

Where to Next?

A personal take on the past, present and future of America's electricity sector, unhindered by simulations, Ohm's Law, counterfactuals, efficient market theory, or econometrics

by

Leonard S. Hyman, CFA
Senior Advisor
Black & Veatch

presented to

Seventh
Carnegie Mellon University
Electricity Conference
Pittsburgh, PA
9 March 2011

(All opinions expressed are those of the author)



In the past ... engineers ... have... been perplexed repeatedly by society's failure to adopt available technical approaches to problems... The reason technical responses to the energy problem are not sufficient is that it is technological in character.¹

--- Thomas P. Hughes

Where do we go from here? Before that, where are we, and how did we get here? And while you ponder those questions, ask whether a mature industry, around for over a century, bound up in so many rules, can really change its spots, and whether, when it does, whether its customers come out ahead?

Restructuring

The restructuring of America's electricity industry developed in two stages. In the first, initiated three decades ago, the Federal government opened the way for qualified independent power producers (IPPs) to sell their output to utilities, at prices determined by the states. The IPPs demonstrated that they could build and operate power plants at least as reliably and efficiently as could the regulated utilities. They also demonstrated that incentivized entrepreneurs could take advantage of rules and regulations to extract large sums of money from the incumbents and, ultimately from consumers.

The IPPs developed their businesses between 1982, when the Supreme Court affirmed the legality of the Public Utility Regulatory Policies Act, and 1992, when Congress passed the Energy Policy Act. During those years, the real price of electricity declined, not because of the introduction of "competitive power" but because fuel prices fell. By 1992, power purchased from IPPs constituted about 6% of the utilities' generating mix, but accounted for over 20% in ten states, and in those, the high cost of that purchased power inflated the electric bills. The introduction of "competition" there may have helped the competitors more than the consumers. (See Figure 1.)

The second stage of restructuring began in 1992, with the Energy Policy Act, which opened the wholesale power market to competition from outsiders. Some states followed up by restructuring their local markets, and the Feds revamped management of transmission and encouraged large scale wholesale markets.

We could characterize the second stage of restructuring (or "deregulation" as some would say) by three developments, or possibly, non developments, sort of like the dog that did not bark in the night.

¹ Thomas P. Hughes, "Technological History and technical Problems", in Chauncey Starr and Philip C. Ritterbush, *Science, Technology and Human Prospect* (NY: Pergamon Press, 1980), p.143.

1. State -by-state restructuring stalled after the California and Enron events, Some states even returned to regulation. I would argue that if restructuring had produced spectacularly positive results, people would have clamored for more of it. They did not. (See Figure 2.)

2. Dramatic cost and price reductions, and new products and services followed the restructuring of other regulated industries. In the electricity sector, new products and services developed, basically, to enable consumers to navigate the newly complex marketplace, rather than provide them with something new. Cost and price reductions, over time, proved little different than before restructuring. Initially, with so much uncertainty about how the market would evolve in each state, industry managers resolved to prepare their companies for competition, just in case the market moved in that direction. In addition, state restructuring agreements fixed prices for multi-year periods, so the utilities had to cut costs in order to show improved earnings. Thus, both the competitive and regulated sectors had reason to and did cut costs, reducing reported non-fuel operating expense per kWh by 21%, in real terms, between 1992 and 2001. Real price to ultimate customers declined. From then on, both non-fuel operating expenses and fuel costs edged up. Thus, on the basis of real price to consumers, or real price minus fuel costs, nothing happened in this restructuring period much different from what happened previously. (See Figure 3.)

