

CHALLENGES FOR CREATING A COMPREHENSIVE NATIONAL ELECTRICITY POLICY

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Introduction

The U.S. electricity sector accounts for about 42% of the primary energy consumed in the U.S., 34% of the fossil fuels consumed in the U.S., and about 40% of U.S. CO₂ emissions. End-use consumption of electricity is growing faster than end-use consumption of both petroleum and natural gas. Accordingly, if you are interested in energy and climate policies the electricity sector is very important and will become even more important in the future.

Moreover, for those concerned with energy security, the electricity sector is a model of “energy independence.” Electricity generation in the U.S. uses almost no petroleum, and petroleum’s share of electricity generation has fallen from 17% in 1973 to 1.5% in 2007. Essentially all of the coal and natural gas used to generate electricity comes from North America and while a large share of the uranium used in nuclear power plants

¹ The views expressed here are solely those of the author. They do not represent the views of the Alfred P. Sloan Foundation, MIT, or any other organization with which the author is affiliated.

is of foreign origin, the supply sources are diverse, the current supply mix heavily influenced by programs to reduce Russian stocks of highly enriched uranium, and uranium can be easily stockpiled.

Not surprisingly, policymakers are relying on the electricity sector to achieve a variety of goals:

1. Providing an abundant and reliable supply of electricity produced *efficiently* to support a healthy growing economy. Achieving this goal will require significant investments in new generation, transmission and distribution facilities. The ability to mobilize the capital necessary to support the construction of these facilities is important. It is also important that these investments take place without the huge cost overruns, and poor operating performance experienced by this sector from the mid-1960s into the early 1990s (when investment in new generating capacity by traditional regulated utilities came to a virtual halt) is not repeated in the next wave of investment in new generating facilities.

2. Ensuring that electricity prices provide consumers with the price signals that will give them the incentives to use electricity wisely, to encourage adoption of more energy efficient technologies (e.g. lighting, HVAC, refrigeration, etc.), as well as to provide adequate revenues to stimulate efficient investment and operations.

3. To play a major, perhaps the major, role in meeting atmospheric GHG stabilization goals when the day comes that the U.S. adopts a national GHG mitigation policy (as well as other environmental goals e.g. for micro-particulates, mercury emissions, and thermal discharge). This will further increase capital investment requirements, increases the efficient investment and operating challenges, and the need to mitigate regulatory distortions that may undermine efficient responses to carbon prices. Moreover, when GHG policies are adopted it is important that market or regulatory mechanisms work effectively to convey to consumers price signals that include the price placed on carbon dioxide emissions.

4. To support continuing efforts to increase energy security and reliability by reducing the likelihood and costs of oil supply disruptions, as well as natural and unnatural events that may disable or destroy portions of the U.S. energy supply and delivery infrastructure. (However, we should recognize that the electricity sector uses almost no oil. Policies to promote nuclear power, wind, etc. may make sense to mitigate CO₂ emissions, but do not directly reduce U.S. oil imports.)

These are fine goals. However, I do not believe that the electricity sector is presently up to achieving them quickly or efficiently from an organizational, financial or regulatory perspective. Unlike every other

energy sector, the electricity sector lacks a comprehensive national policy framework consistent with achieving these goals. In the last 25 years we have adopted national industry restructuring, regulatory reform policies, and competition policies for all of the other energy sectors. We have done so as well for almost every other major infrastructure sector: railroads, trucking, airlines, telecommunications, etc. The electricity sector, however, is stuck somewhere between the policy framework of 1935 and the vision for restructuring, competition and regulatory reform that emerged in the U.S. and a number of other countries in the late 1990s. Without a modern comprehensive national electricity sector organization, regulatory and competition policy framework for the electricity sector, we will not achieve the goals that I discussed above.

