricity networks fully decentralised investment decision involving third parties is unlikely to be very effective.

The alternative would be *Tendered Transmission Investments*. This could be organised as the ISO designing an investment plan and then tendering single projects. The proposal for the 3rd EU Energy Directive arranges with article 13.5.b. for a similar model: the transmission system owner (TO) shall “finance the investments decided by the independent system operator and approved by the regulatory authority, or give its agreement to financing by any interested party including the independent system operator.” This means that the directive explicitly allows for investments to be undertaken by third parties. Yet, the TOs are granted priority, so that they would not have to compete with other potential investors.

¹⁸ Although there are often complaints because shippers have to commit themselves firmly without knowing how much capacity they will get in advance,

The investment decision making process is organised as a two-step procedure. The ISO identifies the project (which is centralised decision) and tenders the investment to a third party (which is decentralised). What will be actually tendered is the financing of the construction and operation from the pool of regulated network tariffs. Such a procedure would have various advantages:

- The key advantage is that the TO is freed from the obligation to invest. In case the TO would not like to carry out the proposed investment, a third party investor could do it instead. In case no investor can be found through the tendering procedure, then this could be regarded as a signal that the planned investment is not economically viable.
- The deep-ISO and tendered transmission investment approach does not require a change in ownership structure as it would be in the case of full ownership unbundling.
- The risk assessment as an entrepreneurial task is brought back to the investors.
- The problem of strategic investment withholding is dealt with effectively, as the decision making competence lies with the deep-ISO. If the investment is viable and there are enough other potential investors, then the TO would have no reason not to undertake the investment or to take part in the tendering process; as a delay of the works would not make sense, thus strategic investment withholding would be eliminated as an option.
- It appears that there might be a counterargument that investment decisions are unduly centralized (in this case the deep ISO). This argument is not valid. Most of the transmission investments are centralised anyhow and in many cases required a prudence test by the regulator; decision making by an independent ISO plus tendering would actually make the regulator's role "light-handed".

The aim of such instruments are "stand-alone" facilities, as these investments can be considered separately from the overall system and can be dealt with on their own from a financial and regulatory point of view or separately from the actual network owners. This concerns mainly large new developments. The case of replacement investments is more complicated. In such cases, the investment of third parties would make it necessary from a property-rights and regulation point of view to split the facility into

two entities. First candidates for tendered transmission investment might thus be large-scale and clearly differentiated infrastructure projects, such as interconnectors.

As mentioned above, there appears to be a development towards stronger decentralised decision-making (cf. Pollitt, 2008) as well as for tendering. Of course tendering as such has a long-standing tradition, but still the application discussed here is novel. One particular recent development is the idea to tender for submarine cables to connect offshore wind parks in the UK (cf. Hull and Green 2008). The UK plans some 33GW offshore wind stretching out along the coast built pretty much near the coast. This implies that the offshore connections are most economically point-to-point connections (connecting the offshore wind parks directly with the main grid). As soon as the offshore wind park has secured connection rights to the onshore grid, the tendering procedure for the connecting cable will be automatically triggered. Importantly, this is thus neither a decision by the incumbent TSO (NG) nor by the regulator Ofgem, although Ofgem carries out the tender. The winner of a tender will be an Offshore Transmission Operator (OFTO) and will build and operate the line and will supply transmission rights for 20 years against a regulated price. The regulated price is derived from the costs of constructing and operating the line and is subject to a 5 year review by Ofgem. Interestingly observers claim that for Ofgem the offshore experience with tendering may serve as a guideline for onshore tendering.