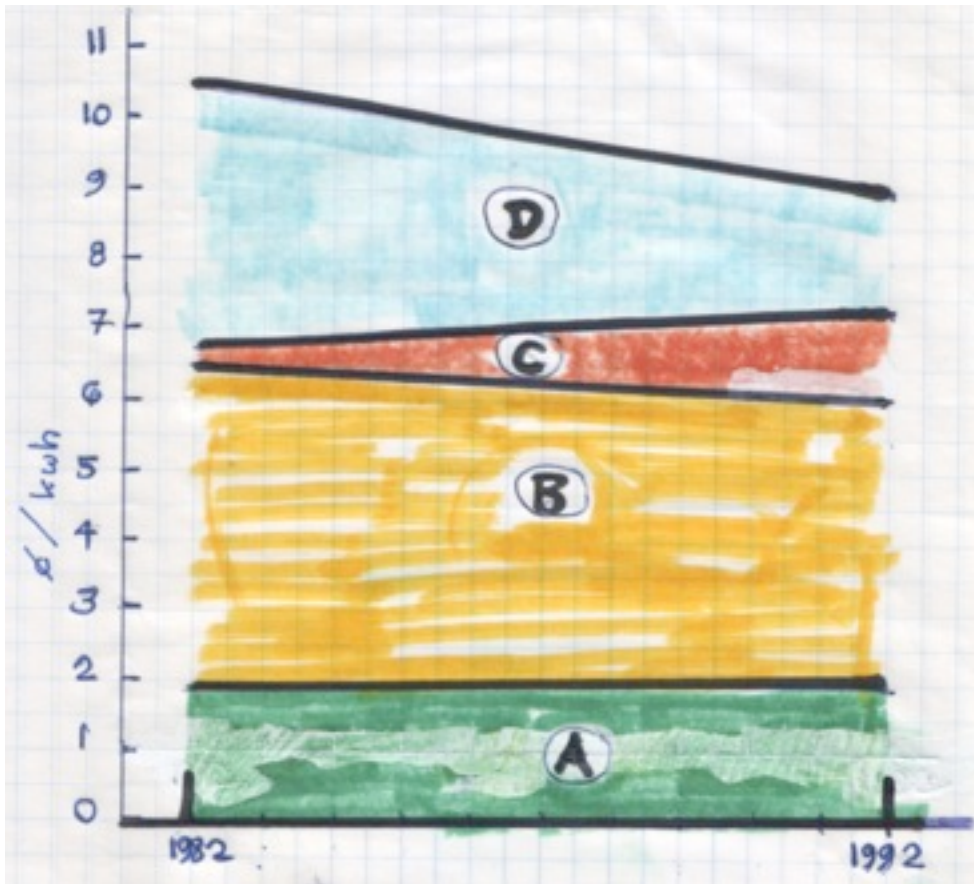
3. Restructuring began in states with relatively high electricity prices. Policy makers there expected competition to push down costs and then prices relative to prices elsewhere. Whether competition did or did not reduce costs more than elsewhere, it did not reduce the relative price gap between the regulated and unregulated states. (See Figure 4.) And for industrial customers, who had pushed hardest for deregulation, they certainly ended up worse off than before. (See Figure 5.)

I will not offer up a *post hoc ergo propter hoc* argument here, that because higher prices followed from restructuring, therefore restructuring caused higher prices. I will say only that to me, restructuring of the electricity sector has all the appearances of a dud, that's all. Personal opinion. You might, instead, take the view of the irate academic who wrote to me, "Who says the customer should benefit?", when reviewing an article I wrote on this topic.² Fair enough. Who should benefit?

That's the past and present. Where to next?

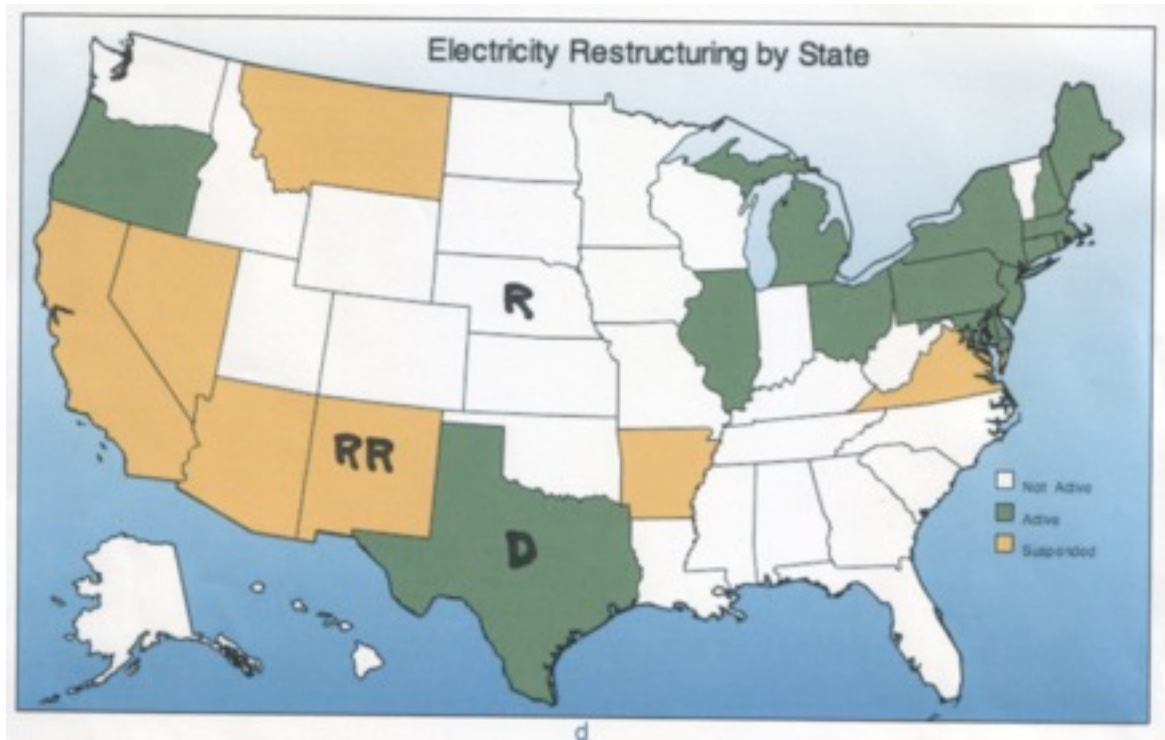
² Leonard S. Hyman, "Restructuring Electricity Policy and Financial Models", *Energy Economics*, 2010, vol. 32, pp.751-757.

