



## LESSONS FROM LIBERALISED ELECTRICITY MARKETS\*

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Over the past decade, several IEA member countries have embarked on a policy focusing on market liberalisation of the electricity supply industry. Pioneers in electricity market reform have now been operating with considerable success for a number of years, delivering substantial benefits to a variety of economies. Finding the most effective way to develop competitive electricity markets that fulfil the goals of real economic benefits has not been clear, however. Scepticism and concerns are voiced in many countries, and debate continues on several key issues. The sceptics point to the California crisis and market breakdown in 2001 and the subsequent, spectacular bankruptcy of Enron. The widespread blackouts in North America, Italy and Scandinavia in 2003 are also sometimes used to argue that electricity market liberalisation is a failed concept, an issue addressed in a recent IEA publication, *Learning from the Blackouts* (IEA 2005b).

While the public has focused on the remarkable failures of the past decade and the slow progress in some countries, several electricity markets have been operating successfully and have developed into robust markets during the same period. These include the UK, the Nordic, the Australian and the Pennsylvania-Jersey-Maryland (PJM) markets. In all IEA member countries, the liberalisation process has progressed at varying speeds. Despite the fact that no straightforward path to success has emerged, there is a general lesson to be learned: electricity market liberalisation is not an event. It is a long process that requires strong and sustained political commitment, extensive and detailed preparation and continuous development to allow for necessary

improvements while sustaining ongoing investment. It is, in fact, a process that has not yet been completed anywhere in the world – nor will it be in the foreseeable future.

### Electricity market liberalisation delivers long-term benefits

Traditionally, electricity sectors developed and operated within strictly regulated frameworks in which vertically integrated utilities have handled most or all activities – from generation to transport to distribution. Moreover, it is a centrally planned activity, wherein needs are assessed and fulfilled by electricity system planners and all associated costs are passed on to consumers.

But traditional, vertically integrated utilities tend to create substantial overcapacity, a fact that became more obvious when electricity demand growth slowed during the 1980s and 1990s in many IEA member countries. In addition to reducing this overcapacity, liberalisation has also been shown to provide large potential gains from improved efficiency in the operation of generation plants, networks and distribution services.

Monitoring of electricity rates paid by different customer classes is one basic way to assess the performance of liberalised electricity markets. Indeed, many countries promised falling prices prior to launching liberalisation processes. Retail prices have indeed decreased in real terms, but prices paid by consumers do not necessarily reflect the costs of producing and transporting electricity. Some consumer groups often subsidise other consumer groups. Different parts of the value chain – from the recovery of fuels to generation and transport of electricity – are also often subsidised in one way or another, or are not fully cost reflective for other reasons. Electricity rates and taxes are often related in non-transparent ways. Changes in fuel costs and environmental regulation affect final costs of supplying electricity and seem to be important drivers for recent increases in electricity tariffs in many, particularly,

\* This paper summarizes the main points and conclusions of the IEA publication "Lessons from Liberalised Electricity Markets", IEA (2005a).

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European IEA member countries but are not directly related to the effects of electricity market liberalisation. In addition, investment decisions made within a vertically integrated industry influence electricity costs for a long time, hence the effects of past investment decisions will be reflected in retail prices for several years to come. All in all, these factors make electricity retail prices paid by end-users complex to interpret.

Examining performance in various specific segments of the value chain paints a clearer picture. Existing plants are now used more efficiently. At the same time, fundamental changes in the use of transmission assets has created more dynamic and enhanced usage, often resulting from increased trade across jurisdictions. Other indicators show marked increases in labour productivity.

A recent study by the Organisation for Economic Co-operation and Development (OECD) explores the benefits of liberalising product markets and reducing barriers to international trade and investment across several regulated sectors. It singles out electricity as one of the sectors with the greatest potential for improvement. The results of the analysis assess the total annual benefits across all sectors to be 1 to 3 percent of GDP in the United States and 2 to 3.5 percent of GDP in the European Union (OECD 2005).

Perhaps more important are the dynamic effects, for example, from an improved interaction between many diverse resources including coal, natural gas, nuclear, hydro, wind power and demand resources. As liberalised markets begin to mature, it becomes more obvious that a centrally planned and vertically integrated approach is less appropriate for a more diverse system and is, in fact, likely to be a barrier to the innovation necessary to meet the needs of the future.

For the moment, it is crucial to avoid being overly short-sighted in the assessment. Liberalisation is expected to bring large economic benefits for consumers and societies in the long term and evidence so far indicates that markets can deliver these benefits. But in the short term certain groups may not realise immediate benefits or may even experience losses. Without question, one of the most crucial policy challenges facing decision makers is the management of social and equity issues in distributing the benefits of electricity market liberalisation.