We may turn around the perspective on tendering. The idea here is not to make a point for or against tendering transmission investment. The idea is to argue that the investment problem of the deep-ISO model can be mitigated with a tendering approach. There is a development towards more decentralised investment decision making and tendering is one of these. Yet, tendering is about the construction and operation of the investment; it does not solve the problem who decides on whether to have an investment in the first place. For this issue an ISO identifying and determining the potential expansion and upgrades would be preferable to a VIU. Furthermore in regulatory practice there is an additional debate going on. As the need for network investment increases, the question arises how to deal with this efficiently under the regulatory regime. The main question is how a regulatory regime can ensure efficient infrastructure investment. Once the choices and regulatory decisions about an investment project are made, tendering of investment projects would then help to secure

efficient construction and operation of the network components. This, however, raises the obvious question who will make the investment decision and thereby the tendering decision. In this case the “deep-ISO” would provide a suitable approach. Therefore the two debates complement each other. Taking all this into account, where there is a (deep) ISO in place, tendering might actually be a good way forward.

5 Concluding remarks

This contribution studies the so-called “deep Independent System Operators” (ISO) regarding its properties on network investment. Following the doubts of the European Commission on the developments in the competition on the European energy markets, the 3rd Legislative Package, which is about to be finalised, takes further steps in unbundling of the energy companies. These measures aim predominantly at a direct improvement of competition and secondly at an improvement of investment incentives for the expansion of interconnector expansion (the “interconnector effect”). As a political compromise, the package will give member states a choice between three options:

- Full ownership unbundling
- Deep Independent System Operators (deep-ISOs)
- Effective and efficient unbundling (EEU), also known as the “third way”

This paper concentrates on *deep Independent System Operators*

In the ISO approach the transmission network ownership (TO) remains in the hands of the former vertically integrated utility while the system operation (SO) is split off and transferred into an independent entity (the ISO). The main important argument for an ISO approach as compared to ownership unbundling is that it complies with constitutional law as it does not involve expropriation of private ownership. Yet, a major flaw of the approach is that it does not adequately address the “strategic investment withholding” argument. Underlying much of the unbundling debate, and central in our paper, is the “strategic investment withholding” argument. This argument basically states that the vertically integrated firm will have inadequate incentives to expand transmission capacity in order to hold off competition from other areas. This mainly concerns interconnector capacity. Under an ISO, an integrated network investor

would still take the effects on the generator's profitability into account. As discussed in the paper, this argument is strong but does have limits. The "deep-ISO" repairs this problem by shifting the network investment decision-making competence to the ISO, which can subsequently order the responsible TO to invest. As a result, the deep-ISO model creates an uncomfortable governance split between decision-maker and risk-bearer.

This paper discusses the potential role for decentralised network investment decisions by third parties to address the investment governance problem. There is definitely scope and development for truly decentralised decisions and participation, but at least for electricity networks the useful application seems to be restricted to peripheral investments. More relevant is the development towards *tendered transmission investment*. The ISO would identify investment projects (like the deep-ISO in the current approach) and then organise a tender for the construction and operation of this project (which would also qualify for a part of the regulated network charges); the eligible TO is allowed but needs not participate. This addresses both the problem of strategic investment withholding and the problem of the investment governance split between decision-maker and risk-bearer. The *tendered transmission investment* approach seems to be applicable predominantly with large, stand-alone projects, e.g. submarine DC cables or cross-border interconnections, but these are the policy targets at the moment anyhow. However, practical experience in different countries suggests that the scope of applicability seems to stretch to smaller units integrated into the meshed network. In a broader sense, the remaining key question with tendered transmission investment is who makes the investment decision? If we have an ISO in the first place, the question is automatically answered. Therefore, the weakness of the ISO may actually be its strength.

One issue for further research might be to address the question whether an ISO approach would be an adequate model for (electricity) distribution networks. So far, the distribution networks have hardly been part of the debate and we know of only two countries where ownership unbundling on distribution networks has been enforced (New Zealand and the Netherlands); but it seems probable that this will change. The current development towards "smart grids" to facilitate far-reaching integration of distributed generation (DG) and load management at the level of the distribution

network makes the unbundling debate for the distribution networks far more important than it now is. Some arguments are similar to the arguments on transmission level, but some are different. In particular, the investment problems associated with the deep-ISO as discussed in this paper are either different or less relevant at the distribution level. However, we leave this for further research.

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