Figure 1
Components of Real Price of Electricity
(¢ / kwh)
(1982-1992)



- A- Regulated profits
- B- Other operating expenses and unregulated profits
- C-- Purchased power
- D-- Fuel

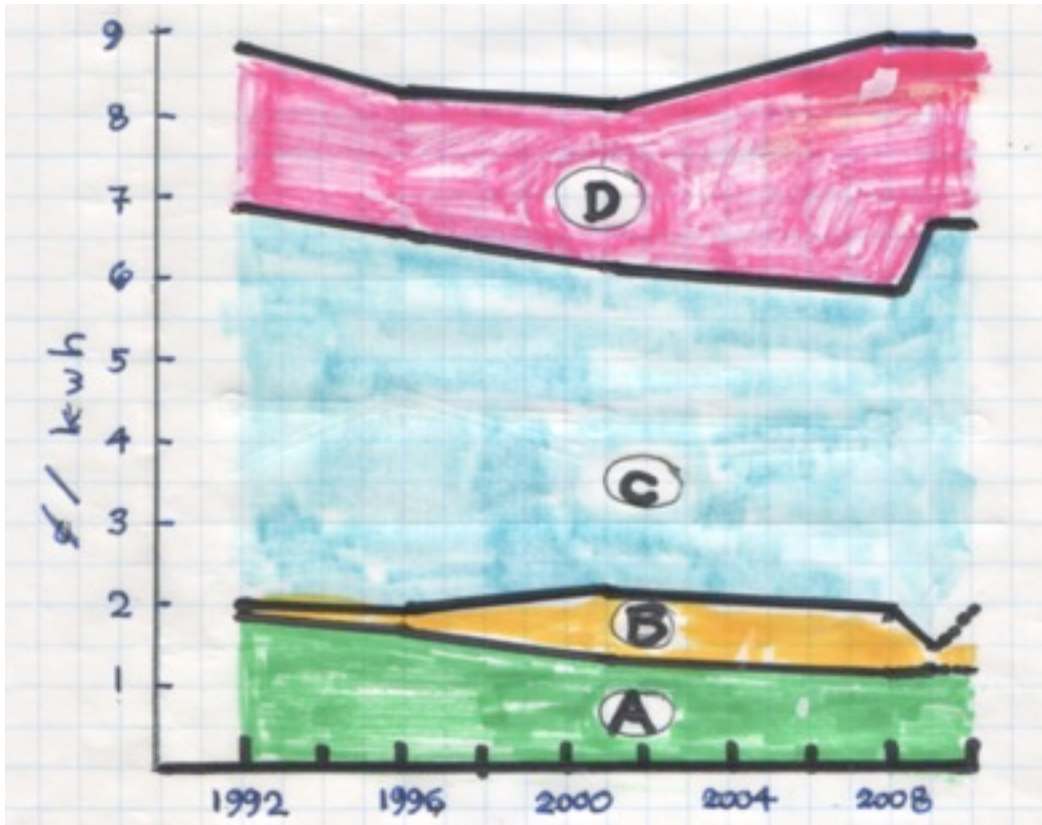
Figure 2
Electricity Restructuring by State
October 2010



R-- Regulated
RR-- Reregulated
D-- Deregulated

EIA classification used.

