

A 'MODEST PROPOSAL' FOR THE U.S. ELECTRICITY INDUSTRY
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In thinking about my remarks today, I decided to assume the role of a visitor from another planet – Venus – asked to view the American electricity system from a distance and make some recommendations. Venus's dense atmosphere is 96 percent CO₂ and our surface temperature is about 900 degrees Fahrenheit, so we know something about the greenhouse effect. We live in gated underground cave communities. It's not so bad, but it's good to come to Earth for a few days.

But when I look at your electricity system, made up as it is of 100 large utilities and 3000 or so smaller ones, and three separate grids, I do wonder, Why did they do it that way?

I will comment on your U.S. electricity system and the challenges it faces, but must do so from the context of the growing needs problems of your planet as a whole. Your Earth is entering a period of massive change. Fifty-five years ago there were less than 3 billion humans on Earth. Now there are 6.7 billion people, and in a very short time there will be 9 billion. Most of the growth will occur in developing countries, whose growing middle class want the amenities – heat, electricity, cars, TVs, appliances – that Americans have grown used to. It's already happening in China, which is putting 14,000 new cars on the road every day and bringing new coal-fired plants online at the rate of one every two weeks. (China is aware that it must soon turn to wind power, solar, and nuclear if its population growth does not literally choke much of the country. One example: its emission standards for new cars are far higher than those in the U.S., which are the lowest in the world.)

As global population and aspirations grow, resources – steel, aluminum, coal, gas, water, and food – will be in higher demand and more expensive.

I see the issues facing you in two groupings – the structural and the substantive.

STRUCTURAL CHANGES NEEDED FOR SUCCESS

- Your transmission systems must become more efficient. Regional transmission organizations (RTOs) are doing a good job, given the multiplicity of tasks, interests and players they face. But the RTO process is often cumbersome and does not serve all interests equally well. You would be better served by a set of six to ten regional transmission companies – Transcos – to maintain reliability, and to plan, operate and build upon the existing system. These Transcos may be private or public but must be totally divorced from any interest in the ownership or marketing of power generation. Their geographic scope should be defined as broadly as practicable, because larger markets can link more buyers and sellers and result in more market-clearing transactions.

A 21st century Federal Power Act, of the type envisioned by Prof. Joskow, could establish the Transcos, authorize them to lease the necessary lines, substations, etc., from their owners, and protect existing contracts. FERC would provide oversight and a market monitor for each Transco. The interests of affected states could be considered through the state joint board section in section 209 of the Act or through interstate agreements.

- Major facility siting should be federalized, with state participation. The electricity business has been multistate in character for decades, so it makes little sense for individual states to decide “yea” or “nay” on major transmission lines or power plants that serve interstate and national interests. State interests in each case can be addressed by having affected states participate fully through section 209 joint boards or interstate agreements patterned after the Northwest Power and Conservation Council, for example. Reasonable time limits for decisions should be set in

the new Federal Power Act. Facilities of a purely intrastate nature would remain the exclusive domain of the states.

- Services should be unbundled and pricing transparent. Power suppliers should unbundle their capacity, energy, and ancillary service offerings at both wholesale and retail levels (to the extent possible), so that all potential customers are aware of the cost for each service and able to make informed decisions. Rolled-in rates disguise the cost of services and lead to inefficient choices.
- Basic and applied research and engineering education must be better funded. U.S. electric utility funding for research is very low – under 1 percent – compared to other developed countries. A tiny levy on each kWh sold could produce an enormous fund the greater part of which – say 80 percent – could be channeled into promising technologies and the remainder used to entice students into engineering education, in which the U.S. is falling dangerously behind.

SUBSTANTIVE CHANGES NEED FOR SUCCESS

- You need a stable, supportive policy toward energy efficiency and renewables. The preferred methods of generation in the U.S. and around the world are energy efficiency and renewables. Although some renewables will not be the lowest cost at the moment of decision, many believe they will prove to be so in the long run, because the cost of fossil fuels – the principal energy source at present – will rise in the long run, while the cost of solar, solar thermal, wind, and biomass are likely to decrease with innovation and mass production. Few knowledgeable people think that these resources alone will be enough to meet U.S. needs, not to mention those of the developing world. But they surely have a major role to play. Your government's erratic backing of them, however, has held back innovation and mass production of these technologies, which

much of the world is hungry for. Wind and solar have been supported by production or tax credits, but only intermittently, like unwanted tenants always facing eviction.

Much of the developing world doesn't have a grid and central station generation. Distributed supply – wind and solar and others – can help them now. But companies that would invest in renewables need certainty before they can commit the huge funds needed for mass production. As Jeffrey Immelt, CEO of General Electric, told Tom Friedman in an interview for Friedman's essential book, "Hot, Flat, and Crowded" –

I think if you asked the utilities and big manufacturers in this business what they would like most, it would be for the president to stand up and say, "By 2025 we are going to produce this much coal, this much natural gas, this much wind, this much solar, this much nuclear, and nothing is going to stand in the way." Well, you'd have about 30 days of complaining and crying, and then people across the whole energy industry would just stand up and say, "Thank you, Mr. President, now let's go out and do it." And we would go out and do it.

