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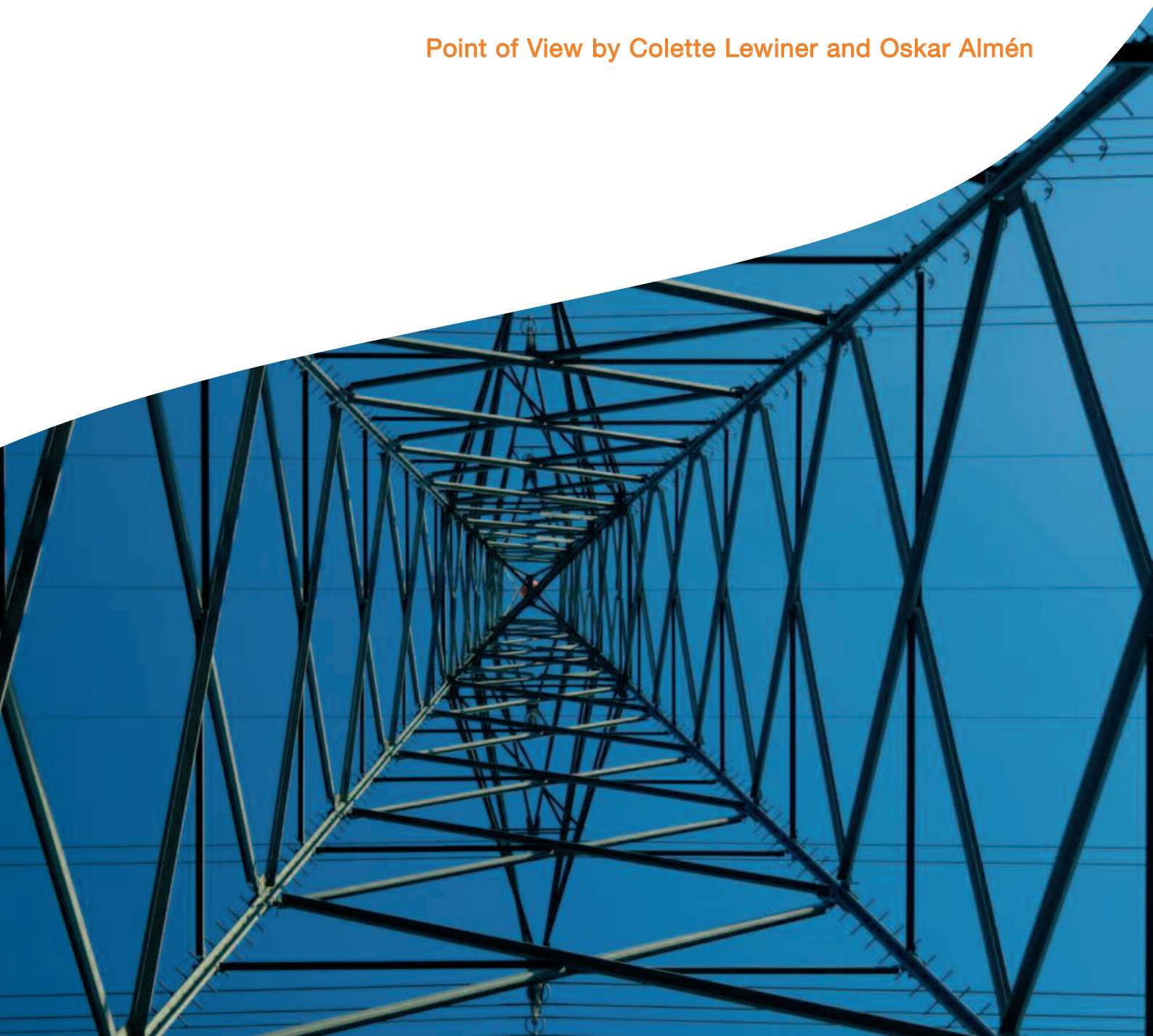
Energy Transmission Networks Unbundling: The Different Options for Europe

Point of View by Colette Lewiner and Oskar Almén



Contents

Executive summary

On July 1st 2007, the European residential electricity and gas markets were opened up for competition. This was the latest European Directive milestone for the electricity and gas market liberalization. The intention of these directives was to create dynamic and competitive electricity and gas markets resulting in lower prices for the end consumers.

However, several factors including lack of investments in infrastructure, the oil and gas price surge together with the volatility in CO_2 Emission certificates, have led to increased prices.

The European Commission (EC), including the Directorates General for Transport and Energy and Competition, concluded that the present rules and liberalisation measures have led to efficiency improvements in energy supply and delivered savings to customers, but that major barriers to free competition still remain.

The current EC directive enforces legal unbundling[1] between the transmission networks (electrical grids and gas pipelines) and the unregulated activities (generation, wholesale market operations, trading and retail). It is generally acknowledged that legal unbundling has improved Third Party Access, but according to the EC, the conflicts of interest within vertically integrated utilities explain the lack of investment in the needed cross border interconnections.

However, this analysis is not endorsed by all EU member states. A group of seven countries led by Denmark, and supported by Portugal, sent a letter emphasising this view to the EC, an opposing group of eight other countries led by France openly refuted, and disagreed with this analysis.

Progression towards a fully competitive European energy market will be helped by the introduction of a new legislative framework (draft proposal) by the EC on September 19th 2007. It is anticipated that this framework will focus on the measures that are required to ensure that all generators have fair and unfettered access to the transmission networks.

In addition, it is expected that the new legislative framework will encompass additional requirements for the unbundling of transmission and generation across Europe.

The Commission is considering two main options: an Independent Transmission System Operator (ITSO) and a full Independent System Operator (ISO). These options, including different ISO models, have been adopted in various countries worldwide, with regional variations.

Capgemini, working with clients in many of these countries has gained considerable in-depth knowledge and experience on the deployment of these market models, their introduction and day-to-day operation.

In this point of view we describe the different market models and their features. We provide also recommendations to enable the commission and the operators to assess how they can successfully achieve their complex and conflicting objectives. The appendix contains our view on the current status of the North American utilities market and the market models that have been adopted and implemented there. Further international case studies, based on our experiences, are available upon request.

In the **ITSO model,** the Network System Operator owns the transmission assets and operates the network, which is independently owned. This model has been adopted for both electricity and gas markets in Denmark, the Netherlands, Portugal, UK, Spain and Sweden, and for electricity or gas in Hungary and Italy.

The **ISO model** requires that the transmission and generation assets within a vertically integrated utility company are physically and legally separated. In this market model, the ISO is solely responsible for operation

1: Legal unbundling means that the entities have to be separated in order to avoid any cross subsidies between regulated activities and unregulated activities. The regulated entities have also to ensure a non-discriminatory treatment of all market players and their tariffs are reviewed and approved by the regulator. However, regulated and unregulated units can belong to the same company. Usually, the regulated activities have been established as subsidiaries of the vertically integrated utilities.

and dispatch, of all load to meet demand across the entire system. The ISO is also responsible for 'settling' the market and is the single interface for generators within the system.

Many ISO models exist worldwide (Scotland, USA, Canada, South America, Australia); these models have variances associated with market rules, governance, the regulator's role and the scope of tasks performed by the ISO.

The shallowest model is the **"outsourced ISO"** model. In this model, the ISO has a range of responsibilities but undertakes little or no work itself.

In the **"deepest"** versions of the ISO model, the ISO assumes responsibility for all of the functions of the system operator, and these are removed from the vertically integrated utility, leaving the utility with the asset ownership.

Based on our experience we believe that at this stage in the unbundling process a number of fundamental questions need to be asked.