Restructuring, Competition and Regulatory Reform

In every other energy sector, the U.S. has implemented fairly clear and comprehensive national policy and regulatory frameworks to achieve reasonably well articulated goals and has then allowed the industrial organization of these sectors to adjust naturally to the incentives that these framework create. In the energy sectors and other infrastructure sector the reform themes over the last 25 years have been similar: (a) industry

restructuring to separate potential competitive from natural monopoly segments, (b) the promotion of competition in those sectors where effective competition is likely to be feasible, and (c) the introduction of regulatory reforms to make regulation more effective for those segments where it is not. Let's look at the natural gas sector as an example:

The natural gas industry, which in principle has many structural features similar to the electric power sector, faced serious shortages during the 1970s and early 1980s due to a failed regulatory system that constrained natural gas prices below their market clearing levels combined with an incompatible mix of federal and state regulation that made the social cost of the resulting shortages even worse. This situation is nicely documented in the work of my colleagues Paul MacAvoy and Bob Pindyck who campaigned during the 1970s for natural gas field price deregulation so that prices could rise to market clearing levels.

Field prices of natural gas were ultimately deregulated and a comprehensive restructuring process for the natural gas industry was initiated and completed by the federal government during the 1980s and 1990s. The federal restructuring process covered natural gas production, interstate pipeline transportation, marketing, and the interstate storage segments of this industry.

We now have a well integrated competitive North American market for natural gas that moves gas economically and reliably long distances (e.g. from Alberta to NYC). The sector responds smoothly to supply shocks, even those as extreme as hurricane Katrina. During the reform process and natural gas prices went up, then they went down, and then they went up again in response to changing supply and demand conditions. Domestic natural gas production is increasing again today in response to higher prices. Substantial investments are being made in new pipeline projects to move gas from new areas where production is growing to the markets where it is consumed. The terms and condition for service on these pipeline projects is subject to light-handed federal regulation.

Judging whether natural gas restructuring and regulatory reform was a good idea or a bad idea based on whether prices are higher or lower than an estimate of what a regulated prices would have been is not the proper way to evaluate the social welfare consequences of such reforms. Regulated prices can be too high or too low and are only right by accident. One must look instead at the efficiency changes on the supply and demand sides of the natural gas sector to properly assess whether it has been successful or not. Indeed, it is widely believed that the reforms of the natural gas sector have

been very successful, despite the fact that natural gas prices are much higher today than were in the 1990s when the reforms were largely completed.

Going beyond energy, I note as well that the restructuring, regulatory reform and competition reforms applied to the railroad, trucking, airline, cable television, telecommunications, etc., sectors, all involved aggressive *federal* initiatives that often reduced state regulatory jurisdiction and were actively opposed by many state regulators and various interest groups. Overall, the dominant political force in the energy and infrastructure restructuring programs of the last 25 years has been federal government action rather than state government initiatives. Indeed, the states have often opposed these reforms.

And then we have the electric power sector, the last reform holdout. For almost 50 years this sector was stuck in an organizational and regulatory framework that may have been well matched to the electricity generation and transmission technology available in 1935, but was surely poorly matched to changes in technology, new technological opportunities, contemporary investment needs, or current economic and environmental challenges. Then in the early 1980s, electricity sector reformers began to stir, responding to concerns about the system of regulated vertically integrated monopolies inherited from the 1930s. The “good old days” of

regulation represent a view to the past with rose colored glasses. The system of regulated vertically integrated monopoly was plagued by cost overruns associated with nuclear power plants, poor operating performance for both nuclear and large fossil-fueled plants, poor fuel procurement decisions, wide price differences between neighboring areas, excess generating capacity, inefficient dispatch and economy energy trading between generating companies, regulatory incentives to keep old inefficient plants operating rather than retiring them, too many small utilities to take advantage of economies of scale, institutional and technological barriers to using the transmission network to access lower cost power, productivity lags, and inefficient retail prices. The system “worked” in the sense that supply and demand were balanced and the system was quite reliable (though the Northeast blackout and summer brown-outs in New York City during the 1960s are hard to forget). But it was unnecessarily costly and inefficient.

Reformers looked to the favorable experience with restructuring, competition, and regulatory reform in other sectors and with electricity in other countries to help to solve the problems associated with the fragmented electric power sector made up of over 100 vertically integrated geographic monopolies. Municipal distribution companies and large industrial customers were especially aggressive at promoting reforms focused on open

transmission access, the creation of transparent organized regional competitive wholesale markets, and (in the case of large industrial customers) retail competition.

A large number of states initially embraced this restructuring, competition, and regulatory reform vision and began to implement it. In 2000 it looked like restructuring and competitive market reforms were going to sweep the U.S. electric power industry.