### **Government has a critical but fundamentally changed role**

Regardless of the approach to liberalisation, the process requires strong government involvement. In fact, the level of on-going political commitment significantly influences the outcome. In the absence of clear signs of commitment, regulatory uncertainty may well become self-fulfilling and undermine a positive outcome. From time to time, all electricity systems will experience a crisis. Such crises have become important tests of the robustness of liberalised electricity markets and, perhaps even more importantly, of the robustness of the political framework backing the liberalisation process. At difficult junctures in market development, strong political commitment – often expressed by *not* intervening – can create the necessary market responses.

Effective markets are fuelled by competition. Thus, one of government's most decisive roles is to establish a framework that allows for the development of effective competition. The first step required to introduce competition is to break down the monopolies that exist in traditional vertically integrated utilities. It is necessary to separate network activities from all other activities, either through legal unbundling of the network entities or, more effectively, through true ownership unbundling. The key is to introduce competition in as many parts of the value chain as possible – from generation to consumption. Remaining natural monopolies (e.g. networks and system operation) should be subject to continued and improved economic regulation.

Unbundling effectively breaks up the centralised decision-making process found in vertically integrated utilities, replacing it with a decentralised process where market players make decisions within markets. This can only work smoothly when markets are “effective”, but effective markets do not develop automatically. Creating a level playing field and developing effective, competitive marketplaces requires establishing detailed market rules, design and regulation. Within the on-going liberalisation processes, the level of government involvement through detailed legislation and rule-making has varied. But it is evident that governments are critical to establishing a framework with the necessary incentives. At the same time, independent regulators are one of the critical bodies within this framework; their role in overseeing compliance with legislation and ensuring fair and efficient economic regulation

of networks is fundamental to successful market development.

Real-time system operation is an aspect of the electricity sector that is maintained as a natural monopoly and, thus, should be unbundled from other competitive segments of the value chain. Market rules, design and regulation aim to direct all actions transparently, but many subtleties remain in secure, day-to-day system operation. For example, system operators will preserve certain discretionary powers, regardless of careful efforts to regulate grid access. Their independence is particularly critical to the creation and further development of well-functioning and robust markets.

In the new decentralised industry structure, transparency is a prerequisite for developing competitive liberalised electricity markets. Competitive market players do not automatically (or voluntarily) collect and publish fundamental market data and statistics. Therefore, it is important to redefine responsibility for this necessary task in liberalised markets. Increased transparency is a proven, strong instrument to ensure continuous development towards more effective markets. In fact, transparency adds to the benefits of liberalisation in its own right, by improving the decision-making framework for all actors – policy makers, industry and consumers alike.

But a formal framework that allows for competition and creates a level playing field is not enough. Competition will flourish only if multiple players compete in the market. Governments and regulators have managed to enhance competition through various means, but a high level of market concentration remains a serious concern in several markets. Effective markets and transparency have been vital to easing access for new-comers. In addition, extending markets across countries and regions helps enable the “import of competition”; this is particularly important in smaller jurisdictions in which the need for consolidation limits the number of market players that can operate efficiently. To date, achievements are more limited in *ex post* regulation of competition. It is illegal to exercise market power, but it often remains difficult to prove such behaviour. In some cases, dealing with market power abuse is further complicated when the largest companies are regarded as national champions or provide substantial revenue streams to their public owners.

Some claim that market failures are inherent across the value chain in electricity markets requiring government intervention. But, upon closer scrutiny, many alleged failures turn out rather to be the result of regulatory failures. In the event of real market failures – as might arise from concerns about reliability of supply and the environmental impacts of electricity production – governments may be called upon to intervene in more active ways.

Unbundling the electricity sector has also called for an “unbundling” of the concept of reliability of supply into its relevant parts of the value chain. Concern has been voiced about secure supply of fuel for power generation, adequacy of investment in generation and network assets, and the security of real-time system operation. When it comes to the latter, markets so far have failed to provide a complete framework of incentives without jeopardising system security. Government intervention is necessary, and this has been carried out (rather effectively) through the establishment of truly independent system operators and a regulatory framework for system security.

The environmental effects of electricity generation are not addressed by normal incentives in competitive markets. Environmental benefits are classical public goods and their value will not be taken into account by competitive market players. Policy intervention is needed to ensure they are properly taken into account. Policies motivated by environmental and climate change concerns are already having serious impacts on liberalised electricity markets, as was intended.

Many environmental policies are, however, potentially distortive beyond the initial intent, particularly when looking across internal markets within the context of international competition. Direct financial support for particular technologies, or non-transparent barriers that block development of others, can lead to inefficiencies and distort competition. This adds uncertainty to the investment decision process and ultimately poses a threat to the system. In several liberalised electricity markets, the preferred option to address this issue is implementation of cap-and-trade policies. This approach transforms the political goal into an obligation imposed upon market players. Market players are then left to fulfil the obligations in ways they consider optimal, including trading the obligations amongst themselves.

