RE-OPTIMIZING FOR THE REVOLUTION

As Diana has described, the theme of this year’s roundtable is broader than in past years. We are not here to parse some FERC electric power order or to ponder a market design question. Rather, we are here to contemplate what may rightly be called a revolution. This revolution, which is going to profoundly alter the electric power industry, has its origins in two compelling concerns—energy conservation, and low-carbon production.

Today we are not going to discuss those concerns per se. Rather, we are going to focus on the implications of those concerns for the institutions and procedures of the electric power industry.

To understand how revolutionary these concerns are, we need only to recall that over much of the last century, the electric power industry in this country was premised on the view that it should produce and sell as much power as possible. That objective was made possible by a number of favorable factors, such as low energy costs, cheap capital, and consumers’ appetite for all things electrical. Private investment, public power, and rural coops all pitched in and made it happen.

The industry that arose had a number of key characteristics. It was dominated by very large-scale production, with vertically integrated utilities, limited transmission capabilities, franchised monopoly distribution, and simple customer rates. And this system was in fact remarkably successful in achieving its objectives. Quarrel as some may about inefficiencies, those pale in comparison to the achievement of reliable power supply and rates that declined in real terms for decades.

Over time a succession of industry leaders and regulators refined and optimized this
system to an ever greater degree. A set of well-developed and well-understood institutions and procedures arose. The major players agreed on the broad outlines of objectives. Even when the parties disagreed on particulars—and they did--they agreed on the terms of the debate. All were committed to it by a common understanding, by predictable behavior, and certainly by their invested capital. We ourselves know this system well.

Into this world comes the objectives of low-carbon production and efficiency in usage. While the electric power industry has faced challenges before, it seems certain that these new objectives will represent revolution rather than change, since they are far more fundamental than anything this industry has faced to this point. These new challenges will force every part of the present industry to reset itself, to reprogram itself, to re-optimize its most basic decisions.

What do I mean by re-optimization? Economics teaches that consumers, investors, utilities, and regulators all operate in a fundamentally similar way: Each maximizes some particular objective subject to binding constraints. Objectives and constraints for each agent are different, of course. So, consumers maximize their personal satisfaction (utility) subject to product prices and a budget constraint. Firms maximize profit given prices of inputs and sales opportunities. Investors maximize returns subject to risk and other factors. Regulators maximize some combination of consumer and producer benefit.

This model is a powerful device for predicting behavior. It tells us how consumers will respond to price changes, how investors will respond to alternative opportunities, how firms will respond to price signals, and how regulation will impact all of the above. In fact, a standard economic model of regulation poses its key question as the behavior of the firm under a regulatory constraint. That is a useful way of thinking about the behavior of all agents—maximization subject to constraints.
This model of optimization does a pretty good job of predicting the behavior of agents, and changes in their behavior in response to policy changes. The model is not perfect, as the current enthusiasm for behavioral economics attests. But at present behavioral economics adds some caveats to predictions of the standard model, but does not constitute a full-blown useful alternative to it.

And this model of optimization is a good way of describing the industry that we inherited at least into the 1990s. My point is that in that context, achieving the objectives of low-carbon production and efficiency in energy usage is going to require re-posing the maximization problem, and then resolving it—in short, re-optimizing. Constraints will be quite different than before, additional to and in many cases tighter than past or present constraints. Objectives themselves will be different, more complex, and reordered in importance: No more maximizing production and consumption, no more isolated geographic markets, no more entitlement to simple rates.

Consumers, investors, utilities, and regulators will all need to re-optimize—to maximize these new objectives and behavior subject to very new and binding constraints. This will not be easy. Change of any magnitude in this industry has never come easily.

And it is made more difficult by a number of its inherent characteristics, characteristics to which the present system has now been optimized over decades of operation. Whereas many of these characterizations once seemed to represent virtues, many now are obstacles to change. The most important of these include:

(1) Capital is extremely long lived. Much of the generation now in place has a physical lifespan in the decades, quite probably longer than its economic lifespan in a world focused on carbon reduction. Early replacement is a costly matter. Moreover, such long lifespans for new
generation raise investor concerns about payback. Investment in generation that is associated with a guaranteed customer base is increasingly seen as preferable.