Then came the California electricity crisis, the collapse of Enron and a number of merchant generating companies, increased volatility to natural gas markets and associated volatility in wholesale electricity market prices, and a long march upward in fossil fuel prices ultimately resulting in rising retail electricity prices in both regulated and restructured states. Most of the states that were leaders in restructuring during the late 1990s, when natural gas prices were low and there was excess capacity, initiated reforms during a period when regulated prices for generation service were expected to be much *higher* than perceived comparable competitive wholesale market prices. The expectation was that over time retail prices would fall. This forecast was based on the assumption that low prices for natural gas in particular would continue and that a new system built on efficient CCGT technology would evolve. At that time, a major “problem” that many of

these states had to cope with were the “stranded generation costs,” primarily associated with what were perceived to be costly nuclear power plants, that were expected to result from the introduction of real wholesale and retail competition. This was expected to be a “transition problem” because it was expected that competition would result in market prices that would fall to levels below the embedded costs of nuclear plants and older fossil plants that would have otherwise been used to calculate (higher) regulated retail prices.

However, as natural gas and coal prices continued to rise far above anyone’s expectations, many of these states soon found that competitive market prices were rising dramatically along with natural gas prices (which affect competitive wholesale electricity prices in most regions of the country) --- arguably rising to levels above what regulated prices would have been today under the status quo ante (though this requires a difficult counterfactual analysis). This, of course does not mean that these electricity sector reforms were a failure. In states that adopted the restructuring, wholesale and retail competition model, retail prices now reflect marginal supply costs, as they should to give consumers the right price signals to use electricity wisely. Rather it means that regulated prices are or would have

been too low to give consumers appropriate incentives to make wise consumption decisions.

In evaluating restructuring, competition and regulatory reform one must understand all of its efficiency and distributional properties, not just at short run price effects. From an efficiency perspective, the restructuring reforms implemented at the federal level and in some states have led to numerous cost reducing successes in the face of rising fossil fuel prices. These include dramatic improvements in the performance of divested nuclear plants, significant improvements in the performance of fossil plants that now face market incentives, roughly 200,000 GW of new (mostly merchant) gas-fired generation has been added to the system between 1999 and 2004, while the risk of cost overruns, fuel price fluctuations, demand variations, and availability problems experienced by some of these plants were shifted to their owners through the market rather than borne by consumers through cost-of-service regulation. There is good empirical evidence that the expansion of the boundaries of RTOs (e.g. PJM) have led to significant changes in power flows and more efficient dispatch of power plants, while inefficiencies are observed at the boundaries of RTOs that have not agreed to be consolidated (e.g. NY/NE). Gradual improvements in wholesale market designs have increased the efficiency of these markets and

have restored investment incentives. Moreover, retail prices now respond quickly to changes in wholesale market prices, providing consumers with the right price signals rather than the wrong price signals resulting from retail price regulation. And these price signals are properly differentiated by time and location to reflect marginal supply costs, rather than the depreciated original cost of generating plants built 50 years ago. Demand management programs linked to short-term supply and demand conditions are expanding quickly as well in the reform regions.

Of course, the full reform program has not been implemented in large areas of the South, the West, and portions of the Midwest. The partial electricity reform equilibrium that we appear to be in now will not serve the country well and is potentially quite unstable. We have a system that is 1/3 reformed and 2/3 stuck in the structural and regulatory paradigm of the 1935s or somewhere in between.

The problems created by an antiquated industry structure and incompatible mix of state and federal regulation have not gone away. They are lurking out there to undermine achieving the goals that I enumerated earlier. Absent a comprehensive national electricity policy framework this sector is and will perform poorly in meeting the four sets of goals that I discussed earlier.

The Climate Change Policy Challenge

The purpose of this talk is not to discuss climate change policy. However, I will use it to illustrate how the current national policy vacuum affecting the electric power sector will undermine efficient climate change policies.

When the U.S. adopts a serious policy to constrain CO₂ emissions, and I think it is a question of when and how, not whether, the electric power sector will be a central target of the associated policy initiatives. The sector produces 40% of U.S. CO₂ emissions and it is generally believed that the most economical opportunities to reduce CO₂ emissions in the U.S. are on the supply and demand sides of the electricity sector.

