Foreword: US vs. EU electricity reforms achievement

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The final report of the Sustainable Energy Specific Support Assessment project (SESSA) provides a valuable overview of the status of policies aimed at creating a well-functioning electricity internal market in the European Union (EU) and provides a set of comprehensive recommendations for removing barriers to the market’s further development. The chapters in the report are written by the leading European scholars who have studied the structure, behavior and performance of liberalized electricity markets in many European countries as well as in other regions of the world. Both the analyses and the policy recommendations contained in this volume are well worth careful consideration by policy-makers in Europe, as well as by policy-makers in other countries that are seeking to adopt successful electricity sector liberalization programs.

The SESSA report also comes at an important time in the development of liberalized electricity markets in Europe. Despite continued enthusiasm for comprehensive reforms to support the development of competitive electricity and natural gas markets from the EU authorities in Brussels, there are indications that the liberalization process has slowed down or even stalled in some European countries. The level of the commitment of policy-makers to making the structural, regulatory and market design changes necessary to realize Brussels’ vision seems to vary widely from country to country in the EU. The policies espoused by some EU countries to promote ‘national champions’ in electricity and natural gas seem to this outsider potentially to create some serious conflicts with important basic principles of electricity and natural gas market liberalization in particular, as well as with broader economic principles that are supposed to guide European market integration in general. The EU’s Competition Commissioner recently stated that an in-depth investigation by her office of energy markets had uncovered serious market distortions and she promised to get tough on mergers, subsidies and abuses of market power in energy markets in the future. At the same time, merger activity among large European electricity and natural gas suppliers seems to be growing,
with policies to create ‘national champions’ by some EU countries playing a prominent role in the merger process. These developments naturally raise questions about how the goals of European energy market liberalization and integration can be harmonized effectively with increased merger activity affected by efforts to create national champions, which, so we are told, will play an important role in the implementation of energy policies and ‘supply security’ policies to benefit individual member states rather than the greater good of the EU. Horizontal and vertical mergers are not necessarily incompatible with liberalization goals, but they must be evaluated carefully to ensure that they do not undermine important liberalization and market integration goals that can benefit the EU as a whole.4

In order to evaluate the performance of electricity sector liberalization policies and to identify needs for additional policy initiatives it is important to articulate the goals of liberalization policies clearly. I do not believe that ‘deregulation’ or ‘competition’ per se are high-order goals for electricity sector liberalization. Rather, deregulation or competition may be (partial) means to achieve a set of more precise performance goals. I believe that the ultimate goal of electricity liberalization initiatives should be to create new governance arrangements for the electricity sector that yield long-term net benefits to society by increasing the efficiency with which electricity is produced and consumed in ways that are consistent with environmental goals and policies. These benefits are to be realized by relying on competitive wholesale markets for power to provide better incentives for controlling construction and operating costs of new and existing generating capacity, to encourage innovation in power supply technologies and to shift the risks of technology choice, construction cost and operating ‘mistakes’ to suppliers and away from consumers. Retail competition, or ‘customer choice’, is supposed to allow consumers to choose the retail power supplier offering the price/service quality combination that best meets their needs. Competing retail suppliers are expected to provide an enhanced array of retail service products, risk management, demand management and new opportunities for service quality differentiation to better match individual consumer preferences. They also increase competition on the buying side in the wholesale market. It is these performance dimensions that the SESSA report focuses upon in its analyses and recommendations.

It has also been widely recognized that effective liberalization programs will still leave a significant portion of the total costs of electricity supply – distribution and transmission – subject to regulation. Accordingly, reforms to traditional regulatory arrangements governing the distribution and transmission networks have generally been viewed as an important complement to the introduction of wholesale and retail competition to supply consumer energy needs. Privatization of distribution and transmission
companies combined with the application of performance-based regulatory mechanisms (PBR) impose hard budget constraints on regulated network firms and provide better incentives for them to reduce costs and improve service quality. In addition, the efficiency of competitive wholesale and retail markets depends on a well-functioning supporting transmission and distribution network infrastructure and the terms and conditions of access to and use of this infrastructure. Some countries have implemented good incentive regulation programs for distribution and transmission, but many have not. The experience with incentive regulation in the United Kingdom suggests that well-designed incentive regulation programs can yield significant benefits in both the cost and quality of service dimensions.