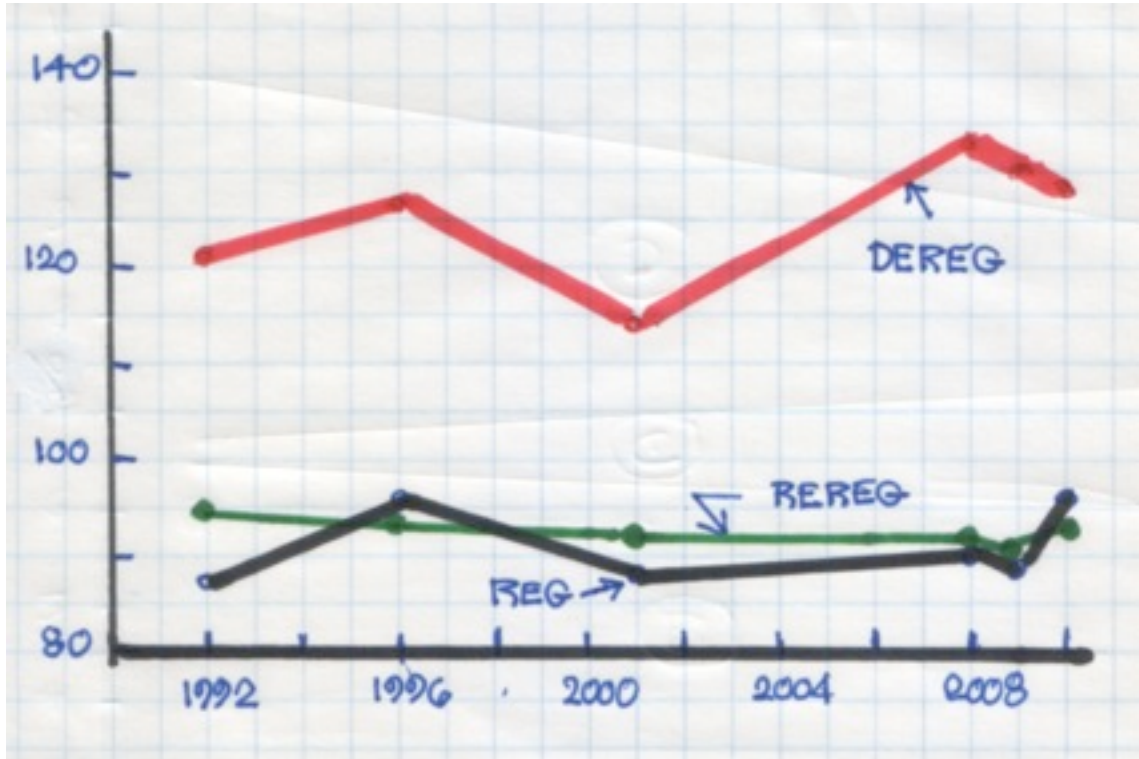
Figure 3
Components of Real Price of Electricity
(¢ / kwh)
(1992-2010)



- A-- Regulated profits
- B-- Unregulated profits
- C-- Other expenses
- D-- Fuel

Some numbers are partially estimated. Full year data for 2010 not yet available.

Figure 4
Electricity Prices to All Ultimate Customers by State
as Percentage of U.S. Average Price to Ultimate Customers
(%)
(1992-2010)



