Why wind power does not work in Ontario - and the solution

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I haven't noticed the price of Ontario's electricity dropping despite an over supply of generation and a ten year low in north American natural gas prices. This is mainly because of the Ontario government's misguided policy of promoting more and more wind generation on the grid under the protection of the Green Energy Act. Large amounts of intermittent wind skew the market leading to take-or-pay contracts (necessary to ensure capacity is built and always available when wind is absent) with the gas-fired generators and the need to export electricity at subsidized give away prices. No one would build merchant gas-fired generators in Ontario since they would be operating at low capacity factors and would price themselves out of the market.

Nuclear electricity provides around 60 percent of Ontario demand and hydro about 20 percent leaving 20 percent or so for the rest, that is, mostly
inflexible natural gas and some unreliable wind under Ontario government authority contracts, with flexible coal coming in at times of peak demand. Without wind on the grid gas would have a better chance of supplying all the intermediate and peaking load and see an increasing amount of steady operating hours with lower generation costs. More and more wind being added to the grid in these times of continuing low demand result in very low market prices, even negative prices during the frequent periods of surplus baseload generation (SBG) that is indicative of a poorly designed grid. Since wind is completely
unnecessary in the first place it makes little sense to provide expensive energy storage, even if this were technically and environmentally achievable.

Since 2009 October Ontario has had feed-in-tariff (FIT) contracts for wind (and wind is mandated to grow from the present 1,700 nameplate MW to over 8,000 MW by 2018 or sooner) and for the small amount of solar and other renewables. As well as natural gas and most of Bruce nuclear output being under various kinds of contracts, regulated rates are paid to Ontario Power Generation's (OPG's) nuclear and baseload hydro facilities all of which results in the so called Global Adjustment (GA). This GA accounts for the difference between the present very low market or spot price and the rates paid to contracted and regulated suppliers and is added to the market price to give the generation cost. The GA is by far the major part of the generation cost. The residential homeowner can pay around twice the generation cost when delivery cost and the other costs are added to the bill.

In the present market even without wind any new generating plant in Ontario might still require some kind of contract and guaranteed floor price for its output in order to get built but without wind there would be a better correlation between supply and demand giving a more stable and reasonable market price and the GA would be a lot smaller. Remember, surplus electricity is exported at the market price and the GA is not paid by the importing jurisdiction, a subsidy from Ontario consumers!

Most, if not all, the present 1,700 MW or so of wind is under pre-2009 rules and has priority on the grid. It cannot be dispatched off for economic reasons and there are no financial incentives for wind generators to do so. It can only be dispatched off for grid reliability reasons so SBG, after maximizing exports, results in water being spilled at the baseload hydro stations like Niagara Falls and output being reduced, or even units shutdown, at the Bruce B nuclear station. This makes no environmental, economic or technical sense.

The grid operator, the IESO, is trying to implement new market rules making all wind subject to its five minute economic dispatch with payment for foregone generation seemingly still undecided - so much for economic dispatch if payments are made. Until this happens any wind generators under FIT rules, and privately operated Bruce B, get paid for foregone generation as at present when requested to reduce power or to shutdown. The Bruce payments could be rationalized as covering the costs for the improvements and wear and tear to the systems used for manoeuvring output. This payment for foregone generation does not apply to the provincially owned OPG which loses money when its hydro output is curtailed and is maybe the reason why it is not keen to manoeuvre it's Darlington nuclear units (Note: Darlington adjuster rods were reconfigured from the original design to out of core position in the late 1990s to improve fuel burn-up and baseload operation; reactor power reductions and steam bypass are only used for unanticipated events and not for load-cycling) during periods of SBG, like Bruce B presently does and like Bruce A will. In addition OPG's hydro stations that are not under regulated rates are paid the very low market price for their output that is reduced to accommodate expensive wind and even OPG's regulated rates are lower than the contract rates paid to the private suppliers, all reducing OPG's present and future profitability.

These new IESO rules, if approved, will dispatch wind at five minute intervals like other generation and this will reduce, but not eliminate, the amount of nuclear manoeuvring now taking place. However the root cause of Ontario's dysfunctional grid still remains, large amounts of expensive unreliable and unnecessary wind that not only result in Ontario not being able to take advantage of the existing very low natural gas prices but is resulting in steadily increasing electricity prices. Subsidized electricity exports, inefficient and costly operating modes of the wind balancing gas-fired generators (that partially or completely negate any savings in greenhouse gas emissions from wind, even more so with increasing shale gas use), spilling clean low cost baseload hydro, powering down clean nuclear and paying for the forgone energy, new transmission infrastructure to connect up wind, and the parts of the so called smart grid needed to incorporate the wind, are all part of the increasing costs due to wind. The real cost of wind to Ontarians is very much more than the 13.5 c/kWh paid to the wind generators. Costs can only go up.

Instead of allowing the IESO to twist itself into knots trying to accommodate unreliable and unnecessary wind onto the grid, a much better approach would be for the government to replace the present unreliable wind and polluting gas combination by more nuclear, reference 1. No additional capacity is needed since wind adds almost no capacity when it is needed anyway. Nuclear can then be manoeuvred to support more nuclear, rather than support wind. **In the future this new or appropriately refurbished nuclear will have to be described as flexible or manoeuvrable and not as baseload.** It has been evident for many years that better nuclear flexibility was needed in Ontario but the industry (AECL/CANDU Energy Inc./CNA/ etc) has

failed, and is still failing, to highlight the potential flexibility of CANDU using reactor power and steam bypass.

The report by the Ontario Society of Professional Engineers (OSPE), reference 2, now agrees with the IESO's proposed new rules to dispatch wind at five minute intervals which is an improvement on its draft report that did not want wind dispatched and preferred manoeuvring nuclear. Wind poses an unnecessary risk to the grid, reference 3, and does little to reduce greenhouse gas emissions, reference 4. OSPE is wrong in not condemning wind, reference 5.

I am not an energy market analyst but that's how I see it.

Note: An earlier version of this article was posted by Steve Aplin at, http://canadianenergyissues.com/2012/06/04/why-wind-power-does-not-work-in-ontario/

References

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