(2) Much of the low-carbon renewable technology is high fixed cost in nature, higher even than conventional fossil-fuel technology. These higher fixed costs create several problems that go beyond what utilities and regulators have thus far had to contend. These include price volatility, which creates significant risks to unhedged players, and cost recovery. The present system already struggles with volatility and cost recovery, but it will need to address considerably more of each.

(3) Many of the new technologies involve intermittent production. Some of that (like tidal) is variable but predictable, but much of it (like wind and solar) is simply unpredictable. Integrating large amounts of intermittent power sources into the system creates significant technology and control issues, much different that those for the small amounts currently supplied.

(4) The present transmission grid was designed for moving modest amounts of power between nearly vertically integrated utilities for balancing purposes. It is not in the right place to exploit wind and solar power, whose natural production points are distant from the locations with major transmission lines. Cost, financing, siting, and state/federal jurisdictional issues all complicate the task of integrating these new sources.

(5) Grid operation will need to be modified to deal with many more and smaller-scale power sources, some firmly connected to the grid, others (like distributed generation) perhaps more loosely connected but nonetheless with implications for grid operation. The incumbent networks may be faced with private networks, with all the controversies over access and connection rules that bedeviled telecom for many years. Once again, present protocols and
regulatory procedures do not contemplate these possibilities.

(6) Regional transmission organizations have not lived up to their promise. While some evidence may support wide-area coordination of dispatch and investment, neither power pools, nor ISOs, nor RTOs, nor to date transcos have proven that they can achieve these objectives in a cost-efficient, competent, and inclusive manner.

(7) Distribution utilities for the most part operate distinctly un-smart grids, and few have experience with the technology and customer interface to make these a success. But advanced metering infrastructure will become ubiquitous. Ensuring the full benefit of time-varying price and other demand responses will require rethinking the traditional distribution utility function.

(8) Incentive regulation of such utilities will need to be rethought since its methodology is best suited to cost control, and for a relatively homogeneous service. Where quality or reliability is a choice variable, incentive regulation struggles to maintain service quality. Where investment requirements are substantial, controlling current costs does little to incentivize investment. As a result, price caps and incentive regulatory mechanisms will have to be adapted to different circumstances that those where they are currently optimized.

(9) And last on this list, customers who have long been accustomed to cheap and reliable power at uniform if not declining rates will be confronted with extensive time-of-use and critical-time pricing. They will need to learn how to process information about rates, how to to adapt their own usage, how to program their home appliances in response to price signals. The potential gains here, by most indications, are considerable but will require customers to re-optimize subject to the new constraints.

This is a sobering list. It is tempting to view these factors as binding constraints, and conclude that we must somehow work around them. But that cannot be. These constraints must
be broken or at least substantially relaxed in order for our production and usage objectives to be met. Re-optimization cannot take them as given, but as I said this will not be easy.

We know that from the last major set of changes confronting this industry—the restructuring process over the past 20 years. Restructuring involved divestiture, entry, competition and regulatory reform. It required many players in the industry to adapt. But for the most part it did not require meeting new objectives: Cost-minimizing production and cheap power remained central objectives.

Nonetheless, the process has been (in a word) ugly: It has been piecemeal, episodic, inconsistent, and incomplete. Regardless of what one thinks of the merits of restructuring in principle, regardless of how one weighs the results thus far, no one—and I do mean no one--should be satisfied with the process or with the patchwork present state of affairs.

And the challenges posed by the coming revolution in electricity production and usage are in fact greater. Unlike with restructuring, the objectives themselves are now changing. We are no longer trying to encourage production and consumption. Rather, we are concerned with decarbonizing production and with conservation in usage. And the solution will involve a system that must be more tightly controlled even as it accommodates more heterogeneity in production and usage than does the present architecture.

So exactly how will this come about? The answer, in short, is through changed attitudes and good policy. There is at least some progress of both fronts.

