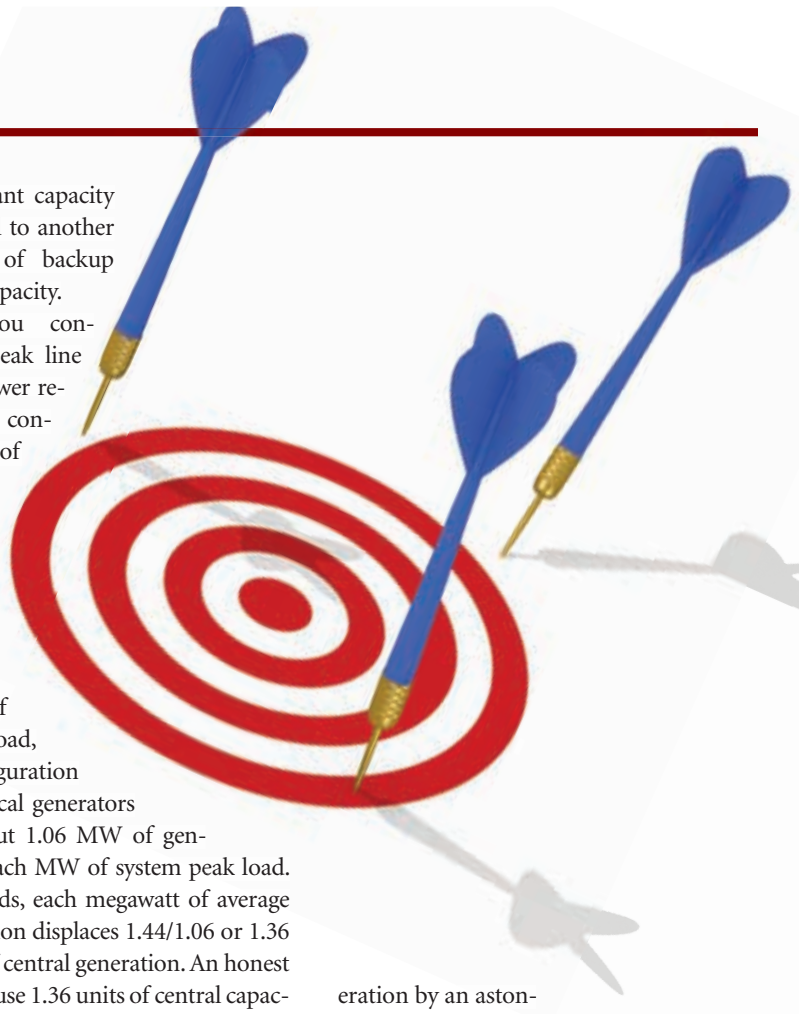
Ontario's missed opportunity

Why proposals for a clean energy standard offer program miss the mark.

By Thomas R. Casten



The Ontario Power Authority has failed to identify and promote the least cost/lowest pollution approach to providing the province's heat and power. In fact, OPA stacked the analytical deck in favour of central nuclear generation by applying a four per cent 'social discount' to the capital cost of nuclear generation and associated transmission and distribution (T&D). It then assumed that local generation would require a 12 per cent cost of capital as well as perform significantly worse in efficiency and load factor than the least-efficient local generation plant I have ever been involved with.

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OPA based its recommendations on costs at power plants instead of on the delivered costs of power, which automatically understates the value of local generation. The agency's approach ignores the avoided capital cost of T&D from local generation. It ignores the peak line losses associated with remote central generation that force the system to generate 20-25 per cent more power at peak than the system peak use, to offset line losses. It also ignores the difference in 18-21 per cent redundancy requirements for a system of a few very large generating stations and the 3-5 per cent redundancy required for a system of multiple smaller generators closer to load.

Beyond coal

In 2006, Premier Dalton McGuinty called for the elimination of Ontario's 6,400 megawatts of coal-fired generation, and a group of diverse stakeholders (The Alliance for Clean Technology or ACT) suggested a Clean Energy Standard Offer Program (CESOP) that would offer long-term contracts to clean energy plants priced at 80-85 per cent of the cost of delivering electricity from the best new central generation plants, providing those local plants achieved 60 per cent overall fossil efficiency or better (double the average grid efficiency).