Is ownership unbundling the only measure to enable liberalized transparent and fluid electricity and gas markets in Europe?

It is our point of view that a very strong regulatory environment could produce the same results. However, the National Energy regulators across Europe do not have the influence, status or the mandate with their respective political authorities, who in many cases are influenced by the powerful incumbent utilities or short term political issues, to implement or manage this type of regulatory environment.

Increasing the regulators' power and introducing a much greater coordination at the EU level would certainly help to achieve the objective; however, it is doubtful that the EC will find these measures sufficiently appealing or persuasive for it to drop its ownership unbundling initiative.

Is ownership unbundling enough to meet the above objectives?

It is our point of view that unbundling alone will not achieve the desired result. Other measures also need to be implemented, including:

- Reduction of the network operators' risks in the construction of new infrastructure, notably through the simplification of administrative procedures.
- Providing financial incentives to enable investment in cross border interconnections (transmission lines) to improve the transmission interconnectivity and enable effective cost recovery and return on investment (ROI).
- Extension of new transmission management schemes, which are currently providing tangible benefits where they have been implemented, e.g. the explicit auction scheme implemented in 2006 on the French interconnections.
- Reduction in time and overhead costs to build new transmission capacity (e.g. one authority to oversee the complete approval of cross border transmission, rather than several national processes and authorities).

If ownership unbundling is adopted: what model(s) should be chosen?

Looking at our in-depth worldwide knowledge there are only two operational models that are sustainable: ITSO or ISO. However, there are no Commercial-Off-The-Shelf (COTS) technologies available today to support these market models. Each market model is based on commercially available technology that is configured to the specific market rules and restrictions. To deploy these models requires that there is a development/configuration and transition period included within the project.

Should the gas and electricity markets be treated differently?

Gas markets' deregulation has been successfully implemented in North America. However, US and Canadian gas supplies are mainly domestic with some gas and LNG imports, while Europe is highly dependent on foreign supplies (notably from Gazprom that has rejected the unbundling scheme).

The security of supply situation is therefore very different on either side of the Atlantic. Any regulations adopted for gas transportation network unbundling must address the issues associated with security of supply across Europe.

What would be the consequences of different models on the utilities' management?

Potential Concerns:

- There are potentially additional costs associated with the formation of a new company, i.e. information systems and loss of synergies across the business that would incur development, software and operational costs. In our view, these costs are potentially higher in an ISO model than in the ITSO model, due to the increased complexity

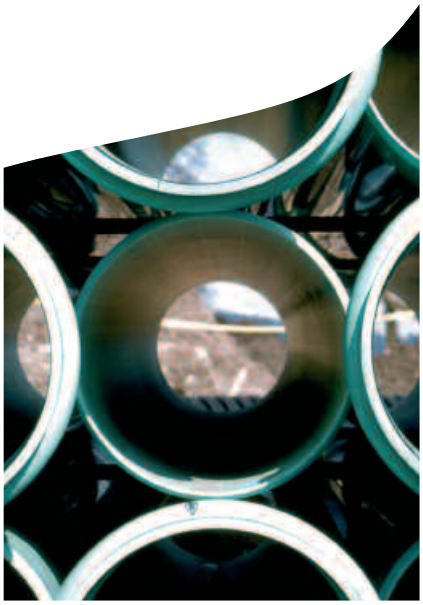
associated with the development and the deployment of an ISO business model.

- Europe has significant social and cultural issues that need to be addressed. These human resource issues have to be accommodated, including dialogues with the various unions and other key stakeholders.
- Clearly, there are fiscal implications in terms of deployment of market participant systems that will be incurred by the individual utility organisations.
- The transition period and the launch of the deregulated market model require careful management, organisation, testing and configuration if the change is to be successfully deployed.
- Any rules will need to be fully simulated and gamed to make sure that the conditions that existed in California in the late 1990's do not occur in the European market.

Potential benefits:

- Have a more focused perspective, particularly related to the implementation of improved grid management systems, providing enhanced technical capabilities that would enable the evolution and deployment of "smart grid" technologies.
- Enable the exchange of information in greater detail with peers at the same time to avoid potential conflicts of interest. This has the ability to enable strengthening and cooperation with other comparable European TSOs.
- Support a wider market model that would allow TSOs to enter into European or international alliances or acquire other TSOs, as per the British National Grid example.
- Make the transportation of the commodities the main focus of the business, with the goal to maximise the utilisation and construction of these assets.

Our research shows that there is a need to boost the creation of fluid and harmonised electricity and gas markets in Europe. There is no noticeable improvement of interconnections and removals of bottlenecks. Furthermore, the wholesale prices are converging very slowly even if power exchanges continue to grow and initiatives as Belpex have proven to be positive and will be extended. Whatever the reactions to the EC decisions will be, one has to recognise that these decisions are answering to a real issue.



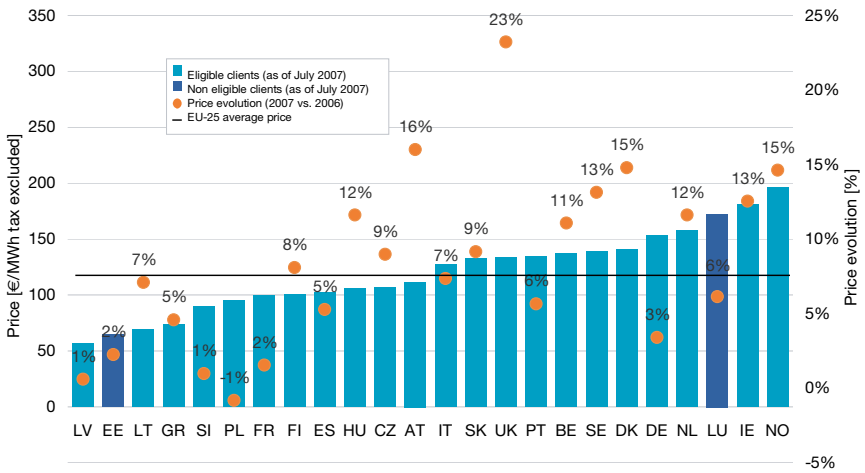
European energy markets liberalization: what is next?

July 1st 2007was a defining moment in the European energy markets; it heralded the deregulation of residential electricity and gas markets across Europe, and the introduction of open market competition. This was the latest European Directive milestone for the electricity and gas market liberalization. The intent of these directives was to create dynamic and competitive electricity and gas markets across Europe, with the expectation of lower prices for the end consumers.

Multiple conflicting factors including lack of investments in infrastructure conspired to create a tight supply situation, oil and gas price increases on a worldwide scale and volatility in the CO_2 emission certificate prices, which resulted in increased prices instead of reduced prices (see Figure 1).

The European Commission (EC), including the Directorates General for Transport, Energy and Competition, concluded that the current market rules and associated liberalisation measures have created an environment that has provided efficiency improvements in energy supply that have resulted in delivering savings to consumers, however, barriers to free competition still remain and are still prevalent.

Figure 1: Electricity prices evolution (residential clients)



Source: Eurelectric

An example of this is that 20 out of the 27 member states have yet to fully adopt the first two European Directives, and that there are major differences in the implementation of the current unbundling provisions across the various member states.

During 2006, the EC (both the Energy Commissioner and the Competition Commissioner) launched significant inquiries into the operations of some large gas utilities, which resulted in corporate raids and the confiscation of records and documents.

The EC published in 2007 their main findings, which identified multiple serious shortcomings in both the electricity and gas markets, including:

- High market concentration in most national markets,
- A lack of liquidity, preventing successful new entry into the markets,
- Too little integration between member states' markets,
- An absence of transparency of market information, leading to consumer distrust in the pricing mechanisms.