Polls show that a solid majority—about 60 percent--of Americans believe that global warming is a serious problem.

A survey of power industry executives found that 80 percent expect binding carbon caps within a decade.
More than half the states now have renewable portfolio standards.

Measures to replace filament lighting, install automated metering systems, and otherwise facilitate demand response are under consideration and even in place in some parts of this country.

And other countries have considerable experience with renewables, with intermittent power, with alternative incentive regulation, with customer metering, and so forth. We can certainly learn from their experience,

As for policy, state and federal regulators, competition authorities, legislatures, and administrations will need to confront the task at hand, provide leadership and resources, and develop the capability to address new issues.

Regulators will need to address many of the tasks I have just listed, and undoubtedly more. These include transmission adequacy and access, dynamic pricing and demand response techniques, incentive regulation reforms, assurance of adequate generation to local distribution utilities, and integration of intermittent generation into control areas. To do so, they will need resources and skills commensurate with the tasks. At the federal level, those ingredients may be in place or at least within grasp. For many states, however, it is clear from their struggles with restructuring issues to date that their capabilities may not extend to dealing with all that will be required for efficiency in energy usage and decarbonized production. Unless this is remedies, there will be the risk of inconsistent policy, bad policy, or no policy at all.

Competition policy will also need to be optimized for this new regime. At present the principle roles of the antitrust agencies is their shared responsibility for reviewing electricity mergers. As Diana has urged, even this needs to be rationalized, but it will also need more fundamental change as the revolution unfolds. The reason is simple: More and more of the
electric power industry will become deregulated, subject to ordinary antitrust standards rather than those more specific to the industry. And generally speaking, when that occurs, the appropriate locus for competition policy shifts to the Justice Department and Federal Trade Commission. This ensures the application of the same standard as for other industries.

These agencies should anticipate a number of competition issues in electric power. For example, based on other industries’ transitions to less regulated or unregulated status, a surge of mergers is likely in a liberalized electricity sector. One such wave has already occurred, but further changes in the industry will likely trigger more such mergers, and the agencies need to be ready for them.

Moreover, electricity mergers pose questions that are in some respects different from most other industries. Standard approaches to defining markets and measuring concentration do not fully capture the risks to competition from mergers. The agencies already know this, of course, but more should be done prospectively to systematize the methodology tailored to this sector.

One particularly important objective of the agencies and regulators should be lowering barriers to entry by new competitors. Ease of entry can compensate for rising concentration from mergers. It can also ensure that new technologies have the opportunity to establish themselves in a market dominated by more traditional competitors. Barriers of various sorts—from siting requirements to regulatory inconsistency—should therefore be identified and reduced or dismantled wherever possible.

The agencies should also recognize that the electric power industry has conditions conducive to certain anticompetitive practices not often found in other sectors. Strategic withholding, price spikes, and access issues arise with particular frequency and magnitude here.
Neither antitrust nor regulation has thus far proven itself especially capable of detecting and correcting the problems, so greater attention to them now would be good policy.

And then, there will be new markets that will create new competitive challenges. Perhaps most especially, the design and implementation of cap and trade will raise a series of competition and regulatory issues that logically will involve DOJ, FTC, FERC, CFTC, SEC, and EPA. The initial distribution of permits, auction design, trading rules, and monitoring will all play a role in the success of any such market process. Policy needs to be attentive to the possibilities of competition problems arising here, as elsewhere.

And finally, if that is not enough, this next revolution will demand something that has been in short supply—more leadership from the federal government. Without a major federal role—a deep commitment from the administration, strong and comprehensive energy legislation, regulatory consistency at all levels, and the requisite resources—without those, we can be sure not only that the process will be ugly, but also that the outcome will be inadequate to the challenge before us.

So, these are the concerns that animate our discussion today. The two panels will focus on the implications of energy conservation and low-carbon production for all the institutions, and players, and markets of the electricity sector, and for the regulation and competition policy necessary to make these things happen and to make them work well. There are important issues, and AAI and Diana are to be commended for looking ahead and anticipating them. I look forward to today’s sessions to provide us all with an agenda for thought and action.