These performance goals for electricity sector liberalization should be achieved in a way that is consistent with environmental laws, regulations and policy goals. There is no necessary conflict between electricity sector liberalization and achieving environmental performance goals. It does require that the instruments for achieving environmental goals be designed to be compatible with the behavior of both the competitive and the regulated segments of liberalized electricity sectors.

Of course, the EU is not the only region of the world that has embarked on a program of liberalization of the electricity sector focused on creating well-functioning competitive wholesale (generation) and retail (end-users) markets for power supported by efficient transmission and distribution network platforms. Similar initiatives have or are taking place in the United States, Canada, Australia, New Zealand, Chile, Brazil and other countries. There is much that has been learned from this experience that can be applied to the evaluation and implementation of liberalization policies in Europe. Indeed, several countries in Europe have adopted electricity and gas liberalization programs that perform well and could serve as models for the rest of Europe and the world. The privatization, restructuring, market design and regulatory reforms for the electricity sector in England and Wales are the international gold standard for energy market liberalization. The Nordic countries’ liberalization reforms come a close second to England and Wales, and provide important insights in particular for how the electricity sectors in neighboring countries can be integrated effectively by adopting compatible wholesale market designs. Spain, Portugal and the Netherlands have also adopted important components of a good reform program.

There is also much to learn from the experience with natural gas and electricity sector liberalization in the United States. And, in my view, given the importance of gas in the generation of electricity, especially where there are constraints on CO₂ emissions, effective electricity market liberalization is partially dependent on effective gas market liberalization. Over the last 15
years, the United States has implemented an effective national liberalization process in the natural gas sector, driven by a common national policy governing unbundling of gas transportation services from the market for natural gas itself, reforms of the regulatory framework governing pipeline transportation and gas storage services and the aggressive ‘ring fencing’ of regulated network services from competitive gas production and marketing services. We must recognize, however, that the United States had the advantage of building upon a very competitive gas production sector, both in terms of the concentration of ownership of natural gas production resources and the geographic diversity (including supplies from Western Canada) of gas supply sources. Europe is presently much more dependent on a small number of large suppliers, though increased use of imported liquefied natural gas (LNG) may help to diversify these supply sources.

The experience with electricity sector restructuring in the United States has not been as good as for gas and remains a work in progress. Lacking a comprehensive national policy promoting liberalization of the electricity sector and, as in Europe, with significant differences among the states in their enthusiasm for liberalization reforms, the extent of electricity sector liberalization varies widely from state to state in the United States. Even in those states that have adopted strong liberalization programs, the mixture of incompatible state and federal regulatory responsibilities creates barriers to fully achieving liberalization goals. This wide variation in liberalization policies in the United States has created a sort of (perhaps unnatural) experiment, testing the strengths and weaknesses of a range of governance frameworks for the electricity sector, varying from reforms modeled after those in England and Wales to continued reliance on regulated vertically integrated geographic monopolies (Joskow, 2006).

While electricity sector liberalization is sometimes characterized by the word ‘deregulation’, this word can create a misleading picture of what is involved in a successful reform program. It is clear from the experience with electricity sector liberalization around the world that industry restructuring along both vertical and horizontal dimensions as well as regulatory reform are important pieces of the foundation for successful liberalization programs that are required to accompany deregulation of wholesale and retail power supply markets. The key aspects of industry restructuring programs that support successful liberalization programs include:

1. Vertical separation of competitive segments (for example, generation, marketing and retail supply) from regulated segments (distribution, transmission, system operations) either structurally (through divestiture) or functionally (with internal ‘Chinese’ walls or ‘ring fencing’ separating affiliates within the same corporation). These changes are
thought to be necessary to guard against cross-subsidization of competitive businesses from regulated businesses and to guard against the exercise of *vertical market power* through the use of discriminatory policies affecting access to distribution and transmission networks upon which all competitive suppliers depend.

2. Horizontal restructuring of the generation segment, to create an adequate number of competing generators to mitigate market power and to ensure that wholesale markets yield reasonably competitive performance results.

