Caught in the Headlights of Electricity Market Reform

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Tragedy on the Road to Reform

What is happening to the North American electricity sector? A few years ago, headlines trumpeted the unstoppable restructuring behemoth, barrelling down the highway. But it now appears to be careening out of control. About-to-reform jurisdictions, like Ontario and New York, stand frozen in the headlights, unsure whether to leap forward or jump back. Recently reformed jurisdictions, like Alberta and Pennsylvania, wonder if they jumped the wrong way, and brace for the impact. One jurisdiction is already road-kill – a messy, direct hit.

Confusion breeds polarization. For believers in a centrally planned, publicly owned electricity sector, the California fatality vindicates their scepticism. For believers in unfettered markets, California's timid reformers must deregulate further. Consumers and politicians don't know whom to believe.

To understand any of this, we first need to remind ourselves of the rationale for competitive electricity markets. Then we need to comprehend the ways in which electricity is not a typical commodity. A California post-mortem might help. Then, perhaps, we can venture back to the highway – albeit cautiously.

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A Primer on Electricity Market Reform

Emerging cost advantages of smaller plants over large, monopoly generators drives electricity reform. (The terms reform or restructuring, instead of deregulation, avoid the unhelpful debate over whether increased or decreased regulation is the ultimate outcome.) Numerous smaller and some larger electricity generators, in concert with open-access, wholesale electricity trade across many interconnected jurisdictions, can provide the usual benefits of competition – lower long-run prices and greater consumer choice. This is because consumers can switch their purchases from unsuccessful, high-cost generators to successful generators. In a monopoly world, they cannot. If their monopoly misinvests, say in nuclear power, consumers must pay – or perhaps taxpayers if the monopoly is publicly owned. In the competitive world, investors pay for their misfortune. Consumers do not escape unscathed, but after a short detour on a bumpy road they usually do okay.

In future, energy markets will continue to be highly uncertain. First, price instability will remain, given that supply and demand trajectories are rarely in sync. Second, environmental harm from fossil fuels (air pollution, greenhouse gases) exacerbates the uncertainties about future regulations, technological change and costs. The only certainty is that misinvestments in electricity generation will continue to occur – some of them colossal – resulting in the typical market mix of winners and losers. In this situation, it is prudent for society to encourage private investors to assume a significant share of the risk. This is the rationale for reform toward a competitive electricity market. A growing number of jurisdictions throughout the world have now carried out reforms in this direction, most with considerable success.

Sounds straightforward so far. But there is a catch. Electricity is not your ordinary commodity. It must be handled with care.

First, there is the system operation issue. Electricity is a special commodity in that supply and demand must be instantaneously balanced at all times throughout the grid and the path of electron flow cannot be guaranteed. If a supplier fails to meet a contractual obligation to deliver power to a customer, other grid users are affected. Centralized and independent control of system operation is required to ensure system stability and to keep track of unmet obligations in real-time. Economic efficiency should also improve with a central market mechanism that enables the system operator to ensure that resources are dispatched in order of cost (merit dispatch) and to help participants establish mutually beneficial, cost-minimizing contracting arrangements.

In creating mechanisms for system operation and power exchange, lots of things can go wrong. If you are at all risk averse, you would overdesign the system, at a reasonable cost, to ensure robustness under unexpected and undesirable circumstances. You would give the system operator the means to ensure sufficient reserve margin under extreme events. You would set stringent power exchange rules to prevent significant suppliers from manipulating the price, which otherwise is not too difficult when supply is tight and the system operator is desperately trying to keep the lights on at all costs.

Second, there is the essential service issue. Left to its own, a competitive electricity market would exhibit the same cyclical price and investment pattern of other commodity markets: the market tightens, prices shoot up and some people have trouble getting supply, the high prices stimulate investment and demand reduction, supply increases relative to demand, prices fall – and the cycle repeats. However, while consumers relate only indirectly to most commodity markets – like lumber, wheat and copper – their relationship to electricity is immediate and essential. They face their electricity bill every month or two. And they can't live a moment without power – especially during the playoffs. Problems occur when electricity reforms are designed by market enthusiasts who believe that everyone is, or should be, as excited as they are about the intricacies of competitive markets. This may be okay for industry, but households are more like government in their ignorance of markets and their dislike of budgetary uncertainty. Few

householders want to play the market with their monthly electric bill – negotiating with suppliers, scanning the futures market, taking out hedges, weathering a price spike. They want a stable, manageable rate that they never have to think about, even if they pay a reasonable premium for that.