### Price signals are the glue

In the process of unbundling utilities to introduce competition, vertical integration has been replaced with markets comprising multiple players. In this new framework, price signals direct decisions in the marketplace. Efficient decisions depend on correct signals, i.e., price signals that reflect the real costs, benefits and values of producing, transporting and consuming electricity.

Electricity has a value to the consumer only if it is supplied at the right place, at the right time, in the right volume and at an acceptable quality. The locational aspect of electricity pricing is the most controversial and complex issue in efficient pricing. Principles that establish a price for each node in a system are the ideal reference because they value electricity based on where it is generated and delivered thereby giving full transparency, and some markets come close to achieving this. However, there are important trade-offs to consider when choosing pricing principles that could justify a less fine-tuned, zone-based system, where a price is established for several nodes that are rarely congested. Even though there are important trade-offs, the main controversy often relates more to social equity and distribution rather than specific pros and cons of market functioning and system operation. Nodal pricing evolved as a necessity in highly meshed networks where transmission lines are criss-crossing the electricity system (e.g. North America); zonal pricing is accepted as a good approximation in more radial networks, where the structure of congestion is less complex (e.g. Australia). Higher transaction costs and the greater complexity of nodal pricing are often used to argue for pricing principles that are less reflective of location. In reality, evidence shows that obvious congestion points have often not been priced appropriately. The highly meshed network in continental Europe is currently developing into a zonal market, often with entire countries constituting one zone, thereby potentially blurring price signals and inhibiting efficiency.

Open trade across jurisdictions is one of the classical merits of liberalised and competitive markets. It enables exploitation of comparative advantages – at mutual economic benefit for all regions involved. Electricity generation and transport include many factors related to resource endowments, geographical characteristics and regional skills. But trade across jurisdictions relies on co-operation amongst

system operators. Therefore, independence and appropriate incentives of system operators are critical in the development of cross-border trade.

Electricity consumption and supply are inherently volatile. But the volatility is an inseparable characteristic of the service and is not related to the organisation of the sector. Liberalised electricity markets create a more transparent framework, allowing for cost-reflective pricing that depicts this volatility. In some instances, government interventions to suppress volatility and cap prices below what can be justified by economic reasons have blurred price signals and slowed market responses.

Price volatility creates risks for market players, including generators and consumers. Risks are the result of uncertainty, and there is considerable uncertainty connected with many of the fundamental factors that determine electricity generation, transport and consumption. In the previous model of a vertically integrated and regulated sector, all costs – and, therefore, all risks – could be passed on directly to consumers. Liberalised markets make risks more transparent and, more importantly, reallocate these risks to the decision makers themselves.

In liberalised electricity markets, business risks can be effectively managed through contracts. Generators, retail suppliers and consumers can agree on prices, volumes, times and other conditions that create the desired certainty within the framework of the contract. In fact, liquid and effective markets for financial contracts improve competition by enabling sophisticated risk management. This, in turn, eases market access for new and smaller market players and contributes to ensuring that market power is not exercised. Most markets provide a framework for a liquid market in the day-ahead and real-time segments through market rules and design. In some markets, relatively liquid and effective financial markets for longer-duration contracts are developing, but the evolution of these markets remains a major concern.

### Empowering the consumer

Vertically integrated utilities naturally focus on the supply side of the electricity sector, concentrating on the two pillars of electricity generation and transport. Until now, consumers paid the bill, and no infrastructure was in place to involve them in deci-

sion-making processes. Liberalised electricity markets introduce a third pillar that allows consumers to become active participants. Effective markets allow consumers to exercise their right to switch suppliers, thereby enhancing competition for better services and increased innovation. Perhaps more importantly, consumer response to prices adds real resources to the system, potentially saving expensive generation or transmission investment and improving reliability. Finally, improved transparency from cost-reflective prices provides clearer incentives for more efficient energy use. This new third pillar is a product of the recent liberalisation process. While the framework for consumer participation now exists, many of the detailed structures needed to facilitate ease of participation must still be further developed.

A first building block to empower the consumer to participate is to create the necessary competitive pressure. Such pressure creates the incentives needed for retail companies to bring the opportunities of a competitive wholesale market to the doorsteps of consumers. Unbundling of competitive retail activities from network activities is the most important step to introducing effective retail competition, but in most cases this phase of liberalisation has been less comprehensive than in transmission and system operation. Regulated access is provided by constructing systems and formal rules for consumer switching, but many markets still have small, but possibly decisive, barriers to switching – or still offer advantages to incumbent semi-integrated retail and network businesses. In all competitive markets, larger industrial consumers have switched in great numbers. The experience for smaller commercial and residential consumers is more varied, ranging from high switching rates in some markets to disappointingly low rates in others. In jurisdictions with liquid financial markets, more sophisticated retail products have been developed to better serve the needs of consumers who want to take an active role in managing risks. However, overall product innovation and development has been slow and sporadic. Establishing competitive retail markets that provide easy access to switching between competing retailers remains a challenge.