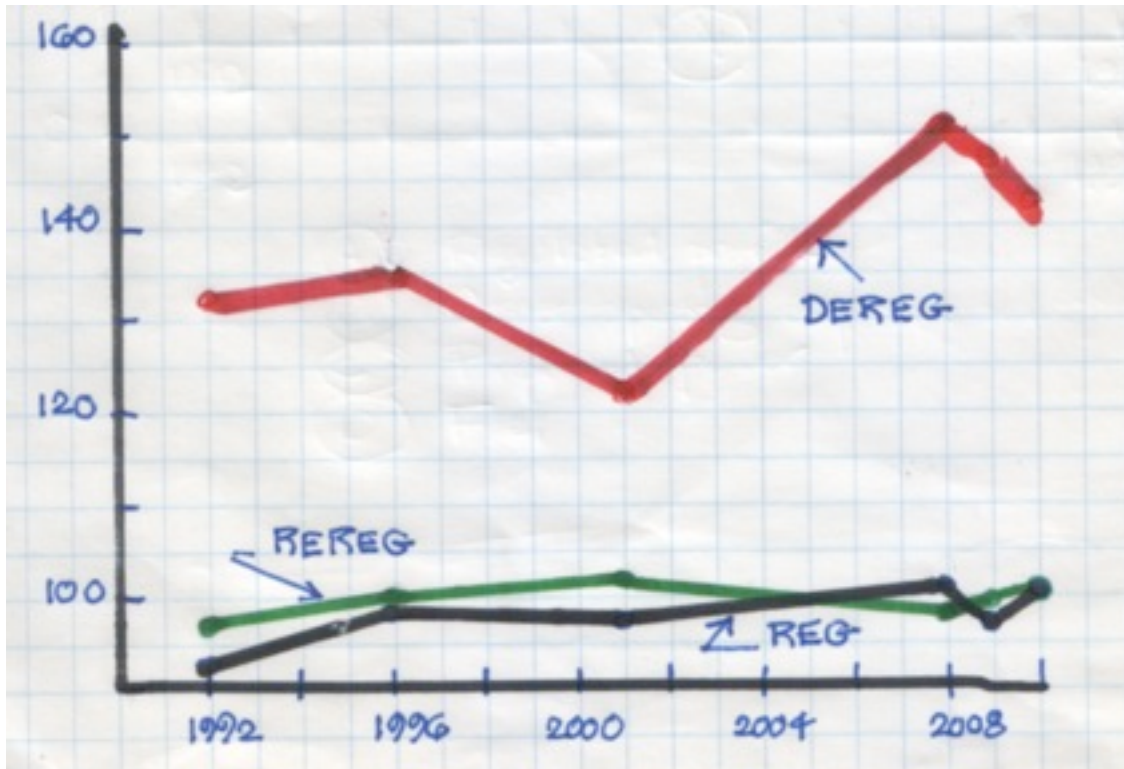
REG--Simple average of price of states always regulated

REREG-- Simple average of price of states that returned to regulation

DEREG-- Simple average of price of states that restructured (deregulated)

Based on latest EIA classification of states.

Figure 5
Electricity Prices by State for Industrial Customers by State
as Percentage of U.S. Average Price to Industrial Customers
(1992-2010)



REG-- Simple average of price of states still regulated

REREG-- Simple average of price of states that returned to regulation

DEREG-- Simple average of price of states that restructured (deregulated).

Based on latest EIA classification of states.

Six design flaws

Going forward, managements, policy makers and regulators have more pressing tasks than the fine tuning of deregulation. They have to figure out how to meet the electricity demands of the economy, lower or eliminate carbon emissions and facilitate a reduction in the country's vulnerability to instability in foreign energy markets --- and do all that in a way that does not overburden a weak economy. I don't see how they will meet those challenges successfully -- especially the last one -- unless they pay attention to basic principles generally ignored to date. Electric engineers keep telling regulators and policy makers, "You can't ignore Kirchhoff's Law", and I'm saying that they've ignored a lot more than that.

Keep in mind that I'm offering these observations as personal opinions. As my irate academic reviewer noted, "You can't prove negatives", and I'm not interested in proving anything, just suggesting some topics of research for those of you looking for something to do. You can always relegate these observations to the crank ideas bin and go back to studying Ohm's Law. Up to you. Here they are:

1. Motivation depends on more than money. Adam Smith explained why in the book that made his reputation, *The Theory of Moral Sentiments*,³ a book I suspect no electricity policy maker read. Smith argued (more or less) that pride, peer pressure, and conscience all motivate people to do the right thing, which may explain why the restructured, monetarily incentivized electric industry did not produce demonstrably superior results for consumers. Maybe the public service-oriented people in the past worked to operate efficiently and not overcharge customers because that was their job, not because they made more money to do so.

The overriding premise behind restructuring was that regulated industry had no monetary incentive to run efficiently, and, therefore, did not. I believed that, then, but I had not read Adam Smith's first book, or the plethora of behavioral and evolutionary studies that have made *homo economicus* look about as real as the Piltdown Man.