The conclusion they reached is that a conflict of interest between network and supply/retail units in vertically integrated utilities has the potential to create negative influences on market operations and investment incentives.

In order to progress towards the completion of a truly competitive internal energy market, the EC is expected to announce on September 19th 2007 a revised legislative draft framework to address the specific issues that they identified.

One European Commission proposal will be on unbundling

One of the issues that has received considerable attention by the EC in its reviews of the Electricity Directive is: what measures are required to ensure that all generators have fair access to the transmission networks across Europe?

Today, different models for transportation and distribution network management exist across Europe:

- **Administrative unbundling:** different entities for network management and control and for sales/production, with shared operational activities within one company.
- **Management unbundling:** in addition to the administrative unbundling, the staff is assigned to different business divisions/units that function independent from each other, but are still managed from a central holding company.
- **Legal unbundling:** network operations are organised in a separate legal entity, which may operate within the umbrella of a holding company together with generation and sales activities.
- **Ownership unbundling:** the network is operated under separate ownership from generation and sales; in this case there is no overall holding company and no shared operational activities.

3: Legal unbundling means that the entities have to be separated in order to avoid any cross subsidies between regulated activities and unregulated activities. The regulated entities have also to ensure a non-discriminatory treatment of all market players and their tariffs are reviewed and approved by the regulator. However, regulated and unregulated units can belong to the same company. Usually, the regulated activities have been established as subsidiaries of the vertically integrated utilities.

The present directive enforces legal unbundling[2] between the transmission networks (electrical grids and gas pipelines) and production/generation operations. The transmission networks are effectively regulated monopolies, while generation, wholesale market operations, trading and retail are unregulated activities. It is generally acknowledged within Europe, that legal unbundling has improved Third Party Access conditions and has brought more price transparency notably through regulated network tariffs.

The EC position is that it is insufficient to only create integrated European electricity and gas markets as was revealed by country reviews and sector inquiries. The lack of investment in transmission grid interconnections has resulted in significant transmission congestion at a number of national borders (see Figure 3); this is also a significant obstacle to the development of an integrated market.

Figure 2: Europe–Transmission networks ownership unbundling status

Member State	Gas	Electricity
Austria	N	N
Belgium	N	N
Czech Republic	N	N
Denmark	Y	Y
Finland	N	Y
France	N	N
Germany	N	N
Hungary	Y	N
Ireland	N	N
Italy	N	Y
Netherlands	Y	Y
Poland	Y	N
Portugal	Y	Y
Romania	Y	Y
Slovakia	N	Y
Slovenia	N	Y
Spain	Y	Y
Sweden	Y	Y
UK	Y	Y

However, this position is not endorsed by all EU member states. While a group of seven countries led by Denmark (Belgium, Finland, the Netherlands, Romania, Spain, Sweden and the UK) supported also by Portugal, have sent on July 22nd a supporting letter to the EC, a group of eight other countries led by France (Austria, Bulgaria, Cyprus, Germany, Greece, Luxembourg, Latvia and Slovakia) have clearly opposed this analysis .

While the first group of countries led by Denmark have, in general, successfully implemented ownership unbundling (see Figure 2), the second group led by France fears that this new regulation could threaten their incumbent utilities. This is especially the case in France and Germany: in France the state-owned company, Gaz de France, generates approximately two third of its income from its pipeline business and in Germany the transmission grid units are closely embedded within the four major utilities.

According to the EC, legal unbundling has not provided a vehicle to allow the entry of new players (e.g. foreign companies) into the market, and it has not created an environment conducive to investment in the needed transmission grid interconnections to remove or alleviate the congestion issues.

This is obviously only one lack of investment root cause. Among other causes let us mention complex administrative procedures, permitting,

3: Letter to the EC July 31st 2007.

lack of bilateral coordination between involved countries, cross border regulatory differences, environmental movements and unclear Return on Investment (ROI) for the operators. It is also not clear why the regulatory system could not deal with such problems. If new entrants are being discriminated against, any good regulator should be able to intervene to prevent the discrimination. Similarly, if the network company of an integrated group is not investing sufficiently in the network or not in the right places, the regulator should have the powers to force them to carry out the investment – or they risk losing their right to own and operate the network.

Also legal and ownership unbundling will inevitably have initial costs and may well have ongoing costs. The initial costs will be the cost of setting up a new company and include:

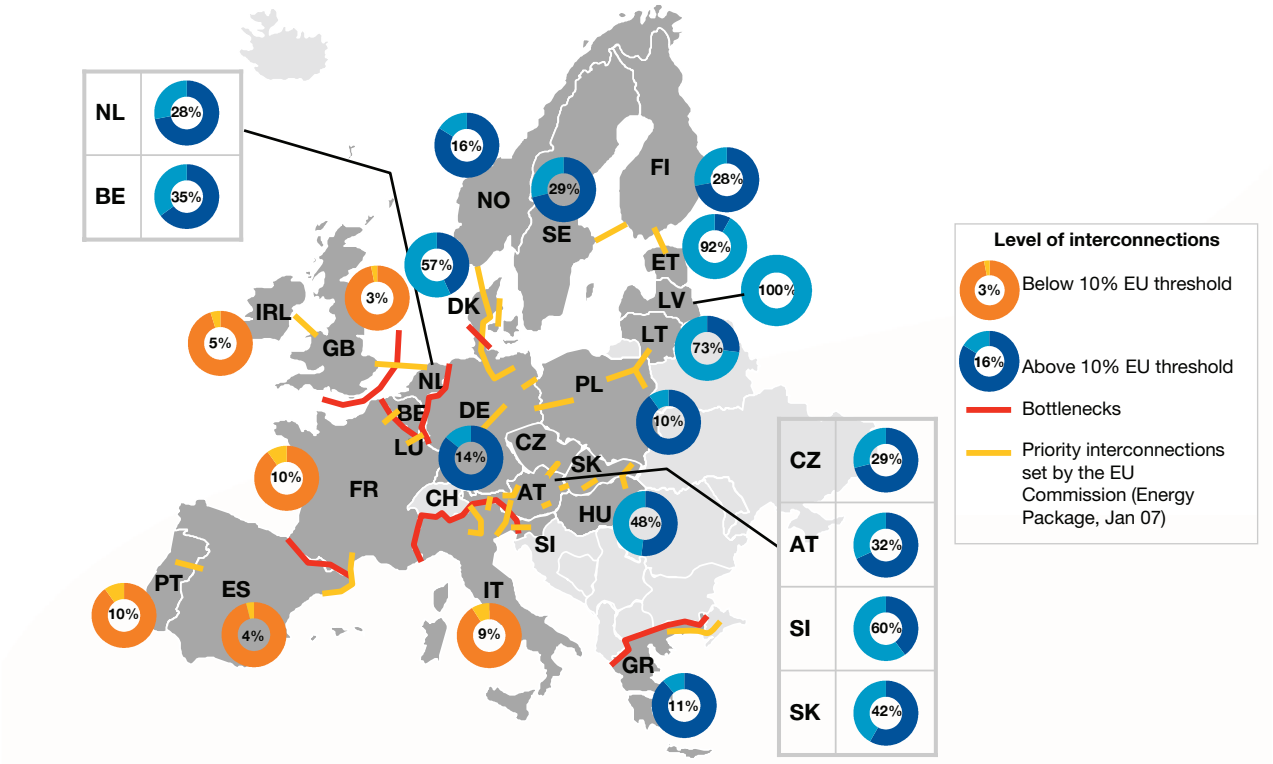
- The recruitment of a new management team and staff,
- Setting up of headquarters,
- Creation of new operating systems,
- Creation of the market mechanisms,
- Branding,
- Capitalization and debt financing.