Another effect of the somewhat slow development of competitive and innovative retail markets and the still often supply-focused market design is the failure to bring market prices to the doorsteps of consumers. So far, there has been only limited opportunity for consumers to create benefits by shifting load as a price response. Considering that electricity is con-

sumed by millions of different consumers for millions of different purposes, consumers are undoubtedly, in principle, willing to shift demand by varying degrees as a response to different prices. Demand is price-elastic: the challenge is to lower transaction costs sufficiently to justify participation for consumers who stand to realise the largest potential benefits. There are several barriers to enabling demand response to price but that being said, there must also be something to respond to: consumers cannot be expected to respond before prices rise sufficiently to off-set transaction costs. The largest consumers, who already have remotely read interval meters, are likely to be the first to see the benefits of shifting demand in response to price. Finding a way to take the wholesale price to the doorsteps of smaller commercial and residential consumers is, however, fraught with a technical and economic barrier given the absence of necessary metering equipment.

Lack of demand participation remains one of the most serious challenges in liberalising electricity markets. The barriers are numerous. Creating easy and effective systems to manage retail switching is challenging. For small residential consumers, the infrastructure to enable switching is relatively costly compared to the potential benefits. In addition, it has been difficult to remove all distortions from semi-integrated networks and retail companies. Where governments show a willingness to intervene through price caps and other means, this also serves as a barrier to demand participation. Finally, lack of liquid financial markets makes it difficult to create the necessary innovative products. However, early evidence shows that consumers do switch suppliers and do respond to price when the conditions are sufficiently good. In fact, remarkably little demand response to price is necessary to significantly improve the performance of electricity markets, enhance system security and substantially reduce volatility and electricity prices for all consumers.

#### **Efficient incentives for investment are critical**

A substantial share of the electricity consumer's bill goes towards financing generation and network assets. The opportunity to improve investment decisions is a significant potential benefit of market liberalisation. The ability of electricity markets to provide sufficient incentives for timely and efficient investment in generation plants continues to be one of the most debated aspects of market design. Many

investment projects require long lead times and have an economic lifetime of several decades. The transitional phase of market development is characterised by uncertainty that may undermine the investment climate – and ultimately the successful transition to a competitive market. Investments in power generation are one of the big tests for the development of robust markets.

Liberalised markets create a new investment paradigm in which decisions are taken under competitive pressure. When risks are shifted from consumers to decision makers, capital-intensive technologies with long construction times are viewed with greater scepticism – even if marginal costs are low. In the new competitive environment where risks are transparent, market players prefer technologies with short lead times that can be built in small incremental steps. Competition also pushes investment decisions to the last minute, which saves resources but can also put policy makers under pressure to intervene in a transitional phase (i.e. before the process has proven to be robust).

In situations where the supply and demand balance is tight, demand response to price can constitute the necessary buffer of last resources and add much-needed flexibility. To date a certain level of active demand participation has been critical in re-affirming the robustness of markets; conversely, lack of demand participation has laid the groundwork for very high price spikes needed to trigger investment. When governments have refrained from intervention and let prices reflect real costs, markets have delivered – they have not failed to provide incentives for a response through investment in new generation capacity. In this context, so-called “energy only” (or, more correctly, “one price only”) markets, in which the wholesale electricity price provides remuneration for both variable and fixed costs, have performed well.

Some markets have not shown enough confidence to rely on the delicate balance inherent in this new investment paradigm. These markets assume that consumers are not willing to participate and thus find that protective price caps are necessary as a consequence. However, with the barrier of a price cap, extra incentives must be added to prompt timely and adequate investment. These extra capacity measures have been implemented in various forms and have incentivised new investment. But they have also been prone to market manipulation. Another drawback is

that capacity measures force decisions regarding the overall need for new generation capacity back into a centralised decision-making process.

Investments in networks are, by and large, still being made within regulated frameworks. The business model for merchant lines has proven to be fragile, and very few merchant lines are currently financed by purely commercial means, but locational pricing has still added substantial transparency to the process of making investment decisions in transmission. For example, several markets are developing information systems that enable a more co-ordinated interaction between decisions on regulated transmission investments and decisions on investments in generation plants.

It is important to design markets and create regulatory frameworks that provide sufficient remuneration and incentives for efficient investment. But none of this makes any difference if investors cannot get permission to build. The absence of transparent and smooth approval procedures – whether to use a particular technology or to site a new generation plant or network at a particular location – continues to be a serious barrier to investment in most markets. This is not related to the liberalisation of electricity markets; rather, cost-reflective locational prices make the consequences of related environmental policies and the so-called “not in my backyard” (NIMBY) syndrome more transparent.

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