



Deregulation to spark innovation in changing electricity market

by Peter Smith, BSc, P.Eng.

Fundamental changes are taking place in the electricity industry that will influence the way we generate power. In May of this year, the Energy Competition Act will establish a competitive electricity market. The Ministry of Energy, Science and Technology says that Bill 35, introduced in June 1998 and passed in the Ontario Legislature in October 1998, will provide new tools for environmental protection and ensure a safe and reliable supply of electricity. It also seeks to coax electricity providers to think outside the box. It's hoped that competition will encourage new ideas and technological innovations, making it possible for new companies to enter the electricity business. Perhaps new ideas and innovation will help to drive the old style, large, coal-fired generators out of business.

Conservative, risk averse, cautious, prudent, safe, steady; these are all words that come to mind when we think of electrical utility companies. And why not, because for the past century or so these companies have operated in a world where they had a monopoly. They were guaranteed a return on costs no matter how poorly they were managed. While these companies might not have been very innovative, and while they might not have encouraged new thinking or an entrepreneurial spirit, they did have certain strengths. Their stability allowed them to plan for the long-term: Load was forecast 10 or more years ahead and facilities were built to meet that anticipated load. With the exception of the years of recovery and rapid growth following the Second World War, brownouts and blackouts were virtually eliminated. We all knew that when we flicked the switch the lights came on. Even if it cost us a bit more than absolutely necessary, we were content to pay it because we had reliability and security.

But times change, and there are now a number of new forces acting on the electricity marketplace that are eroding these old paradigms and eliminating the certainties of the past. The entire nature of the electricity business is changing, fostering change in the old, large utilities, opening up new opportunities for both established and fledgling energy companies, and offering consumers choices that they have never had before. There are basically three sources of change that will shape the market over the next few years. And as always, it will be those companies and individuals that can see change coming and anticipate it that will benefit. The most significant of these forces, and the one that in many ways supports the others, is regulatory change.

Regulatory change

A year or so ago, the media entertained us with almost daily reports of rolling blackouts and horrendous electricity prices in California, and to a lesser extent in Alberta. The underlying message seemed to be clear: Electricity market deregulation does not work! However, there was

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little (if any) media coverage of the jurisdictions that have successfully opened their electricity markets, and there is little reporting today of what is now happening in California and Alberta, where the blackouts have ended and prices have returned to normal. The fact is, despite the shortcomings of their market designs, the temporary high electricity prices encouraged more new generation, and more generation resulted in lower prices. The markets worked. They were not perfect, but they did work.

Now it is our turn in Ontario. It is about four years since we started what was thought to be a two-year process to prepare Ontario for an open market. And not only has it taken longer than anticipated, but the resultant regulations and processes are also far more complex than envisioned. It all makes the term "deregulation" thoroughly inappropriate, since we have more regulations than ever before. However, come May 1, 2002, we will have our open electricity markets in Ontario.

Of course, the market is not opening to universal applause. There are those who believe that Ontario Power Generation (OPG, the successor company to the former Ontario Hydro generating division) will have far too much market share to permit true competition. OPG was given 10 years to divest itself of all but 35 per cent of the province's generating capacity. Even after that, many economists believe OPG will still have too much market influence, while the government believes it has implemented sufficient safeguards to prevent market manipulation. We'll just have to wait and see what happens to prices in both the short- and longer-term.

When the natural gas market deregulated in the 1980s, the transition went

largely unnoticed by the general public except for those annoying marketers who went door-to-door trying to sign everyone up for "cheap" gas. However, the publicity and rolling blackouts in California have focused the public's attention on the process and the issues associated with electricity deregulation in a way that we could

not have hoped to achieve by other means. Electricity is no longer taken for granted as it was before last year's events. Consumers have gained a new awareness and respect for electricity, particularly where prices are concerned.

Regardless of whether prices go up or down, once the market opens the price of electricity is expected to be highly volatile. In other jurisdictions, as demand has varied between on- and off-peak hours of the day, prices have sometimes changed by a factor of 10 or more. Even if average prices stay about the same, it is the inevitable price spikes that will be reported, possibly creating the perception of higher average prices. While most of the attention has been focused on the price impact of deregulation, it is the ending of the Ontario Hydro monopoly and the opening of the market to all sources of generation that might result in the most profound changes. Like the conjurer's sleight-of-hand, while watching the price distracts the audience, the real action takes place elsewhere.

Environmental forces

For the first time in Ontario, consumers, whether large industrials or individual homeowners, will be able to choose where their electricity comes from. But if we, as consumers, can choose the source of our electricity, we also have to take some responsibility for the consequences of our choices. If we choose to buy cheap electricity from an old, coal-fired station in Pennsylvania, we cannot complain about air quality in Ontario, and we might feel a pang of guilt when we learn of yet another death due to lung disease. We may not all run out and join Greenpeace, but it will affect our choices and put further

pressure on the movement towards more environmentally friendly alternatives. Opinion polls continue to show that Canadians are concerned about global-warming and the state of our environment. As long as the price differential is seen as reasonable, an increasing number of consumers will decide to pay a little more to buy power from a "green" source to keep their conscience, and the air they breathe, clear.