2. This brings me to my second point, demonstrated by researchers such as Vernon Smith, that participants in the market sometimes do not act in the ways predicted by economic theory, for any number of reasons. They may not act rationally in markets, either. They may act dishonestly. They may not think long term. Customers may not know how to determine the cheapest product. Why then, do we try to impose what J. M. Clark called the "normative ideal",⁴ maybe appropriate for a static market, and then spend endless effort trying to police it against people who will make enormous profits by finding ways around the rules. Yes, they are smarter than the regulators, and better motivated. As Adam Smith wrote:

³ Adam Smith, *The Theory of Moral Sentiments* (Amherst, NY: Prometheus Books, 2000).

⁴ John Maurice Clark, *Competition as a Dynamic Process* (Washington, DC: The Brookings Institution, 11961), p.ix.

Those passions which are restrained by the sense of propriety are all in some degree moderated and subdued by it. ⁵

But don't kid yourself. People who want to beat the system have gotten over any sense of propriety. If you have doubts, read *The Big Short* ⁶.

That also brings up the question of what a competitive market accomplishes, other than driving down costs and prices, if truly competitive. Is that all we want? J.M. Clark, who invented the idea of "workable competition" agreed that the experts considered it inferior, but argued that:

... the kind of competition we have ... is better than the ... norm, because it makes for progress. Some departures from "pure and perfect" competition are not only inseparable from progress, but necessary to it. The theory of effective competition is dynamic theory. ⁷

Better to have a perfect market that does not produce lower prices or something else?

3. Cost of capital matters in a capital intensive business where it makes up almost one quarter of the bill. Shifting the risk of capital investment matters, too. Shifting that risk was a major rationale for restructuring: let the generator investor rather than the consumer take the risk for the investment decision. That is, if the market does not require electricity from the generator, the investor loses, not the consumer. I made that argument many times, as did others. However, we all seem to have ignored Modigliani and Miller's dictum that the risk inherent in each investment determines its cost of capital. Place the risk on the investor, and the investor will demand a higher return in compensation for the increased risk. Shifting the risk does not make it go away. Consumers in a particular market might not have to pay for a particular unnecessary power plant. They will, however, eventually pay for the higher cost of capital that all competitive power stations will demand due to the higher risk of the competitive business, if the competitive power business is to remain competitive in the capital markets.

Let me put it this way:

- Customer takes the risk, customer is entitled to a lower price as payment for taking that risk.
- Generator takes the risk, generator is entitled to a higher price as payment

⁵ Smith, *op. cit.*, p.387.

⁶ Michael Lewis, *The Big Short* (NY: W.W. Norton, 2010).

⁷ J.M. Clark, *loc. cit.*

for taking on the risk.

The real trick, however, is to shift the risk without losing the payment associated with the previously taken risk. I think that Shimon Awerbuch was the first person to take note of that phenomenon.⁸

Getting to the bottom line, the operating savings produced by competition have to exceed the higher cost of capital to make the deal work for consumers.

4. Early in restructuring, policy makers latched onto the idea that dis-integrating the business into its components would promote efficiency. The firm could look for the cheapest producer of a component of the product, rather than rely on its in-house supplier. Furthermore, policy makers had to separate the obviously competitive generating function from the obviously monopolistic transmission and distribution functions (just as Judge Greene separated the Western Electric manufacturing operation from AT&T's telephone services). Competitive outsiders could, then, sell their products and services to ultimate customers using the regulated wires for transport. This concept of dis-integration came along about the same time -- with the same messianic fervor-- as the re-engineering movement, later renounced by its prophets .⁹

Yet over 50 years before, Ronald Coase, another Nobel Prize winner resident at the University of Chicago, wrote a seminal article on transaction costs, pointing out that organizations that encompass multiple activities within the corporate entity, can avoid transaction costs between suppliers. Classic economic theory, I gather, said that individual suppliers, all competing, could furnish supplies more efficiently than could the assembler of the product doing everything in-house. Coase said that, perhaps, all the transaction costs of the coordination effort exceeded the savings caused by competition. Stephen Peck, formerly of EPRI and a student of Coase, once said to me, "Maybe there's a reason that electric companies are vertically integrated."¹⁰ Yet I don't remember anyone mentioning transaction costs during restructuring.

Now, in restructured states, the electricity goes through at least five entities, all of which take a piece of the action. Some intermediaries have pay scales beyond the dreams of utility operators, and I'm sure that Adam Smith would have put them in his unproductive category of worker. None of these entities has full control of the product, or an incentive to keep down the price or the costs through the supply chain. (Note that the Bell System and the dis-integrated UK electric system have re-integrated.)