3. Horizontal integration of transmission and network operations to encompass the geographic expanse of ‘natural’ wholesale markets and the designation of a single *independent* system operator to manage the operation of the network, to schedule generation to meet demand and to maintain the physical parameters of the network (frequency, voltage, stability). Horizontal integration of transmission facilities and control area operators eliminates inefficient institutional seams between physically synchronized networks, allows for more effective use of network capacity, expands the geographic expanse of competition, reduces distortions caused by inefficient transmission prices and supports the operation of wholesale markets with a minimum of intervention by system operators or regulators.

4. An *independent* system operator (whether in the form of a system operator with responsibility only for balancing supply and demand in real time consistent with the network’s topology and reliability criteria, or a ‘Transco’ that owns and operates the network’s transmission facilities as well) is needed to guard against discriminatory ‘self-dealing’ practices that might otherwise arise where there is common ownership between market participants who use the network to supply and/or buy power and the entity that operates the network and supporting market mechanisms and can distort market outcomes to benefit their unregulated affiliates.

5. Transparent public wholesale spot energy and operating reserve market institutions should be created to support requirements for real-time balancing of supply and demand for electric energy, to allocate scarce network transmission capacity, to respond quickly and effectively to unplanned outages of transmission or generating facilities consistent with the need to maintain network voltage, frequency and stability parameters within narrow limits, and to facilitate economical trading opportunities among suppliers and between buyers and sellers. The design of public spot energy and ancillary services markets should be compatible with the evolution of private markets for bilateral forward contracts for energy and associated derivatives, including
instruments that can be relied upon to hedge basis risk associated with transmission congestion, power exchanges and other institutions to facilitate financial arrangements between buyers and sellers.

6. The application of regulatory rules and supporting network institutions to promote efficient access to the transmission network by wholesale buyers and sellers in order to facilitate efficient competitive production and exchange, including mechanisms to allocate scarce transmission capacity efficiently among competing network users, and to provide for efficient siting and interconnection of new generating facilities.

7. The unbundling of retail tariffs to separate prices for retail power supplies and associated customer services to be supplied competitively from the regulated ‘delivery’ charges for using distribution and transmission networks that would continue (primarily) to be provided by regulated monopolies. This makes it possible for retail consumers eligible to choose their power suppliers competitively to purchase their power supplies from competing retail suppliers without having to overcome barriers caused by behavior of incumbents that may have the effect of increasing entry barriers for independent competitive suppliers.

It is clear from the analyses and recommendations of the SESSA project that the liberalization program in several EU countries proceeded without an adequate appreciation for some of the important aspects of successful electricity liberalization programs outlined above. Even in England and Wales, where an extensive restructuring program accompanied liberalization, inadequate attention was paid initially to horizontal market power issues in the wholesale generation market mediated through ‘the pool’. Curiously, the EU’s efforts at liberalization started at the retail level (‘third-party access’) and moved rather slowly to focus on wholesale market and transmission institutions that are necessary to support efficient retail competition programs. The EU and its member states are now in the process of ‘backfilling’ with policies aimed at remedying some of the deficiencies caused by inadequate attention to industry restructuring and regulatory reform as they affect both wholesale and retail market behavior and performance. However, it has been my experience that it is much more difficult to implement major restructuring initiatives after, rather than before, competitive wholesale and retail markets have been launched, transition arrangements (e.g., stranded cost recovery) have been agreed upon and market participants have made investment decisions based on the rules of the game that are in place. Moreover, continuing ‘reforms of the reforms’ can have adverse effects on investment incentives. Accordingly, practical
policies going forward are necessarily constrained by decisions that have been made in the past.

The liberalization process in the EU initially paid inadequate attention to potential horizontal market power problems affecting prices in wholesale power markets. The particular characteristics of electricity supply, demand and reliability criteria – non-storability, very inelastic short-run demand, network congestion, long construction times, real-time balancing and system control requirements, repeated interaction, and so on – make short-term electricity markets especially conducive to the exercise of market power. Accordingly, conventional structural criteria for diagnosing market power may not be appropriate for electricity markets. On the other hand, transition arrangements that in one way or another commit generation suppliers to supply at prices that do not move with spot market prices can help to mitigate market power. One can, of course, pretend that ‘Europe’ is a relevant geographic market and evaluate the structure of generation markets by calculating various market share indicia for all of Europe. However, this approach is necessarily misleading when transmission congestion limits the competitive effects of suppliers from outside of a transmission-constrained import area.