However, it isn't just electricity that will be sold on an open market in Ontario. Emissions to the air are already being traded in Ontario and other areas around North America. The level of such trading will increase even further if Canada implements the Kyoto Protocol and sets targets for all emitters. The system is quite simple: A generator who has an emission rate well below the generator's target (because of new technology or the use of a low emission fuel, etc.) can sell an emission credit (for X tonnes of CO₂) to another generator who has emissions higher than the second generator's target. The seller of the credit then reports the seller's actual emissions plus X tonnes. Conversely, the buyer would report the buyer's actual emissions minus X tonnes. Both parties would then meet their emission targets. As the value of these credits increases, as it surely will if the government progressively restricts overall emissions, the more environmentally friendly technologies will be financially encouraged and polluters will find their costs increasing.

Technological forces

In addition to the incremental improvements that have taken place over the last 100 years in the technology of generating electricity from fossil fuels or from a dammed river, there are some new and exciting technologies that are just coming of age. A few really are new, but others have been around for a long time. Although technically feasible for some

time, they have been unutilized because there was no way to sell the power that could be generated. After years of languishing on the sidelines, we can now expect to see these technologies move into the mainstream as more consumers take advantage of an opportunity to generate their own electricity or demand power from environmentally friendly sources.

Perhaps the most benign of the emerging technologies is photovoltaic generation. The devices that we could, at one time, afford only to put on satellites or remote monitoring stations are rapidly becoming cheaper, as their efficiency and manufacturing technology have improved. In 1975 it cost \$75 for every Watt of generating capacity installed; today that price is \$5 per Watt and the price is forecast to drop to only \$1.50 per Watt by 2005. All that is needed now is a large enough market to permit the economics of mass production to drive the price down even more. Along with the old roof-mounted panels now comes a low-cost, high-efficiency inverter to generate the 110 volts needed to drive our household appliances. However, the really exciting part is that, because of market deregulation, when we generate more electricity than we can consume, our local utility will have to buy the excess from us at market price. It is quite reasonable to suggest that within a few years it may be economic for houses in Canada to be routinely roofed on the south-facing side with photovoltaic panels that will provide all of the household's electricity. With some of the power storage technologies under development, it may even be possible to store excess energy for use at night.

However, the sun not only provides direct energy that can be converted into power in a photovoltaic array; it also drives the Earth's weather systems and winds. Compared to some parts of the world, Canada and Ontario have taken very little advantage of wind-power. These windmills

may not be as picturesque as the ones you see in old Dutch paintings and they may be a little noisy if you live close by, but the latest wind turbines do have the potential to supply a good portion of Ontario's needs. As long as they are sited away from centres of population, migratory bird routes and places of great natural beauty, they have little impact on the environment or our appreciation of it. The latest models are approaching 2 megawatts (MW) in size, and even 2000 to 3000 more modest units could provide 10 per cent of Ontario's electricity needs. The drawback with wind-power is that, even in the best locations, the wind does not always blow and we need to have other sources ready to supplement our needs.

Another promising new technology is distributed micro-generation. Imagine this: Instead of just being released to the atmosphere, the methane generated by an old garbage dump is collected and used to run a small generator that is tied in to the local electrical distribution system. Several such micro-generators already exist, each generating several hundred kilowatts of electricity from waste fuel that would otherwise seep into the atmosphere, where it has many times the impact of CO₂ on global-warming. It is estimated that 25 per cent of Canada's methane emissions originate in old garbage dumps. It is free fuel for the taking and using it in this way is of double benefit to the environment. Of course, we could have done something like this years ago. What has changed now is that the micro-generators are becoming smaller and more efficient, the voltage regulators and frequency controllers are now cheaper, and the legislation is finally in place to make the local utility take the power generated.



Photovoltaic panels, such as these, may soon become a standard feature on the roofs of new homes, turning the sun's rays into electricity and making each home-owner partially self-sufficient.

On a much larger scale, the advent of the open market is encouraging commercial cogeneration. Industries that require large amounts of thermal energy to heat their processes have always been able to build cogeneration facilities to meet their own needs. However, they can now install larger facilities to take full advantage of the steam-load by generating additional electricity for sale to the market. The entire process can generate steam and electricity at twice the efficiency of a conventional electrical generating station producing electricity alone, reducing both costs and emissions. These cogeneration plants can be anywhere in size from a few MW to the 650MW plant that TransAlta is building in Sarnia, Ontario.

The opening of Ontario's electricity market should therefore be more than just an economic exercise. It should be a catalyst for the transition of an existing system fed by massive central generating stations and dominated by huge monopolies, towards a degree of self-sufficiency and a distributed system of small- to medium-sized generators. Of course, the day of the large generating station is far from over. We still need power when the sun doesn't shine and the wind doesn't blow. Even then, we will need them less than we do today because small-scale, distributed generating plants using diversified fuel and energy sources will supply more of our electricity. ❖

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