⁸ Shimon Awerbuch and Leonard S. Hyman, "Demystification-- The Economic Realities of Securitization", *Electricity Journal*, Oct. 1997, pp. 27-37.

⁹ Michael Hammer and James Champy, *Reengineering the Corporation* (NY: HarperCollins, 1993).

¹⁰ Stephen C. Peck, "Coasian insights on Electricity Structural Reform", Flèche, May 2003.

5. That brings us to the customer. The legendary management consultant Peter Drucker admonished:

The Customer is the Business.¹¹

Yet does any firm in the restructured electricity market control all aspects of the process in order to assemble the lowest cost, most reliable product for the customer and compete with other firms that try to do the same? The customer, instead, faces an additive process, in which no member of the supply chain cares much about what the previous ones or the next ones charge, or the cost of the final product. In the end, furthermore, the customer may face a confusing array of service offerings that provide the same commodity product, and not even know how to choose the least expensive one. Perhaps the only way to make a profit on the retail sale of an undifferentiated commodity is to confuse the consumers.

Consider the view of the customer as an inconvenient attachment to the network, as it affects the smart grid, as an example. The smart grid started as a means to operate the network more intelligently, efficiently, economically and reliably. As such, I am certain that regulators and consumers would have bought in. Then it morphed into other things, first a vehicle to facilitate greenness, and then, as a means to impose the pricing systems that economic purists always wanted to impose, but customers did not seem to want --- imposing those charges (as well as the added cost of the smart grid equipment) on customers already reeling from the impact of the Great Recession. Imagine trying to insert seemingly intrusive Orwellian devices into the homes of suspicious customers already up in arms over other government intrusions, real or imaginary. The smart grid promoters could not come up with good cost/benefit analyses for smart grid, but don't worry, the Feds like it! Talk about a tin ear!

In most other businesses, firms try to shape themselves so that they can give customers what the customers want. Do electric businesses reverse the process, and try to figure out how to change the customer in order not to inconvenience the electricity supplier? Is the customer always wrong? To the extent that smart appliances arrive at the scene, they could end up controlled by smart cell phones, with the meddlesome electric company smart grid shut out of the picture altogether. Why not first find out what the customer wants, and who can best deliver what the customer wants?

6. F.A. Hayek, the favorite economist of the rising Republican right, had a lot to say about energy policy, even if he did not mention it, and if you listen to what the newcomers to DC say, you will hear Hayek. For at least the past decade, politicians have chosen to focus on doing things rather than setting policy. Basically, that means subsidizing a chosen solution to a fuzzily stated problem --- nuclear, domestic oil drilling, windmills, whatever. Congress picks the solution and the general taxpayer or consumer pays, and so does the provider of a competing service that has been pushed out by the subsidy, as Hayek noted.

¹¹ Peter Drucker, *Managing for Results* (NY: Harper & Row, 1964), p.91.

In *The Road to Serfdom*¹², Hayek laid out why the central planner does not know as much as the market, why the government should set goals, letting the participants in the market figure out how to get there in the most efficient manner possible, and why ignoring these principles can lead to unexpected and undesired consequences. One recently empowered Republican in the House of Representatives announced that the government “shouldn’t pick winners and losers.”¹³ But that’s what the government plans to do. So far, 29 states plus DC have mandated that electricity suppliers buy given amounts of renewable resources. The Federal government seems to have similar plans to encourage a long list of energy resources. The think tank Resources for the Future claimed that putting a price on carbon, instead, would reduce carbon emissions 70% more at a 25% lower cost than via a renewable standard.¹⁴ I wonder if they have factored in the cleverness of people who will use the rules to do better than any think tanker could have dreamed.

None of this gets to the heart of the matter: the conflation of the goal of reducing carbon emissions in an efficient manner with that of boosting the production of renewable resources. Which do we want? The former may require an energy policy, possibly even a tax. Nobody with clout lobbies for energy policy. They lobby, instead for tax breaks and mandates for their particular products. So, we get selected solutions chosen by politicians that could create entitlement programs similar to the ones that produced such handsome benefits for the IPPs.