US policy-makers focused much more attention on horizontal market power issues than did the EU at the start of the liberalization process. Federal and state regulators recognized early on that horizontal market power in wholesale electricity markets is a potentially serious problem, drawing on the experience in England and Wales during the early 1990s. The Federal Energy Regulatory Commission (FERC) has adopted procedures and criteria to identify horizontal market power problems and only gives generators the authority to sell at market-based prices (rather than cost-based prices) if they can demonstrate that they do not have significant market power under a variety of states of nature. FERC has created a large market monitoring division of its own, which interacts frequently with market monitors that have been created in the regions where regional transmission organizations (RTOs) or independent system operators (ISOs) have emerged. Where market power appears to be a problem, FERC has implemented various market power mitigation rules, including price caps. This ‘behavioral’ approach has been necessary because FERC does not have general authority to require divestiture of generating facilities as a structural remedy for horizontal market power except through its authority to review mergers where it may condition a merger’s approval on structural remedies, including divestitures of generating facilities. For example, in the case of the pending merger between Exelon and PSE&G (Public Service Electric & Gas Company), FERC has conditioned its approval on divestiture of 4000 MW (megawatts) of generating capacity and virtual
divestiture of 2600 MW of generating capacity.\(^5\) Mergers of generation suppliers must also be reviewed by the antitrust division of the US Department of Justice or the Federal Trade Commission under general US competition laws governing mergers.\(^6\) And, indeed, except in a few ‘load pockets’ where there are significant import constraints during many hours of the year, wholesale power markets in the United States are quite competitive.

In considering the US experience, however, there are a number of things that should be kept in mind. First, generation ownership in the United States was much more decentralized in most regions of the country prior to liberalization than was the case in Europe. Second, some states required incumbents to divest generating capacity prior to the liberalization of wholesale and retail markets, typically in return for guarantees regarding stranded cost recovery. Divestiture has not been used in the United States as an instrument to mitigate market power ‘ex post’ except in the context of merger reviews and, even there, only as a remedy for increased market power determined to be a consequence of the merger. Finally, the market power mitigation mechanisms that have been put in place are crude and constrain prices too much under some states of nature, helping to undermine incentives to invest in new generating capacity. That is, aggressive market power mitigation rules may have gone too far, constraining prices to levels that are too low, especially when supplies are very tight and competitive market prices should be very high.

Potential ‘vertical market power’ problems in wholesale and retail markets also attracted considerable attention at the beginning of the liberalization process in the United States, though refinements are continuing. FERC has focused on carefully defining the terms and conditions of access to transmission networks and requiring transmission owners to grant access, build interconnection facilities and expand transmission capacity based on transparent cost-based prices specified in tariffs with a common structure for all transmission owners across the country (Joskow, 2005). FERC has also required transmission owners to provide extensive real-time information about the availability of transmission service on their networks by creating Open Access Same Time Information Systems (OASIS) and to respond to requests for transmission service in a timely fashion. FERC has also required transmission owners to ‘ring fence’ the operation of their transmission networks from their wholesale and retail marketing activities. These requirements are accompanied by strong and precise rules governing information transfers between transmission divisions and other divisions of companies (ibid.). Finally, FERC has promoted governance arrangements that turn transmission system operations for multiple transmission owners over to ISOs, sought to expand the geographic expanse of ISOs to
cover large regions of the country and pressed for closer market integration between the networks operated by ISOs. While this final set of initiatives governing system operations and geographic scope have been controversial, over 50 per cent of the generating capacity in the United States is now located in areas with ISOs and the interconnected systems in the Northeast and Midwest have adopted similar market designs and are embarked on a process of continuing improvement to better integrate the wholesale markets they support (Joskow, 2006). The reliance on very similar market designs in the Northeast and Midwest have helped to facilitate better market integration and more efficient use of both generating and transmission capacity.