This characteristic of electricity puts the onus on market reformers to include mechanisms that dampen the cycle of over- and under-investment and that partially protect consumers from the potentially brutal but necessary price signals to investors, all of this while ensuring a highly reliable service. If you are at all risk averse, you would include an extra incentive, at a reasonable cost, that compensates risk-taking investors for the chance that their units might run infrequently during excess supply. You would provide pricing and contracting mechanisms that ensure average retail price stability during times of volatile wholesale markets, without creating a financial imbalance. You would maximize the opportunities and rewards for those consumers who can and are willing (usually but not only industry) to reduce demand in response to price signals, which would further dampen price volatility. You would sustain the long-run rights of consumers to a share of low cost resources if they initially had such a benefit under the monopoly system.

California Dreaming Meets Reality

In hindsight, California reformers should have been much more cautious: testing the robustness of their market design under alternative conditions, especially with regard to the implications of these unique characteristics of electricity. Instead, the California reformers assumed that the right amount of investment would happen at the right time simply because they had opened the market. They assumed that prices could only go down, so they legislated fixed retail rates and did not allow distribution utilities to hedge the wholesale rates. They assumed that independent generators could not manipulate the spot market (although they worried about the former utilities), so they neglected to establish adequate safeguards. They assumed that price signals alone would enable the system operator to ensure adequate hourly supply, so they did not include ironclad authority for the operator to secure back-up supplies. They assumed that California's spot market would continue to attract sufficient out-of-state supplies, so they prohibited the distribution utilities from signing long-term contracts with these external suppliers (or with anyone else).

In fairness to the California reformers, they were also unlucky (a warning to other reformed and reforming jurisdictions which need to ponder how their systems would fare under a similar unfortunate sequence). While the first two years of the California reform were uneventful, with wholesale spot prices around 3 ¢/kwh, California then experienced one of its hottest summers and coldest winters from mid-2000 to early 2001. This coincided with one of the lowest water conditions for hydropower resources in its supplying region. It also coincided with several unforeseen in-state plant outages at critical times.

But these were not the only factors. During the 1990s, California's strong economic growth drove electricity demand higher by about 10,000 MWs while the state's generating capacity stagnated. This might be okay if external capacity is available. However, during the same period, demand in the western interconnected system (California's trading region) grew by 26,000 MWs while capacity grew by only 10,000 MWs. As is frequently observed in commodity markets, investment was lagging demand. But no one in California's reformed system had the responsibility to take preventative action (remember, the reformers did not include a special mechanism to stimulate investment during surplus, unlike the English market reformers for example).

This combination of foreseeable market trends and unpredictable events resulted in an extremely tight California market in the summer of 2000. In the power exchange, high wholesale prices were required to secure adequate supply for the system operator, with the price sometimes spiking above 50 ¢/kwh. This continued through the summer, with average prices around 20 ¢/kwh and, after a short respite in the fall, prices climbed back to their high levels and stayed

there for the winter. Throughout this period, the distribution utilities were required to purchase all electricity in the power exchange at the high wholesale prices and sell it to their customers at low, government-mandated retail rates (remember, the reformers did not plan for high wholesale prices). The major utilities underrecovered their power purchase costs by about $12 billion in 2000 and the financial haemorrhaging continued unabated into 2001. In April, Pacific Gas and Electric filed for bankruptcy protection. Even at these high prices, the system operator was unable to acquire sufficient supply at critical times, forcing customer curtailments, emergency warnings and some rotating blackouts. During most critical periods, a significant percentage of in-state generating units were out-of-service for maintenance or refueling (remember, the reformers did not give the system operator emergency controls over generating units to keep the system in balance).

To make matters worse, it appears that influential independent suppliers exercised market power to accentuate the price spikes and earn windfall profits. Exercising market power may be undesirable, but it is only illegal if it involves collusion, a conspiracy to coordinate market action. But individual suppliers can eventually infer, from trial and error in the bidding process, if they have market power at critical times and then offer power at prices above their cost of production. The California system operator estimates that over $500 million in windfall profits were earned in the period May to November 2000 (remember, the reformers did not establish safeguards to prevent this or recapture the excess returns). B.C. Hydro alone earned $200 million, which may explain why British Columbia is now known as the jurisdiction in North America most supportive of electricity reform – in California.