As a practical matter it is almost a certainty that the U.S. will adopt a cap and trade program rather than an emissions tax. In this case, many economists have argued that all allowances should be auctioned because, they say, giving emissions allowances away for free to electricity generators, will result in windfall profits for generating facilities and because the auction revenues can be used to cut “bad taxes.” There is a good case for auctioning allowances, but the first argument for doing so flows from reasoning based on the assumption that the generation segment of this industry is competitive

rather than regulated. However, a large fraction of the CO₂ emissions in the electric power sector come from power plants owned by traditional regulated vertically integrated utilities and are regulated based on traditional cost of service principles.

When emissions allowances are given away for free to regulated utilities their cost --- zero --- will be passed through in retail prices so that the primary beneficiary of free CO₂ allowances is given to consumers rather than to the utilities. The problem here is not “windfall profits” for generators in states with cost of service regulation, but rather that in regulated jurisdictions retail prices will be too low, failing properly to reflect the marginal social cost of electricity production, discouraging conservation and investments by consumers in energy efficiency.

On the other hand, in jurisdictions with wholesale and retail competition, the price of emission allowances will be reflected in both wholesale and retail prices whether or not they are given away for free. This creates inequities between consumers in different states, complicates implementing a national CO₂ policy, and further undermines our ability to sustain competition in those states that have chosen to adopt a competitive market framework.

Almost every model that examines the efficient responses in the electricity sector to carbon prices set to achieve specific atmospheric GHG stabilization goals efficiently yields similar results. On the demand side there are relatively low cost ways to reduce electricity consumption by increasing energy efficiency in building, lighting, HVAC and other equipment. That's why getting the retail price signals right is important and why muting them with regulation based on traditional cost of service models is inconsistent with promoting adoption of economical energy efficiency opportunities. Auctioning allowances to regulated generators will partially compensate for the inefficiencies of regulated prices in the states that have not deregulated generation since the market value of these allowances will then be passed through to electricity consumers. That's a better argument for auctioning allowances than concerns about windfall profits and the dream of replacing bad taxes with good taxes. It is likely, however, that a large fraction of the allowances will be allocated free and, absent appropriate policies for distributing the "rents" associated with the free allowances, regulated retail prices will, as a result, be too low.

Second, the GHG mitigation models typically spit out significant investments in nuclear power plants, carbon capture and storage facilities, and renewable energy. Can we avoid the cost overruns and inefficiencies

that were experienced under regulation during the last wave of investment as regulated utilities begin to build power plants again? I see little evidence that the states that have stuck with regulation have implemented available incentive regulation mechanisms. Moreover, traditional vertically integrated utilities no longer have any experience managing large construction projects. Most traditional vertically integrated utilities have not built major generation projects for 15 years or more. Whatever expertise they may have once had in managing major generation construction projects is gone. This increases the likelihood that absent appropriate incentives to control costs, regulated generation projects will be excessively costly and that the cost overruns will be largely borne by consumers.

In the other hand, in the states that have implemented competitive generation market models, cost and performance risks are shifted to investors from consumers, properly aligning construction and operating efficiency incentives.

Let me turn to renewable energy as another example of why the current system is poorly adapted to respond efficiently to GHG mitigation goals as they are reflected in policies to promote renewable energy. The most efficient sites for renewable energy facilities, especially wind and large scale solar facilities, are often located far from load centers --- on shore and

off-shore. To take advantage of these opportunities very significant investments in new long-distance transmission facilities will be required. The organizational and regulatory framework that presently governs much of the U.S. electric power sector is not conducive to supporting these transmission investments. If remote sources of renewable energy are not available to meet state or potential future federal renewable energy portfolio standards or to respond to the incentives provided by CO₂ emissions prices, CO₂ mitigation goals will be even more costly to achieve.

What is to be done?

We need to stop dealing with the electric power sector by placing band aids on the Federal Power Act of 1935. We need a comprehensive national policy for the electric power sector --- a Federal Power Act of 2009 to replace the Federal Power Act of 1935. A policy that respects legitimate state rights but also reflects the contemporary attributes of electricity generation, transmission and distribution technologies, opportunities for innovation, and the public policy demands that are or will be placed on the electric power sector. While, I recognize that there are many technical differences between them, the restructuring of the U.S. natural gas industry provides a very successful basic organizational model to start with for the

electric power industry. The special attributes of electricity and electricity networks can be layered on top of this model.