And in the ISO model:

- New rules for construction of assets,
- New interconnect standards for new generators,
- Replacement costs at the Transmission Operator for systems, staff and facilities that are transferred to the new companies,
- New systems to share outage and other operational information between the distribution companies and the ISO to provide for security of supply where these were previously shared with a generation or retail business,
- There may be ongoing costs from loss of scale economies.

These potential increased costs must be offset by tangible and sustainable benefits.

Figure 3: Congestion electricity zones in Europe



Source: ETSO, UCTE, European Commission

Differences between transmission and distribution networks' unbundling

With the objective of creating competitive pan-European electricity and gas markets, the EC is only addressing transmission or transportation network unbundling (high voltage lines or primary gas pipelines).

Unbundling of distribution networks is far more complex because of the territorial ramification of these networks, the large number of distribution companies, the local communities' involvement and the number of employees involved. As an illustration, there are four German TSOs (E.ON Netz GmbH, RWE Transportnetz Strom GmbH, Vattenfall Europe Transmission AG and EnBW Transportnetze AG) whereas there are around 900 distribution network operators in Germany! There are other specific complexities as in France where electricity and gas networks are managed in common by two competing utilities: EDF and Gaz de France.

However, the pan European situation is even more complex, Figure 4 highlights the different models that have already been adopted, and clearly identifies legal unbundling and unbundling of accounts as being the most prevalent within the EU to date.

According to the EC, legal unbundling implementation has already triggered progress by:

- Allowing the regulator to overview and approve the tariffs,
- Creating increased transparency in the price information to customers with a clear separation of distribution tariffs and retail energy prices,
- Allowing benchmarking of costs and different distribution models (more or less outsourced), recognizing that benchmarking enables improvement (see Figure 5),
- Pushing the newly formed distribution units to articulate a roadmap for new technologies (as smart metering) implementation that result in better grid management and lower CAPEX and OPEX costs.

The Netherlands is currently the only EU country in the process of implementing ownership unbundling, separation of the metering companies, from the rest of the organisation. The current legislation requires this separation by January 2009. This is however subject to debate with companies such as Delta Utility, who are contemplating court actions against the state to remove this policy.

The retail companies having lost their recurring distribution revenues need to reshape their customer relationship, billing processes and information systems in order to lower their "cost to serve" and enable them to compete with leaner new entrants.

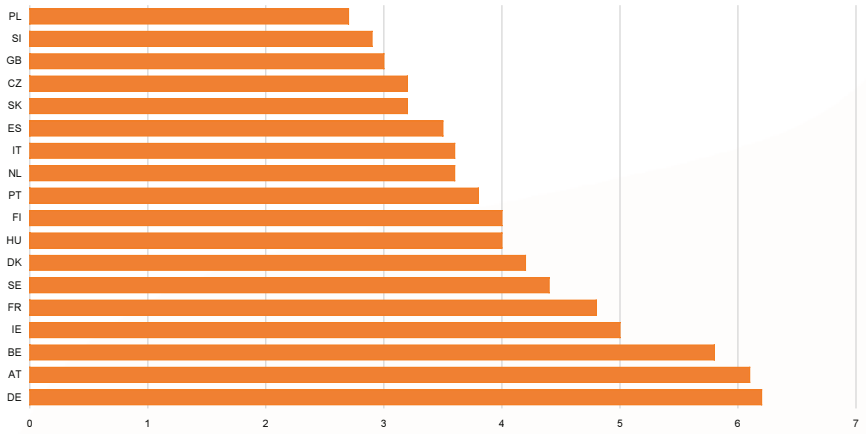
But after all, decreasing the end customers' prices is the final EU objective!

Figure 4: Europe: Distribution networks unbundling status

Basic unbundling model	Number of EU member states
Accounts	9
Management	4
Legal	10
Ownership	0
None	2

Source: Network Industries newsletter, March 2006.

Figure 5: Electricity distribution network charges for residential customers (€/100 kWh tax excluded) Jan 2006



Source: Eurelectric

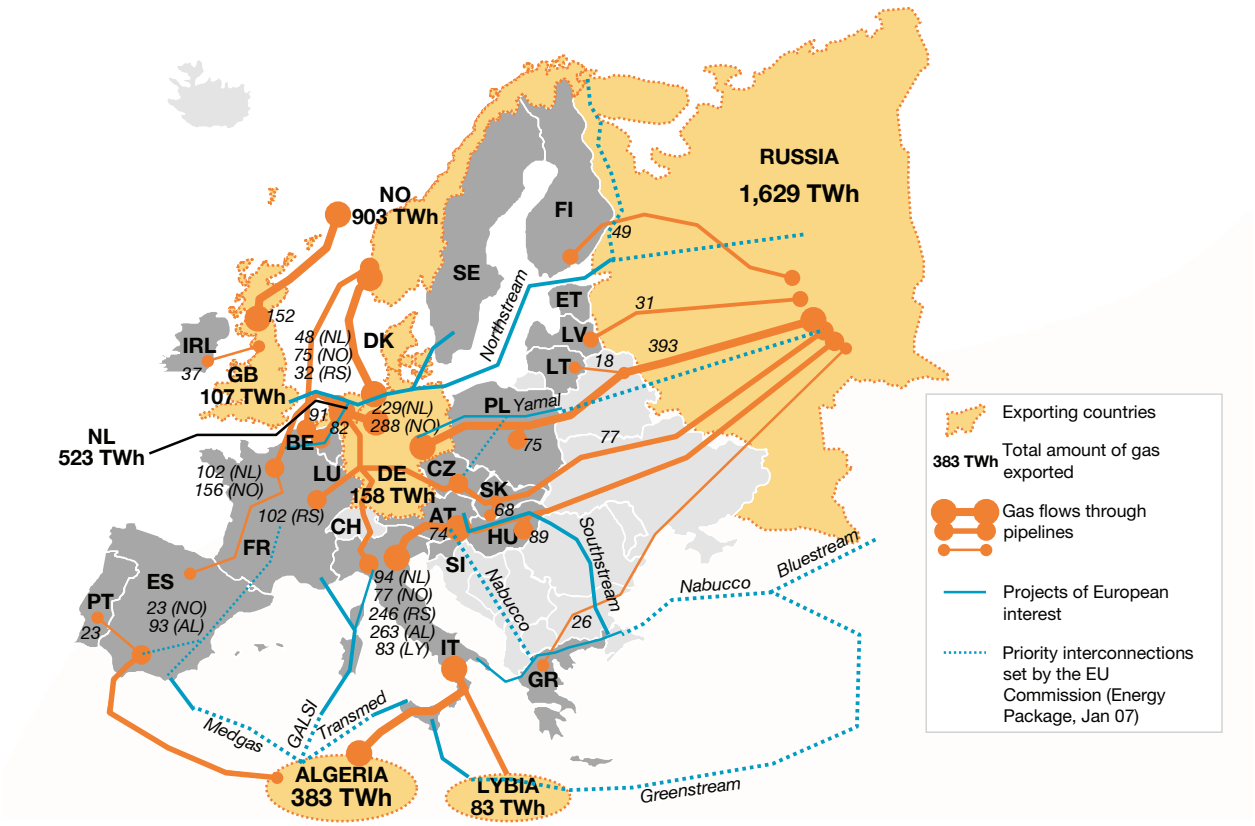
Differences between gas and electricity transmission networks' unbundling

There are significant differences between these two energies' supply conditions that trigger different approaches regarding unbundling questions. The main differences are:

- Gas is produced in upstream fields often located outside the EU so that transportation pipelines have to be build from the gas fields to the consuming countries. This is different from electricity that is generated within the EU and, provided that the fuel (fossil or nuclear) is available, can be generated near the customer locations. In other words, the gas customer is dependent on international transportation pipeline availability whereas the electricity customer relies on a more local grid.
- The development of gas fields represents investments of tens of billion of Euros (around 40 billion Euros for the development of the vast Russian Sakhalin 2 field) which in turn means that the owners and operators want to secure their ROI with long-term supply and transportation contracts.
- This ROI analysis is also true for LNG where huge investments along the value chain are needed:
  - Liquefaction plants - built in producing countries - are big and complex industrial facilities (construction of a liquefaction plant that annually produces 8.2 million tons of LNG could cost $1.5 billion to $2.0 billion)[4],
  - LNG terminals- built in consuming countries- need also significant capital investment (from $100 million to $2 billion),
  - Investment in ships to transport LNG is also important as it represents between 20% and 30% of the total LNG value chain investments.
- Europe is heavily dependent on foreign gas suppliers notably from Gazprom (Russia) which today supplies about 50% of its needs, this

4: According to the Gas Technology Institute (http://www.gastechnology.org).