ACT estimated a potential to develop 11,400 MW of local combined heat and power, of which 3,000 MW would be produced without added fossil fuel by recycling wasted energy from industrial activities such as steel mills, chemical plants, refineries, carbon black production, gas compressor stations and steam pressure drop. OPA responded with a draft Clean Energy Standard Offer Proposal (CESOP) that used a different methodology to calculate prices, ignored some of the costs of new central generation, and limited the offer to plants with 10 megawatts or less of capacity.

Tackling line losses and redundancy

The OPA, unfortunately, ignored the costs associated with line losses and redundancy requirements. When a 1,000 MW power plant fails, there must be a spare 1,000 MW of idle generation to fill the gap. In fact, the present system of large generators thus requires 18-21 per cent redundant capacity to reduce the statistical probability of major outage to levels acceptable to the public.

By contrast, a system of many small generators, all close to load, is significantly more robust. The relatively simple systems of typical CHP and recycled energy plants have random forced outages in the range of 2-3 per cent. As the number of local generation plants increases, the statistical probability of outage approaches the same value — 2-3 per cent overall outage. A Carnegie Mellon University dissertation concluded that 3-5 per cent redundant capacity would produce the same system reliability as 18-21 per cent redundancy for a system of large remote generation.

Peak period line losses range from 22-25 per cent. Let's be generous and assume that on that hot summer day last year when the Ontario system required 30,000 MW of central generation that the line losses were 20 per cent, with overheated transmission lines and transformers eating up 6,000 MW of power. Customers drew about 24,000 MW. Meanwhile, the system needs 20 per cent redundant capacity as well, equal to another 6,000 MW of backup generating capacity.

When you consider both peak line losses and lower redundancy, a configuration of large central generators requires 1.44 MW of generation capacity for each MW of system peak load, while a configuration of smaller local generators requires about 1.06 MW of generation for each MW of system peak load. In other words, each megawatt of average local generation displaces 1.44/1.06 or 1.36 megawatts of central generation. An honest study would use 1.36 units of central capacity to displace 1 unit of local capacity.

If the province were to install 6,000 megawatts of local generation, direct line losses would be in the range of 2-3 per cent, or 180 MW. However, by reducing the peak demand for delivered power from the transmission system from remote generation from 24,000 to 18,000 MW, the line losses associated with remote generation would drop to perhaps 10 per cent, or roughly 2,000 MW. The peak customer use of 24,000 MW is thus supplied by 6,180 MW of local generation and 20,000 MW of remote generation, (18 gigawatts use divided by 0.9 to calculate a 10 per cent line loss). The new system has a total of 26,180 MW of total generation requirement.

This approach reduces the peak capacity requirement to 26,180 MW, saving 3,820 MW of line losses. But it also reduces the need for redundant capacity. Assuming a ratio of 5% redundancy for the 6,000 megawatts of local generation and 20 per cent redundancy for the remote generation, the required redundant generation is now 4,300 MW versus 6,000 MW needed by the all-central system, thus avoiding the need for 1,700 MW of redundant capacity.

Altogether, the deployment of 6,180 MW of local generation avoids the need for the same amount of central generation, and after factoring in line-loss savings and redundancy, reduces the need for total generation by an astonishing 5,520 MW. Thus, deploying 6,180 MW of local generation would reduce the need for central generating capacity in Ontario by 11,520 MW, while providing the same reliability as the present system.

A better CESOP would call forth at least enough new generation to 'creatively destroy' Ontario's coal plant need. Inducing at least 6,000 MW of clean local generation would allow the market to eliminate the need for 11,520 MW of present generation. In specific terms, it would enable the closure of coal-fired power plants in Lambton, Nanticoke, Thunder Bay and Atikokan, which have combined capacity of 6,434 MW, and also replace the next worst five gigawatts of central generation. If OPA would take advantage of this opportunity, rather than stacking the deck in favour of central nuclear technology, it can go a long way to 'creatively destroy' the present system's dirty, inefficient generation. As a byproduct, Ontario's manufacturing sector will gain added revenue for the sale of their presently wasted energy, and/or save money on thermal energy needs. ■

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