Unlike the directives issued by the EU, there is no US law that mandates retail competition. Many US states have not adopted retail competition programs and electricity consumers in these states continue to be served by regulated vertically integrated utilities. Vertical market power issues that may arise at the retail level in states that have adopted retail competition programs have been governed largely by individual state regulatory requirements in the United States. The states that have adopted retail competition programs have unbundled retail tariffs to separate regulated service charges (distribution, transmission, stranded cost charges and renewable energy subsidies) from competitive service charges (generation and some retail services). The network connection and utilization charges are regulated by the states (distribution and some transmission) and FERC (unbundled transmission) based on similar cost-of-service principles. Incumbent distribution companies that seek to offer competitive retail service must do so through separate unregulated affiliates, which are governed by strict ‘ring fencing’ rules to guard against cross-subsidization and transfers of commercial information that is not available to all competing retail suppliers. The states have also typically required that incumbent utilities offer a default service retail tariff for some number of ‘transition’ years. These tariffs have typically been set at levels that started or eventually fell below wholesale market values as natural gas and wholesale electricity prices rose and have been a significant impediment to the diffusion of retail competition. Texas adopted a retail framework similar to that in England and Wales and has had similar experience with it (ibid.).

Wholesale market design issues have been a high priority in the United States, England and Wales, Spain, Portugal, the Nordic countries, Australia and other countries that have liberalized their electricity sectors. Wholesale market design has been given much less attention in several important EU member states. Transparent organized wholesale markets for energy, ancillary network support services (e.g., frequency regulation and spinning reserves) and (where there are capacity obligations) capacity
are critical features of successful liberalization initiatives. Ideally, these organized markets should be integrated with the allocation of scarce transmission capacity so that this capacity can be allocated efficiently and spot prices for energy and ancillary services can vary to reflect the marginal cost of congestion and marginal losses. The wholesale markets in the United States organized around a bid-based security-constrained dispatch system that yields locational marginal prices (LMPs) that reflect congestion and losses, work quite well in all dimension but one (ibid.). The Nordic countries and Texas have adopted alternative approaches to integrating energy markets with the allocation of scarce transmission capacity, though Texas is in the process of moving to a ‘nodal’ market that will have properties similar to those operating elsewhere in the United States. The California ISO is also developing a new wholesale market design that follows the basic nodal/LMP architecture. It is clear that poorly designed and non-transparent wholesale markets can lead to significant inefficiencies, the California electricity crisis being a prime example (Joskow, 2001). It is also clear that similar market designs in neighboring control areas facilitates more effective integration of their wholesale power markets and more effective utilization of scarce transmission capacity. The SESSA project’s focus on improving wholesale market designs in Europe and better integrating the market designs implemented by different EU countries is appropriate and deserves careful attention by policy-makers.

Policy-makers in the United States are concerned that organized wholesale markets for energy alone (so-called ‘energy-only markets’) as they are now structured, however, do not provide adequate incentives to stimulate investments in new generating capacity. At first blush, this concern may be surprising since the early experience with reforms during the 1990s suggested that competitive wholesale markets could and would mobilize adequate (or more than adequate) investment in new generating capacity. Substantial amounts of capital were mobilized during the late 1990s to support construction of new efficient generating capacity in many countries that have implemented reforms. In the United States, over 200,000 MW of new generating capacity went into service between 1999 and 2005, most of it merchant capacity, an increase of nearly 30 per cent in total US generating capacity (Joskow, 2006). About 40 per cent of the stock of generating plants in service in England and Wales was replaced with modern efficient combined-cycle gas turbine (CCGT) technology between 1990 and 2002 as old coal-burning generators have been closed and expensive dirty coal plants have been displaced by cheaper and cleaner CCGT capacity. Many other countries implementing reforms during the 1990s, including Argentina, Chile and Australia, also attracted significant investment in new generating capacity (Jamasb, 2002) after the reforms were initiated. On the
other hand, many EU countries entered the liberalization era with excess generating capacity and are only now facing ‘supply security’ issues that may arise if competitive markets do not provide adequate incentives to stimulate investment in new generating facilities consistent with economic and reliability goals.