Figure 6: Origin of imported natural gas and transportation network to Europe



Source: EU Commission, BP statistical review of world energy 2007

is projected to increase to about 80% by 2030, making Europe heavily dependent on Russia for its energy supplies (see Figure 6).

Within an environment where Europe is becoming increasingly dependent on Russia for the majority of its gas supplies, Russia refuses to ratify the Energy Charter treaty, which would commit it to open Gazprom's pipelines to other providers (typically ex-CIS countries). During the last two years, Gazprom has increased its grip on gas transmission networks from neighbouring countries such as Ukraine, Belarus and others.

Russia is moving towards an environment of super-bundling, and the creation of a major monopoly in the area of gas supply and delivery, that raises a number of concerns related to security of supply across Europe, including:

- Gas companies might not be able to match long-term gas supplies with long-term transportation contracts. This could, at first glance, endanger the security of gas supply.
- Operational evidence from the gas sector is harder to come by than in the electricity markets as only a few countries have implemented an ITSO environment, and there are no ISO experiences in the gas market. Within Europe, only the UK has significant experience with ownership unbundling. At the end of 2005, in addition to the UK, only Denmark (from 2004), Spain (from 2003), Sweden (from 2004 for one of two companies), and the Netherlands (from 2005) had ownership unbundling of gas transmission based on the ITSO model.
- Ownership unbundling has the potential to disadvantage some gas companies that have only a small percentage of their own upstream gas and generate the majority of their profits from their pipeline businesses.

These questions are also relevant for gas storage facility ownership unbundling, together with LNG terminal access and management. This was demonstrated during the Suez/Gaz de France merger negotiations. The EC requested that the Suez Group (the incumbent vertically integrated utility) separate the Belgian gas transportation pipelines and the Zeebruge LNG terminal ownership and management, in order to guarantee that TPA would be really implemented. Suez was no longer allowed to retain a majority stake in the terminal's management.

The above demonstrates the differences that are apparent in the approach to unbundling electricity and gas operations/markets, and clearly indicates that these two industry verticals should have different legislations to manage and control the operation of the industry and market. The European Parliament acknowledged this on July 10th 2007.

The ownership unbundling models' features

The Commission is considering two main options: the Independent Transmission System Operator and a full Independent System Operator.

However, there is no Commercial-Off-The-Shelf (COTS) model application that can be readily adopted in Europe. Each country has a different environment, infrastructure, history, incumbent utilities, energy independence, social laws and political landscape. The adaptation of an operational model that meets country specific requirements is a pre-requisite for success.

Below are the functions and features of the different operational models.

Independent Transmission System Operator (ITSO)

An ITSO owns both the transmission assets and operates the network. It would be independently owned, and the supply/generation companies could no longer hold a significant stake in the TSOs.

This would provide a number of advantages:

- Non discriminatory TPA to networks would be guaranteed and perceived as such, thereby encouraging new entry in generation and gas import infrastructure,
- TSOs could more easily exchange potentially market sensitive information increasing effectiveness,
- It would allow clear incentives to be provided to increase internal EU infrastructure capacity since investment decisions would no longer be distorted by supply interests,
- It would facilitate cross border mergers of transmission companies, which would allow for more effective management of cross border issues and accelerate the European Energy markets.

The lesser regulatory burden of the ITSO when compared to other alternatives suggests that it could be implemented faster and with fewer constraints than other alternatives.

However, there are a number of issues associated with changes that have to be addressed:

- Employee reactions that could fear moving from a large incumbent utility to a smaller organisation,
- Threat to security of gas supply (as discussed earlier),
- Significantly weakened existing gas companies (as discussed earlier),
- Additional cost, notably linked to new organisation set up and branding, new information system implementation and loss of synergies,
- Cross training of linemen and other field workers to allow for recovery from major disasters when more workers are needed – this additional workforce was more easily provided within a vertically integrated company.

A full Independent System Operator (ISO)

This alternative requires the separation of system operation from ownership of the assets. Supply/generation companies would no longer hold a significant stake in the ISO. However, the transmission assets themselves would remain within a vertically integrated group. The system operator would be solely responsible for operation and dispatch, being the primary interface with network users.

In the design of existing ISO models, the ISO may retain additional tasks linked to network maintenance, investment and development. These ISO models require detailed regulation and permanent regulatory monitoring. Clear incentives need to be provided to avoid under-investment by vertically integrated transmission owners to ensure the continued viability of the transmission grid.

Several questions associated with the deployment of an ISO model need to be addressed in the design, development and deployment of the model, including:

- Who is responsible for investments and network long term planning?

Figure 7: Implemented ISO Models

North America	South America	Europe	Australia
USA (7 ISO) · CAISO · ERCOT · ISO NE · MISO · NYISO · PJM · SPP **Canada (2 ISO)** · AESO · IESO	**Argentina** · CAMMESA **Brazil** · ONS	**Scotland** · NG **Ireland** · EirGrid **Bosnia & Herzegovina** · ISO B&H **Switzerland** · Swissgrid	· NEMMCO

- Who is responsible for the maintenance execution?
- How would the ISO have permanent access to the exact network physical status and topology?
- How to avoid leakage of confidential information to incumbent companies?

Some of the ISO models provide adequate answers to part of these challenges.

Already several countries in Europe and in other parts of the world have introduced various models of ISOs, with the most extensive experience coming from North America where nine ISOs exist (see Figure 7).

The central ISO modelling questions are how to define the tasks (scope of activities), and how to manage and regulate the relationship between the transmission asset owner and the ISO (form of organisational governance structure).

Detailed description of the ISO model varieties

Governance structure

The chosen model is affected by the legal form, the regulatory relationship, the contractual relationship, and the task it is asked to perform.

Legal form
There are a number of potential options for the legal form of an ISO model as described in Figure 8.

Regulatory relationship
The regulatory and commercial relationships between the ISO and the Transmission Owner (TO) can vary. This is exemplified in Figure 9. The relationship hence goes from being the minimum involvement (shallow) to the maximum involvement (deep).

Contractual relationship
The contract between the ISO and the TO is a bilateral contract between parties, but its content is clearly of importance to the wider energy market. Several challenges exist regarding transparency of commercial agreements, regulation including a potential role of a regulator, and incentives for future investments.