The emergency crews are now at work. In January of 2001, the Federal Energy Regulatory Commission terminated the California power exchange. The U.S. Secretary of Energy has issued orders to compel generators to operate when needed. The California Department of Water Resources now purchases power directly on behalf of utility customers. The state government is about to purchase utility transmission assets above book value to compensate utilities for losses. The California Public Utilities Commission substantially raised retail rates for utility customers in April. The state government is streamlining plant siting and permitting requirements while exploring a complete overhaul of its electricity sector. In the meantime, California's market should remain tight, depending on weather and other difficult-to-control factors.

Cautions for Reformers

At great cost to itself, California has provided free lessons to electricity reformers. Let's hope they take heed. When designing competitive generation markets, reformers need to ensure a stable and efficient investment and price regime for those consumers who would rather worry about other things – like taxes and credit cards. Here are a few simple suggestions for current and would-be reformers in Canada.

Do not surrender your low-cost endowments. Quebec, British Columbia, Manitoba and Newfoundland have low-cost, substantially amortized hydropower resources that are likely to remain inexpensive under most scenarios of technological change, environmental constraints, and market dynamics. In a restructured market, these resources can be dedicated to domestic consumers via entitlement contracts (with essentially fixed prices) between the generating units and the distribution utilities, the latter acting as purchasing agents for customers. In B.C., such a contract (for 60 years duration) has existed since 1995 between Columbia Power Corporation and West Kootenay Power on behalf of its customers. While an entitlement contract sustains a low average cost of electricity, it need not distort market price signals to consumers as two-part tariffs already exist throughout the world that differentiate marginal costs from average costs. Thermal-dominated systems, as in Alberta, Saskatchewan, New Brunswick and Nova Scotia, may also have cost advantages to protect. Indeed, Alberta started its electricity restructuring in the early 1990s with a form of

entitlement contract to link consumers to its low-cost coal plants. Thus, it was disconcerting to watch Alberta's reformers change their approach at the end of the decade – with uncanny timing – and expose their consumers to the market by auctioning off the rights to the production from the low-cost coal plants, just as California's crisis elevated market prices throughout western North America. In the short-term, the Alberta government is compensating consumers with monthly rebates from the auction revenue. But what happens to consumers when the payments expire?

Err on the side of overdesigning mechanisms to ensure system reliability and prevent market manipulation. Reformers in Alberta and Ontario must demonstrate how, under a wide range of conditions, their systems will stimulate new generation investment, ensure sufficient reserve margin, counter market power, undertake appropriate transmission expansion, and protect consumers from market volatility. Their approaches, thus far, do not inspire confidence of sufficient differences from California, in spite of public claims to the contrary.

Implement mechanisms for demand-side price response well before launching market restructuring. California's utilities are now hastily implementing a host of tariffs and curtailment options that allow consumers to benefit themselves and the system by modulating their demand in response to real-time fluctuations in the power acquisition costs of their utility. Obvious candidates are industrial and large commercial customers (if they already possess time-of-use meters) but advances in information technology and reductions in metering costs will extend this scheme to those smaller customers who actually enjoy playing the electricity market. If California becomes, by necessity, a technology leader in this area – and reaps export benefits – the golden state may yet find a silver lining in those black clouds.

In conclusion, California's calamity has provided an opening for the ideologues on either side, some arguing for a reversal of reform, others for more radical reform. As usual, the best approach is to believe neither.

On one side, market enthusiasts criticize California's politicians for not hitting consumers with the wholesale price shocks, which would reduce demand and eventually lower the price. For a lesson in political realism, the market enthusiasts should be required to stand between politicians and consumers during the announcement of such a policy.

On the other side, central planners want to return to the days of aloof, secretive monopolies making enormous public investments – where society suffers the consequences of risky mistakes made by people whose job and personal investment is not on the line. For a lesson in economic risk, the central planners should be required to cover personally the losses of the next monopoly misinvestment.

The reformers in California can be criticized for an amazing faith in everything working, right away. Their cavalier design provides a lesson of what not to do, just as aspects of the reforms in England, Norway, Australia and elsewhere provide examples of what works. And what works is a cautious approach that pursues the benefits of competitive generation markets while recognizing that markets are not perfect in terms of matching supply and demand, and that most customers don't want to think at all about electricity. Then, just maybe, you won't get run over by electricity market reform.