Friedman's book recounts the story of First Solar, an Ohio startup in 1992, which had brought down the cost of solar modules from \$3 to \$1.12 per watt by the end of 2007. But First Solar has become largely a German success story because there was no market in the U.S. during the '90s for its product. First Solar found its mass market in Germany, which enacted an incentive "feed-in" law, which other European countries have since copied. The German government told consumers that if they put in solar installations, they were guaranteed a connection to the grid and would be paid for their production for 20 years. Germany's market for solar boomed. Soon much of Europe was headed the same way.

First Solar built its first two plants in Ohio, but when it decided where to locate its new mass production plant it chose Germany. Between 2006 and 2008 First Solar's market cap soared from \$1.5 billion to \$20 billion. Its CEO, Mike Ahearn, says "Countries all over the world are contacting us to build our next factory there, but so far no one has called from the U.S."

- You need to find better ways to use coal and nuclear. Coal and nuclear are generation's "bad boys" – coal because of its CO₂ and other harmful emissions, and nuclear for a variety of reasons: uncertainty about its costs, waste disposal problems, and other concerns. But they are badly needed for baseload generation – capacity.

California, Oregon and perhaps other states are banning not only in-state coal-fired plants but imports from out-of-state as well. IGCC plants look expensive today and greenhouse gas sequestration is still unproven. But you have the equivalent of a Saudi Arabia of coal in the Wyoming and Montana coalfields. It's too rich a resource to give up on, so I suggest an accelerated research effort to find out how to use this abundant resource safely.

Nuclear power is more an emotional problem than a scientific one. Like coal, it is a domestic resource. But unlike coal, it has virtually no carbon emissions. Some believe that Earth's temperatures are rising because of other reasons, but it seems clear that human activity contributes to the greenhouse effect. Nuclear power can cut carbon emissions, not only in the U.S., but Earth-wide. Nuclear could, for example, displace many of the coal-fired plants that China, with its 8 to 10 percent growth rate, will otherwise build – at the rate of one every two weeks.

But, just as you did decades before, you may be going about nuclear the wrong way. For nuclear power to be feasible, you need to choose one or two standardized designs following a careful

but timely licensing process. Today there are a score of applicants for NRC construction and operating licenses, and multiple plant designs. This portends delay and excessive cost. If you are serious about advancing nuclear power, the NRC should weed out the less promising designs and applicants early and focus on two or three projects. Nuclear power can be clean and affordable. It can provide a major solution to climate change, national security, and balance of payment concerns – but not if plants take 15 years to license and build.

- Gas – the Transition Fuel. Natural gas is still plentiful. Gas turbines and combined cycle plants are relatively inexpensive and easy to build. Gas can be our transition fuel, but for how long?
- You should upgrade the Power Grid. When was the last time you heard a presidential candidate mention the need to upgrade the electricity grid? Never. So why now? I suspect it's because wind developers are finding it difficult to move energy from remote installations, many of them in the Great Plains, to load centers. It's time to upgrade the grid, not just to clear points of congestion, but to enable large region-to-region transfers. For example, to move large amounts of wind and coal-fired generation from the Montana, Wyoming, and North Dakota coalfields to Midwest and West Coast load centers.

And isn't it time, at last, to link up the eastern, western and Texas grids? The best way to do this may be with direct current transmission. DC transmission can work well as an overlay to the AC grid. Because of its directionality, DC can help avoid or restore outages in the AC system. It's cheaper to build than AC, has less line loss, and requires less right-of-way. It's time to apply DC technology more widely for the added security, flexibility and efficiency it offers.

- You should promote Electric Vehicles – now. Two-thirds of America's use of oil is for transportation and over half of that is for automobiles. With most urban driving consisting of

10 to 50 mile trips, imagine what electric cars or plug-in hybrids could do to cut our carbon output. Imagine what plug-in electrics, charging at night, would do to smooth out utility load factors, boost revenues, improve air quality, and improve the country's balance of payments? Your trade associations should be working with the Obama administration now to make sure the auto industry retools to mass produce a fleet of affordable EVs for in-town driving, and also to offer tax credits or other inducements to buyers. Plug-in EVs require no special voltage upgrades. They are not tomorrow's technology; they can and should be mass produced now.

- Wanted: Leadership. If the Obama administration commits to investing in energy technologies as the President-elect promised during his campaign, U.S. companies would get a huge boost and create badly needed employment here. U.S. companies would be better positioned to compete with foreign firms that have leapt ahead of you in many areas. In many of these technologies, innovation and mass production are key. These are things U.S. companies know how to do, but they need steady, predictable support from the government.

You have been talking around and around a National Energy Policy for decades. You need a real plan – not one made on the fly in conferences committee, after last minute compromises that make little sense, like the heavy tariff on energy-rich sugarcane ethanol from Brazil, while not taxing Saudi oil at all. You need the sort of solid plan Jeff Immelt talked about.

You need leadership to forge a solid program for efficient expansion of your power system, and to put U.S. companies back in the lead of technologies the world sorely needs. It's fast approaching zero hour – time to decide if you want to be leaders or followers. ■