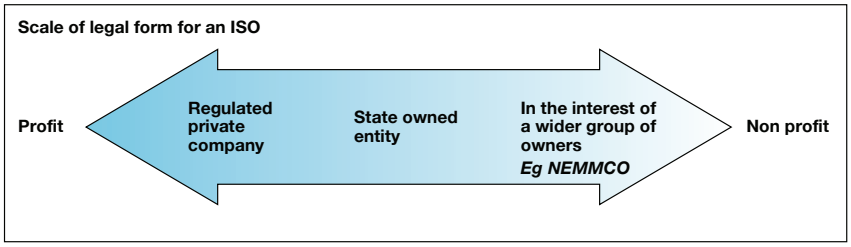
Tasks
The task list varies considerably depending on the scope or depth of relationship between the parties of the model (ISO and TO). The distinctions follow the technical logic from long-term to short-term decisions and responsibilities of duties and tasks.

Below follows a brief description of the models, going from shallow to deep, using the vocabulary of the European Regulation Group for Electricity and Gas (ERGEG)[5].

The shallowest model is the **"outsourced ISO"** model. In this, the ISO could have a range of

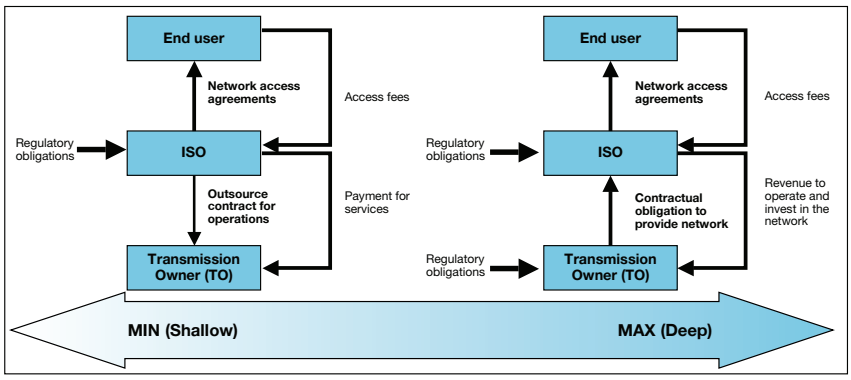
5: Source: ERGEG (European Regulation Group for Electricity and Gas).

Figure 8: Legal Form for an ISO



Source: Frontier Economics / ERGEG

Figure 9: ISO Models



Source: Frontier Economics / ERGEG

responsibilities but undertakes little or no work itself. Rather, it contracts back for the provision of these services to the TO.

Still with a limited scope of activities, the **"balancing ISO"** takes on work directly, albeit linked to real time dispatch of the network. This includes undertaking flow simulations or load flow studies, procuring balancing energy and ancillary services, managing congestion, and it would direct real time energy flows through the system. It would also manage agreements with shippers and market participants, and would collect revenue at least to fund its own activities.

The **"deepest"** version of the ISO model entails all of the functions of the system operator being removed from the bundled company, leaving the bundled company only with the ownership of the assets. In this model, the ISO will undertake live network operation, arrange for network access, undertake network planning and make investment decisions, arrange for network connections, undertake emergency planning and levy for use of the network, maintain direct relations with the transmission customers and manage information flows to the outside world.

Under the deepest ISO model, the TO's role is effectively reduced to activities directly related to the tasks of maintaining the physical assets (asset health analysis, work scheduling within a defined overall plan, and physical asset control and constructing new assets), procurement and contractor management, and testing/commissioning.

The "deep ISO" model is close to the approach used in a number of electricity systems where ISO / TO arrangements have been put in place –notably in some US markets (e.g. PJM).

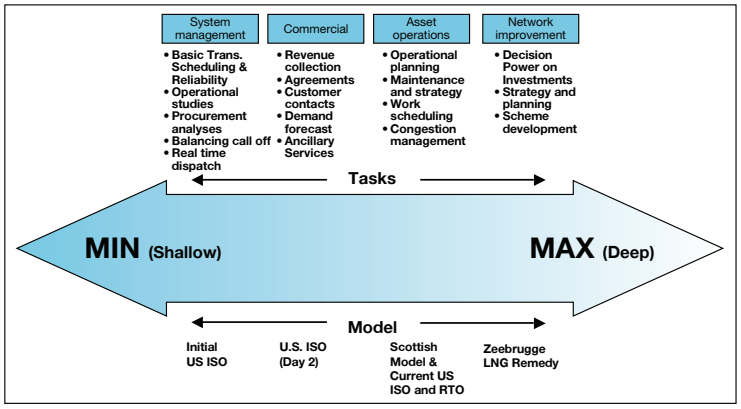
Rationale for a deep ISO model

With the sole objective of minimizing discrimination, the ERGEG argues that the optimal ISO model will be the deepest one, i.e. the outcomes will be as close as possible to those of ownership unbundling.

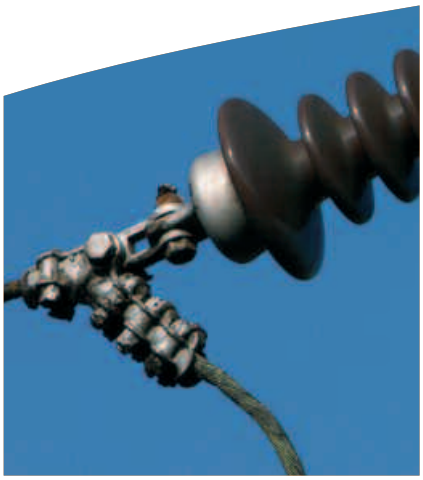
The deep ISO model minimises the risk of discrepancies between network operation, maintenance and investment, as all three are performed by the same legal entity. A separation of these could result in network congestion, inefficient maintenance costly for network users, or in a default of maintenance, increasing the risk of a supply interruption or accident. An obligation to establish an ISO is less intrusive than an ITSO as incumbent companies are not forced to sell their assets and could, in some models, more easily manage their human research concerns.

However, the ISO model involves unbundling of the network business itself, i.e. ownership from operation of the grid. It therefore introduces a new interface in the value chain, which is critical and has to be properly regulated and managed to avoid network incidents that would deteriorate the security of supply.

Figure 10: ISO Task List



Source: based on Frontier Economics/ERGEG and The Brattle Group



Conclusions

Is ownership unbundling the only measure to enable liberalized transparent and fluid electricity and gas markets in Europe?

In theory, a strong regulatory environment could produce the same result. However, as mentioned by the EC in its January communication[6], the National Energy regulators are not in a strong enough position to influence their countries' political authorities, who are often clearly influenced by powerful incumbent utilities and/or short term political issues. There is also a need for a stronger coordination of national regulators at EU level, specifically regarding decisions affecting the evolution towards a European Energy market (e.g. cross border generation and supply). To help solve these questions the EC intends to propose the creation of a formal European Network of Independent Regulators (ERGEG+).

These measures would certainly help to achieve the above objectives. However, it is not believed that the EC will find these activities sufficient to abandon its "ownership unbundling" initiatives.

Is ownership unbundling enough to meet the above objectives?

It is clear that additional measures also need to be implemented, including:

- Minimize the network operators' new infrastructure construction risks notably through the simplification of administrative procedures. The NIMBY syndrome applies strongly in those situations. A suggestion would be to adopt a similar measure to the one related to the "priority Transmission corridors", existing in the 2005 US Energy Policy Act.[7]
- Stronger coordination between TSOs and acceleration of the priority interconnections construction. The EC has now appointed coordinators to pursue the four most important priority interconnections.[8] Hopefully these measures will decrease electricity congestion (see figure 3) and improve security of gas supply.
- Provision of financial incentives to enable cross border investments to achieve a satisfactory ROI.
- New energy management schemes, similar to the explicit auction schemes implemented across the French border interconnections that have provided tangible benefits, should be extended.
- The creation of balancing wholesale market zones, such as the Belpex zone that is going to be extended to Germany and then to Nordpool countries, is a major contributing factor to enable the alignment of electricity wholesale prices across Europe.