Looking ahead

At this point, I don’t want to do what many novelists do when they realize that they have to wind up the book, but can’t figure out how to do so, so they concoct an unsatisfactory solution, or leave everyone hanging, or open the door for a *deus ex machina*, such as the last minute arrival of the U.S. cavalry, for instance. So here goes. Keep in mind that I have been asked to predict what will come next, not what I hope will come next.

First of all, doing more of the same will produce more of the same. The industry has been cutting costs for 20 years. What is left to cut? It has not come up with significant new products and services, either. Why should that surprise us, given the low expenditures on research and development and low priority to developing marketing skills. Why expect something different?

Second, market and industry structure usually evolves over time, to fit the particular needs of an industry and its market. The structure of the restructured electricity industry

¹² F.A. Hayek, *The Road to Serfdom, Text and Documents, The Definitive Edition* (Chicago: University of Chicago Press, 2007).

¹³ Jeffrey Mervis, “Can Obama Strike a Deal With House Republicans?”, *Science*, 4 February 2011, p. 520.

¹⁴ Eli Kintisch, “Obama Shifts From Emissions to ‘Clean ‘ Energy”, *Science*, 4 February 2011, p.524.

did not evolve. It was designed. Some designs are better than others. The electric design had errors built into it. It will evolve only with the greatest difficulty because of the need to satisfy at least 52 regulatory jurisdictions in advance of any changes that might satisfy investors or consumers.

Third, what does the electricity industry do that distinguishes it from run-of-the-mill industries, other than providing a necessity for modern society that, so far, requires a physical connection from manufacturer to consumer? Well, it builds, finances, owns and operates infrastructure, vast networks expected to function at almost all times, under the most stressful conditions, It serves all applicants who can pay for the service, whenever they want the service. It also builds, finances, owns and operates facilities that manufacture usable energy on a scale that few ordinary commercial firms would undertake without a governmental or consumer guarantee. Furthermore, the industry must furnish the output when the consumers want it. The industry, as well socializes --- dare I use that word?-- risks, a process which makes certain massive projects do-able, I think. That 's what the industry does best. If you want new products or bugs that eat the carbon dioxide in the coal and produce aphrodisiacs as a byproduct, go somewhere else. Don't expect Caterpillar to build a Porsche.

So where to next?

A serious energy policy, one rooted in realistic economic, financial and managerial principles, one that appreciates the value of long lasting infrastructure and recognizes the costs of externalities, could play to the strengths of the industry, and even provide benefits to consumers, but I do not see such a policy on the horizon, for three reasons.

First, it would require clear signals, backed up by taxing mechanisms, and an acceptance on the part of all parties of Hayek's argument that :

There are... undoubted fields where no legal arrangement can create the main condition on which the usefulness of the system of competition and private property depends: namely, that the owner benefits from all the useful services rendered by his property and suffers all the damages caused to others by its use.¹⁵

That gets us to reason number two. We cannot just throw money at technical solutions but not give the market reason to buy those solutions or to make them here. Everyone would like to see electric automobiles charged up by wind at night, managed via a smart grid. That would solve carbon emission, job and national security problems of all sorts. But consider the cost of the electric car versus an ordinary car, the price of natural gas, the location of the most aggressive green manufacturers, and the fragmented adaptation of smart grid. Where is the payoff to move ahead, other than via subsidies that could disappear in the next iteration of the Federal budget, or via mandates that might disappear once their cost became evident?

¹⁵ Hayek, *op. cit.*, p.87.

Third, we must set priorities for public policy. Do we want to expend our efforts on squeezing another 5% out of the electric bill, or do we want the industry to tackle major energy and environmental issues? Where is the bigger payoff? Does policy A facilitate or hinder policy B? Sounds like guns or butter, or the political option, guns and butter, doesn't it?

I believe that significant change will come from outside the industry, from entrepreneurs who see an opportunity to connect with customers, to sell them something that they want, and from technologists who may even produce products compelling enough to force the industry to take them, which brings us back to public policy, which should, at least, keep the door open to change

You make your assessment of public policy, and whether some outsider will come up with the invention that solves it all, the *deus ex machina*. I can't predict the latter, but I can predict more of the same, more disputes, more entitlements, more technical fixes in place of policy. Neither the supposed latter day disciples of Keynes nor of Hayek seem likely to get the difference between things and policy, something Thomas P. Hughes warned of decades ago, but who reads history?

Then again, who predicted the iPad, the iPod and the iPhone? Maybe I just need a new crystal ball. I hope so.