It is important to recognize that the financing environment for new generating capacity has now changed as many merchant generating companies have encountered serious financial problems, gone into bankruptcy and investors have gained a new appreciation for the risks associated with investing in competitive electricity markets without the security of long-term contracts at predetermined prices. The merchant investment model based on project financing and large amounts of project-specific debt that fueled the boom during the 1998–2001 period is, in my view, not viable at the present time. Potential private investors in new generating capacity are looking for stable market rules and longer-term contractual commitments before they will commit capital for new generating facilities. Continuous market redesign, regulatory actions that limit prices, system operators’ ‘reliability’ actions that depress market prices and other market and regulatory imperfections are being pointed to as deterrents to private investment in unregulated generating plants that must expect to sell into markets where they will not have the security of 10–20-year contracts. Financing investments in peaking capacity, which rely heavily on wholesale market prices creating ‘rents’ to support fixed investment costs in a relatively small number of hours, is especially problematic.

Analyses done of regional markets in the United States make it fairly clear that ‘energy-only’ markets do not produce adequate revenues to attract investment in generating capacity consistent with the reliability standards that are still applicable to them and have now become mandatory (Joskow, 2006). The organized markets in the United States have or are adopting capacity obligations, capacity prices and capacity markets to provide a safety-valve source of revenues to ensure that generation investment incentives are compatible with reliability criteria. I believe that these reforms are necessary to fill the primary remaining gap in the design of organized wholesale markets in the United States.

The issues associated with investments in new generating capacity naturally lead to the question of whether ‘big companies’ with ‘big balance sheets’ are necessary sources of financing for new generating capacity, especially capital-intensive nuclear-generating capacity. The experience with renewable energy around the world, especially wind, makes it clear that these projects can be financed by a wide range of companies inside and outside of the electric power industry if these projects can get long-term contracts at (high) fixed prices with creditworthy counterparties. The
financing issues become more challenging when potential investors in new generation are looking at entering markets where retail intermediaries are not willing to enter into long-term contracts. In these situations I see two interrelated trends emerging. In several countries with active retail competition programs there appears to be a growing movement towards an industry structure where competitive retail suppliers acquire generating capacity to meet a significant fraction of their competitive retail supply commitments. This trend is likely to reflect an efficient response to relatively high transaction costs associated with real wholesale power markets in practice and the ability to rely on a reasonably stable aggregate retail customer base to secure financing, even if individual customers will only sign up for short-term contracts. The second trend is for investments in generating capacity to rely much more on balance sheet financing by firms with strong balance sheets and good credit rating than on project financing with junk bonds.

Some have argued that vertical integration between retail supply and generation creates market power problems. I do not believe that this view is correct. As long as transmission and distribution networks have been separated (structurally or functionally) from market participants in wholesale and retail markets there is no inherent competition problem with vertical integration of this type as long as there are a sufficient number of vertically integrated and unintegrated suppliers that continue to compete at the wholesale and retail levels. However, if there is significant market power in the upstream or downstream markets, vertical integration could lead to a further reduction in competition by increasing the operating or entry costs of rival retail suppliers. Vertical separation of the regulated network segments from the competitive segments eliminates one potential problem in this regard. Ensuring that the ownership of generating capacity and retail supply in relevant geographic markets is not too concentrated mitigates the other potential source of vertical market problems. That is, companies that have both retail supply businesses and generation businesses do not create market power problems as long as there are enough of them to support vigorous competition at both the wholesale and retail levels.

Some have also argued that companies with ‘big balance sheets’ will be necessary to finance new generating capacity in the future. This argument has also been used to support efforts to create ‘national champion’ vertically integrated utilities. I do think that balance sheet financing will play a much more important role in financing the next wave of investments in generating capacity than was the case during the most recent merchant investment boom. And companies with healthy balance sheets may be able to secure financing more easily and cheaply than companies that are thinly capitalized. However, companies can have healthy balance sheets and broad experience with building and operating generating plants without
controlling a large share of the generating capacity in any one regional market in the EU. Big companies with big balance sheets can have generating capacity in many different areas of the EU or in other countries of the world. Indeed, competition between six or more large companies with generating resources dispersed throughout the EU, but without any individual company having a large share in any regional market, would likely lead to more vigorous competition and better performance. There are large well-capitalized electric power companies in the United States, Japan and Canada. There is no reason in principle why they cannot be strong competitors in European markets if the regulatory and political environments do not create barriers to entry. Indeed, the owners of the largest generating companies in England and Wales are headquartered in France and Germany. Of course, the United Kingdom has not adopted a policy of promoting a UK national champion in the electricity sector by discouraging non-UK firms from buying UK assets. Accordingly, the view that it is desirable to have large electricity and gas companies with big balance sheets to finance future generation investments does not require ‘national champions’ with generating resources concentrated in their home countries.