If ownership unbundling is adopted: what model(s) should be chosen?

Looking at our in-depth worldwide knowledge of the different existing models of operations, there are only two sustainable models: ITSO or deep ISO. However as mentioned above there are no Commercial-Off-The-Shelf (COTS) applications available to address the business, legal and technical requirements, and each model has to be adapted to the local requirements. This also requires that a suitable transition period has to be included in the overall transition and implementation plan.

Should the gas and electricity markets be treated differently in Europe?

Legal unbundling with a strong focus on TPA has been successfully implemented in the US and Canadian gas markets. In North America the pipelines are owned by a very small number of companies and they own the pipeline from the gas field to the end customer – without regard to borders (e.g. Canada through the US to Mexico and even to the Caribbean Islands). This single ownership is part of what makes it work. This model is closely related to the North American gas situation where domestic supplies are largely dominant, the balance being mostly LNG. At the opposite end, Europe is highly dependent on foreign supplies (notably from Gazprom that has rejected the unbundling scheme) and international networks are usually majority-owned by the foreign suppliers (e.g. Gazprom).

6: Source: Communication from the Commission to Council and European Parliament, January 2007.
7: Source: US Energy policy act (passed in July 2005) by which the Federal Energy Regulatory Commission (FERC) is given 'backstop' authority to order the acquisition and permitting of the right-of-way for siting and development of transmission lines within these priority corridors.
8: Source: The four projects are the Power-Link between Germany, Poland and Lithuania, connection to offshore wind power in Northern Europe, electricity interconnection between Spain and France and the Nabucco gas pipeline bringing gas from the Caspian to Central Europe.

The security of supply situation is therefore very different on both sides of the Atlantic. The regulation adopted for gas transportation network unbundling should not, in any case, deteriorate the European security of supply.

What would be the consequences of different models on the utilities management?

Potential Concerns:

- Additional costs linked to the incorporation of a new company, new information systems and loss of synergies could be incurred, which would be passed onto the end customers. These costs will be higher in an ISO model (that is more complex to implement) than in the ITSO model.
- HR issues are a potential major concern in Europe, and dialogue with unions and other bargaining groups must be established.
- There is the potential for incumbent utilities to be subjected to some degree of fiscal burden; the extent of this requires analysis and assessment.
- The overall transition period has to be carefully managed to ensure the successful operation of the transmission grid.

Potential Benefits:

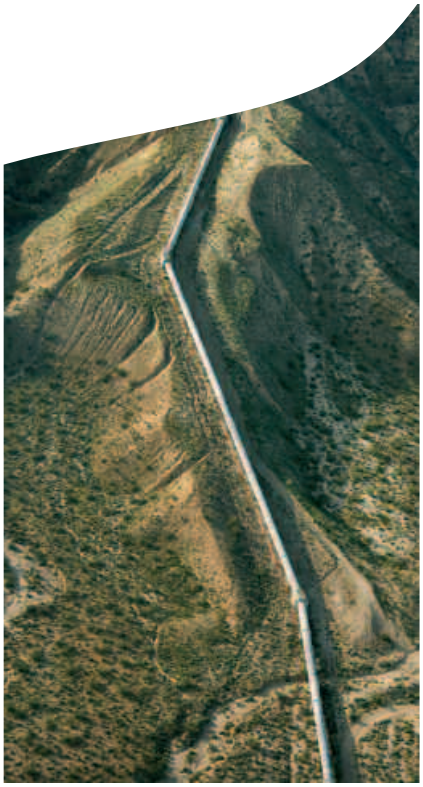
The newly created units would:

- Have more focus on improving grid management and implementing technical upgrades to enable them to evolve towards a "smart grid" operational model.
- Have the ability to exchange more information with their peers (with no potential conflict of interest).
- Strengthen their cooperation with other European TSOs.
- Be able to enter into European or International alliances or acquire other TSOs, following the British National Grid example.

Are there other prerequisites?

Finally, the success of any of these new models requires clear market rules, new interrelated systems as well as efficient and low cost data exchange mechanisms. Some deregulated regions as Australia (Nemmco) or Ontario have successfully implemented data exchanges hubs allowing for reliable, quick and inexpensive data flow which are indispensable for operating these newly regulated markets.

Our research shows that there is a need to boost the creation of fluid and harmonised electricity and gas markets in Europe. There is no noticeable improvement of interconnections and removals of bottlenecks. Furthermore, the wholesale prices are converging very slowly even if power exchanges continue to grow and initiatives as Belpex have proven to be positive and will be extended. Whatever the reactions to the EC decisions will be, one has to recognise that these decisions are answering to a real issue.



Appendix : North America market case study

Similarity and differences

Before describing the electricity and gas market unbundling situation in North America it is important to stress the differences between these two energy markets as well as similarity and differences between the European and American markets.

- While the value chain structure is similar for these two highly commoditized energies requiring high investments, there is no large-scale storage possible for electricity. Thus, the electricity grid operator is faced with a much more complex system to operate, manage and plan than is the case of the gas transmission grid operator.
- Some of the key aspects of US restructuring are similar to the situation in the EU with common objectives to promote open access, ensure non-discrimination, ensure adequate investment levels and provide fair tariffs to the customers. Additionally in Europe as in North America, there exists a need for improving interregional (or inter-country) energy flows and coordination between systems with different technical and regulatory backgrounds.
- However, there are also significant differences between North American and European gas and electricity markets in liberalization timing, regulation systems, network operator models and security of gas supply (see Figure 11).

Figure 11: Differences between North American and European Gas and Electricity Markets

	Dimension	Europe	North America
Similarity	Overarching objectives	- Promote open access, ensure non-discrimination & adequate investment levels and provide fair tariffs to the customers - Improve interregional (or inter-countries) energy flows - Security of supply	
	Value chain	- Same in both (production, transmission, distribution, supply and wholesale markets)	
	Capital intensive	- Gas becoming as capital intensive as electricity (gas fields more complex to operate; LNG plants and terminals in development)	
	Transmission system	- More complex for electricity than gas on both sides of the Atlantic	
Differences	Market liberalization timing	- Started in UK in 1986 for gas and 1990 for electricity - Deployment period from late 1990 's to 2007 - Similar paces for gas and electricity	- From 1980 to 1990 for gas - From 1990 to beyond 2000 for electricity (wholesale market is open - retail is going back slowly to regulated)
	Regulatory system	- Member States regulatory systems within the European Directives framework - National regulators coordination (ERGEG)	- State and federal regulation combination - Strong oversight by the Federal Energy Regulatory Commission (FERC) - Because of the lack of state ownership in the industry the regulatory system is strong
	Unbundling models	- European Commission examines ITSO and ISO models for both energies	- Legal unbundling for gas evolving ISO models for electricity
	Gas Supply security	- High dependence (50%) on imports mainly from Gazprom	- High level of domestic production in North America (US and Canada) - Growing importance of LNG

Source: The US Energy Industry Restructuring: Some Lessons Learned Seminar; Sponsored by: Anne Laperrouze and Alejo Vidal Quadras, Members of the European Parliament

Overview of the US energy systems

The restructurings of the US electricity and natural gas industries were long, complex processes that took place at different times, reflected different industry characteristics and resulted in different outcomes.

Gas

Through an Ownership unbundling model, market restructuring has led to an open access market combined with an open investment environment and strong regulatory oversight from the FERC (Federal Energy Regulatory Commission).