What provisions might a Federal Power Act of 2009 contain?

1. The economic, planning, reliability, and siting review and regulation of high voltage transmission facilities with voltages above, let's say, 69 kv, should be federalized and the prices for transmission service over this network fully unbundled from generation and distribution service and made transparent. This would follow the structural and regulatory reform model associated with interstate pipeline transportation of natural gas and the successful implementation of electricity sector reform models introduced in other countries. Recent federal legislation effectively "federalized" reliability rules and made them mandatory. This is a step in the right direction.

2. The key provisions of FERC Order 2000 should be put into law. This would require the creation of RTOs that manage the operation of large regional transmission networks, implement FERC's transmission access, pricing, and planning regulations, and operate voluntary wholesale markets for electric energy, ancillary services, capacity and transmission rights. There is abundant evidence (a) that RTOs are needed to support efficient competitive markets, (b) that expanding the geographic expanse of RTOs

and improving the market designs for energy, ancillary services and capacity lead to efficiency improvements, (c) and that wholesale market designs built around what is generally referred to as the “standard market design,” augmented by capacity obligations and capacity markets, promote economic efficiency.

3. Vertically integrated utilities should be required to unbundle generation service from distribution service so that their respective costs or prices are transparent. They should also be required at least to move their generation facilities to a separate generation affiliate. Existing cost-of-service arrangements governing existing generating capacity can be replicated through properly structure long-term wholesale contracts between distribution and generation affiliates that are regulated by FERC. This will preserve the imbedded economic benefits (or costs) of existing generating capacity for retail consumers. These contracts would be transparent wholesale power contracts and regulated by the FERC.

4. The states would be free to decide whether or not they wanted to introduce retail competition for some or all customer classes. Where distribution companies continue to have obligations to serve retail customers at regulated retail prices, however, they would be required to meet at least their incremental power supply needs through competitive wholesale market

solicitations managed by the states using procurement mechanisms that meet reasonably flexible FERC competitive procurement criteria. In states that have already restructured and adopted a competitive wholesale market model, all default retail supply obligations would be met through approved competitive procurement programs.

5. Any federal loan guarantees available for financing nuclear, CCS, or renewable generation would be available only for “merchant” generating facilities and not to facilities subject to traditional cost-of-service regulation. Generators should get loan guarantees only once. Regulated generators can effectively get loan guarantees through cost of service regulation. Merchant generators can get similar financing relief from federal loan guarantees. This would roughly place regulated and merchant generation investment options on a level playing field.

6. Any free CO₂ allowances allocated to the electric power sector should go directly to electricity consumers through non-distortionary lump-sum distributions based on, say, historical consumption in a base period. All generators that emit CO₂ would be required to buy allowances in the market to cover their emissions. Generators subject to cost-of-service arrangements would be allowed to pass the associated costs through the retail price regulatory process and they would be reflected in retail prices. Consumers

would get a lump sum “dividend” on their bills each month for the value of the allowances allocated to them. That is, consumers would face the efficient retail price on the margin, while receiving a dividend that would not depend on whether their consumption increases or decreases, but would lower their total bills. This would then provide better retail price signals on the margin where it matters for stimulating wise consumption decisions.

7. State regulatory jurisdiction and regulation would continue over distribution facilities, sub-transmission facilities below 69 kv, whether and how retail competition will be permitted, energy efficiency programs, and competitive procurement of generation consistent with FERC procurement criteria. This is no different from the states’ jurisdiction in the natural gas industry.

Conclusion

The U.S. electric power sector is the last energy sector in the U.S. to be brought into the 21st century with organization and regulatory governance institutions that are compatible with modern technology, future technological opportunities, reliability and environmental goals. It would be nice if both presidential candidates would articulate their visions for this important sector that goes beyond sound bites about nuclear power,

renewable energy, energy security, and energy efficiency. It will take significant political courage to design and implement a comprehensive electricity sector reform program because there are powerful interest groups that benefit from the status quo. As they say, however, you can't make a good omelet without breaking some eggs and then using the right recipe. We know what eggs need to be broken and we now have a good recipe for turning them into an omelet. What we lack is the national leadership to make the omelet.