Creating a well-functioning transmission investment framework is important but continues to be a significant challenge in many countries. It is clear from the SESSA report that this is the case in much of Europe as well. As wholesale markets have developed, congestion on the transmission network has not only increased but is increasingly recognized as a significant constraint on the development of efficient competitive wholesale markets for power. In many countries with liberalized electricity markets, investment in transmission capacity, especially interregional transmission capacity, has not kept pace with the expansion in demand, generating capacity, or the volume of wholesale trade. In Europe and the United States there has been almost no investment in interregional transmission capacity since the early 1990s.

In addition to the effects of transmission congestion on wholesale power prices and the associated social costs of congestion, a congested transmission network makes it more challenging to achieve efficient wholesale market performance. Transmission congestion and related reliability constraints create load pockets, reducing effective competition among generators and leading policy-makers to impose imperfect market power mitigation rules that create other distortions. Congestion makes it more challenging for system operators to maintain reliability using standard market mechanisms, leading them to pay specific generators significant sums to stay in the market rather than retire and to rely more on out-of-market (OOM) actions that depress market prices received by other suppliers. In New England, the amount of generating capacity operating
subject to special reliability contracts with the ISO has increased from about 500 MW in 2002 to over 7000 MW for 2005 (ISO, 2006, p. 80), amounting to over 20 per cent of peak demand.\textsuperscript{8} These responses to transmission congestion undermine the performance of competitive markets for energy, exacerbate the net revenue problem discussed above and lead to additional costly administrative actions to respond to market imperfections resulting from transmission congestion.

In the United Kingdom and Argentina, the restructuring process included a comprehensive set of institutions and regulatory mechanisms to govern transmission operating cost and reliability, the allocation of scarce transmission capacity and approvals of transmission investment programs, as an integral aspect of the reform process. In many other countries, the regulatory framework governing transmission operation and investment was not given too much attention and was allowed to evolve along with the markets. Stimulating performance improvements in the operation of transmission networks and, especially, attracting adequate investment to reduce congestion and to increase the geographic expanse of competition to reduce market power and the associated need to regulate wholesale markets to mitigate it, has been a challenge. The transmission systems that have exhibited the best performance are organized with a single independent transmission company that spans a large geographic area, integrates system dispatch, congestion management, network maintenance and investment under PBR mechanisms where the regulated network firm has high-powered incentives to control costs and meet quality of service and reliability benchmarks (for example, National Grid Company [NGC] in England and Wales). Fragmented transmission ownership, separation of system operations from transmission maintenance and investment and poorly designed incentive regulation mechanisms reduce performance. Relying primarily on market-based ‘merchant transmission’ investment, which is where new transmission investments must be fully supported by congestion rents (the difference in locational prices times the capacity of a new link), is likely to lead to inefficient investment in transmission capacity (Joskow and Tirole, 2005).

The frameworks for supporting transmission investment in many countries continue to have deficiencies. Progress is being made, however. PJM (Pennsylvania-New Jersey-Maryland) and other ISOs in the Northeastern United States have adopted spot market mechanisms that integrate energy and ancillary services markets with the allocation of scarce transmission capacity. These ‘nodal’ markets work very well from the perspective of short-term price formation and resource allocation. They have also refined their transmission planning and investment programs significantly to capture investment needs driven by both reliability and economic consid-
erations, though their interdependence has been slow to be recognized. These processes accommodate merchant transmission investments but do not rely on them. The Nordic markets take a different approach to integrating day-ahead energy markets with the allocation of scarce transmission capacity, but a transmission investment framework appears to be much less well-developed there. Mechanisms being developed through cooperative activities of European transmission and power exchange operators and regulators for integrating energy markets with the allocation of scarce inter-country transmission capacity are moving forward in Central Europe. And recent EU principles governing investment in interconnector capacity that expands transmission capacity between countries are very constructive. There is a great deal of work to be done on the creation of effective institutional arrangements governing the organization of transmission operations, operating costs, congestion management, reliability and investment to expand capacity, but progress is being made.