The results of the restructuring have been good, emphasised through FERC[9] *"Overall, gas infrastructure investment in North America has been an important market success story for many years […]"*. Highlights of restructuring include:

- High market liquidity,
- Responsive to price signals:
  - Expenditures on exploration/production for 2005-2006 were 40% above 2001-2002 levels,
  - Continual adjustment of storage infrastructure,
  - Significant pipeline project deal flow (over 20% and 30% throughput increases in 2007 and foreseen for 2008, respectively),
- Balance between regulatory oversight and market-oriented philosophy,
- No calls for ownership unbundling or setting up a new or overarching regulatory or management organization (e.g. ISO-type).

9: State of the Markets Report (FERC, June 2005)

Electricity

The US electricity market is an open access market with a variety of ISOs operating in several regions. Through FERC there is strong federal oversight over the wholesale markets. However, the ISO models and their situations are different according to the deregulation status of each state.

The model is based on the ISOs operating the grids of member transmission asset owners and often run region-wide markets. The physical assets are owned by a transmission owner (TO), regulated by FERC (FERC enforces federal reliability standards with sanctions for failures). With this model, the ISO manage the bid/offer process in the de-regulated market. This gives the ISO the responsibility for the integrity of the transmission grid to meet demands, although the grid is owned (and operated) by market participants. Moreover, the ISOs run congestion and contingency analysis models to determine the integrity of the grid.

Comparison of the US models with the theoretical ISO

The US ISOs successfully share some responsibilities with TOs and are hence not properly characterized as either "shallow" or "deep"[10] but rather the evolved model fits somewhere in the middle of the theoretical ISO model.

Practical lessons learned from the North American model

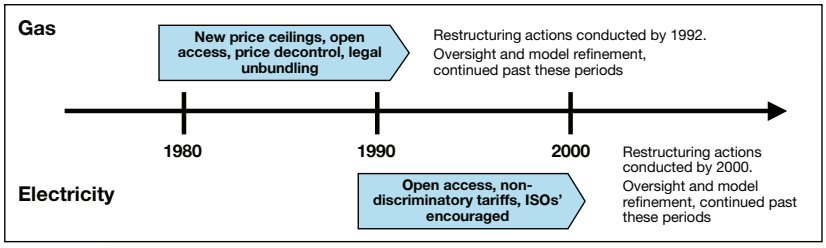
The market dynamics and the political agendas arising from deregulation drove the development of the models used in the US and Canada.

Ownership unbundling of electric transmission and/or natural gas pipeline assets was not necessary to achieve restructuring goals in the US. Market participants would have faced major hurdles regarding property rights as well as valuation issues anyway. Hence the introduction of the legal unbundling model for gas and ISO models for electricity have proven to be relatively effective as they have increased access and reduced discrimination of the participants. Further, it has increased investments in the transmission network.

In 2000, the state of California encountered a situation where the electricity demand increase combined with new market rules led to large increases in imports to satisfy energy needs. These needs could not be totally fulfilled because of transmission congestion at the California border and skyrocketing prices. This situation created numerous blackouts and brownouts that affected California for several months.

As in the case for North America, Europe faces the same challenges including the ones related to clearly defined responsibilities, processes and most importantly responsibility for investments in the network. In addition, the new market rules including congestion management will have to be defined and simulated in order to avoid a situation like the one that occurred in California. These challenges need to be addressed and resolved before Europe implements an ISO model.

Figure 12: Key events on the US gas and electricity markets



Source: The US Energy Industry Restructuring: Some Lessons Learned Seminar; Sponsored by: Anne Laperrouze and Alejo Vidal Quadras, Members of the European Parliament

Figure 13: US Gas Market

Open Access	• No bundled (commodity/transportation) sales allowed • Legal separation of interstate pipelines • "Arms-length " pricing and affiliate rules with codes of conduct
Planning, funding, management and maintenance	• No central planning; pipeline companies propose as they see fit; others can build • FERC approves new investments; pipeline companies have flexibility in development • Network management and maintenance planned and executed by Transmission Owners (TOs)
Tariffs/returns	• Cost-based pricing
Enforcement	• Very strong on affiliate conduct • Strong equal access rights for market operators and data availability • Discrimination complaints investigated by FERC

Source: The US Energy Industry Restructuring: Some Lessons Learned Seminar; Sponsored by: Anne Laperrouze and Alejo Vidal Quadras, Members of the European Parliament

10: "Shallow" and "deep" characteristics per ERGEG report, 2 February 2007

Case study – PJM Interconnection

FERC's open access mandate called for independence on the part of regional grid operators, known as ISOs, to be reasonably certain that transmission would be handled in a non-discriminatory manner by an operator that was not a market participant.

PJM Interconnection LLC is an ISO without market ties to the resources it oversees. Currently, PJM operates as a single transmission provider with a common tariff for multiple transmission systems. It serves as the regional security coordinator for the North American Electric Reliability Council (NERC).

PJM covers 13 US states with a total of 51 million residents. With 90,270 km in transmission lines, it operates the largest electricity transmission network in the world. PJM is a "club" and is owned and governed by its members (some 450 in total). The members include generators, transmission owners (TOs), suppliers and traders, distributors, and large end-users. The members determine a board of independent executives.

As the control area operator for a single coordinated system, PJM plans grid expansion within the region and has the only working generation interconnection process, with over 30,000 MW proposed for regional development, it operates an integrated power exchange for buyers and sellers of electricity. PJM is the only ISO currently operating that meets all the characteristics and functions of a Regional Transmission Operator (RTO).

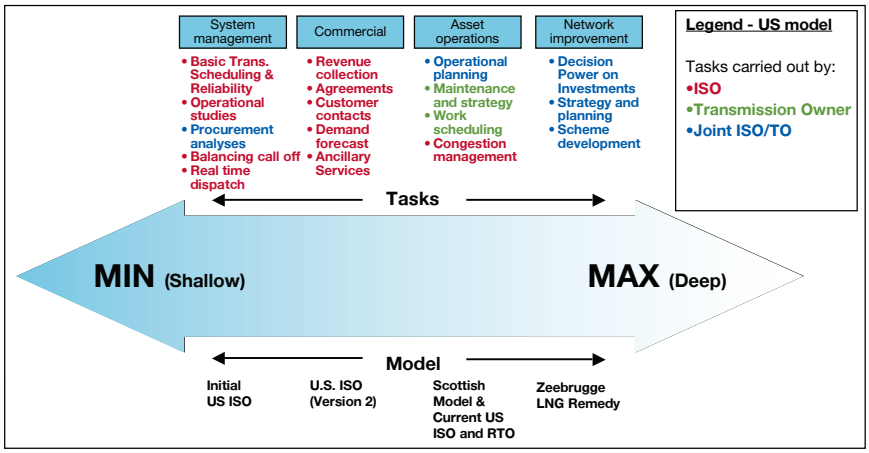
An ISO typically handles scheduling of transmission service based on requests received, manages congestion and line constraints, oversees basic security of grid operations, and ensures that the grid remains stable by scheduling such ancillary services as spinning and non-spinning reserves and coordinating maintenance. Deciding where new transmission lines should be built and of what size, however, generally falls to both transmission line owners and ISOs, since those decisions require cooperation from owners who must foot the bill and the operators who run the grid.

Governance

Stakeholders are involved indirectly and they appoint a members committee. Then in turn, the members committee elects the PJM Board. This is done on a "One member, one vote" manner with FERC being an ex-officio member.

The board members are independent from the sector and act as a supervisory board with the board president being CEO of PJM's Executive Board. This structure is utilised to create secure independence and mitigate biases during investment and long term planning.

Figure 14: Comparison of the US models with the theoretical ISO



Source: based on Frontier Economics / ERGEG and Capgemini Research

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