The US Energy Act of 2005, along with recent FERC regulations, have sought to reduce regulatory and financial barriers to investment in new interregional transmission facilities. The Act gives FERC new backstop siting review authority and authority over reliability rules. FERC has also adopted regulatory mechanisms aimed at creating a more attractive financial environment with ‘incentive rates’ for investment in new transmission facilities subject to its regulatory jurisdiction and has continued to promote better regional transmission planning processes. These changes appear to be bearing some fruit already. On 31 January 2006, American Electric Power (AEP) announced plans to build a 550-mile (885-Km) 765kV transmission line between West Virginia and New Jersey, increasing the capacity of the PJM network to move low-cost power from the Midwest to the East. On 28 February 2006, Allegheny Power announced its intention to build a 330-mile (530-Km) 500kV transmission line from West Virginia to Maryland both to improve reliability and increase opportunities to move lower-cost power east. Both projects are moving forward in response to the provisions of the 2005 Energy Act and FERC’s offer of incentive rates for service provided over these new links.

One similarity between the United States and the EU is that liberalization has proceeded with a mix of federal-EU-level and state/member state initiatives. The EU-level initiatives have promoted liberalization with a growing set of directives defining the basic principles that all member states are to adhere to in implementing EU mandated electricity sector liberalization programs. However, there is no EU-level regulator like FERC and the details of the implementation of the EU directives have been left to the member states. Some states have implemented the intent of these EU directives with more enthusiasm than have others and, at least from the
perspective of an outsider, the EU’s authority to impose more detailed requirements are limited in practice if not in theory. While FERC’s authority too is limited under US law and FERC shares regulatory responsibilities with the states, where FERC does have jurisdiction it has used it aggressively to define how important aspects of liberalization at the wholesale level will proceed. Especially as these initiatives relate to transmission access and pricing, wholesale market power issues, market power mitigation and mergers, FERC’s policies have played an important supporting role in the liberalization process. The US liberalization process has benefited from having a federal regulator with a broad national perspective, with strong legal authority to define the details of the liberalization process in wholesale markets that affect groups of states and with the ability to use various carrots and sticks to facilitate the evolution of common transmission access, transmission service pricing, transmission planning, wholesale market design and market power identification and mitigation mechanisms that span multiple states in each region of the country. FERC has played an important role as a counterweight to state regulatory actions that have created barriers to liberalization, too often at the behest of incumbent utilities that do not want to operate in a liberalized environment. A federal regulator for the EU covering wholesale electricity markets and natural gas transportation is an institutional innovation that may be worth serious consideration.

Implementing a good electricity sector liberalization program is a technical, institutional and political challenge. Almost everywhere, some unanticipated (at least by the policy-makers) problems emerged that required major or minor refinements to the original reform program. It appears that countries in which the reforms have strong pro-competition political support are more likely to respond to problems that emerge by identifying market or institutional imperfections and trying to fix them in ways that are consistent with the continued successful evolution of competitive wholesale and retail markets. They are also likely to be willing to live with some imperfections, recognizing that no market is perfect and that the cures can be worse than the disease. Where the political commitment to competitive electricity markets is weak, when problems emerge policy-makers are more likely to seek what appear to be quick fixes that undermine continued evolution of competitive markets or just cut and run from the competitive market agenda. If the commitment to competition is not strong in the first place, of course, the reforms are likely to be timid and have little effect on the status quo anyway. In the end, the desire and will to promote electricity sector liberalization are at least as important as the mechanical details of restructuring, regulatory reform and market design.
NOTES

1. Professor of Economics, Massachusetts Institute of Technology (MIT) and Director, MIT Center for Energy and Environmental Policy Research, Cambridge, MA, USA.
6. Section 7 and Section 7A of the Clayton Act.
7. For example, the system operators may pay individual generating plants to run out of bid-merit order without going through organized wholesale market mechanisms.
8. FERC has ordered the ISO to replace these agreements with a locational capacity market mechanism built around an administratively determined ‘demand curve’ for generating capacity.

REFERENCES