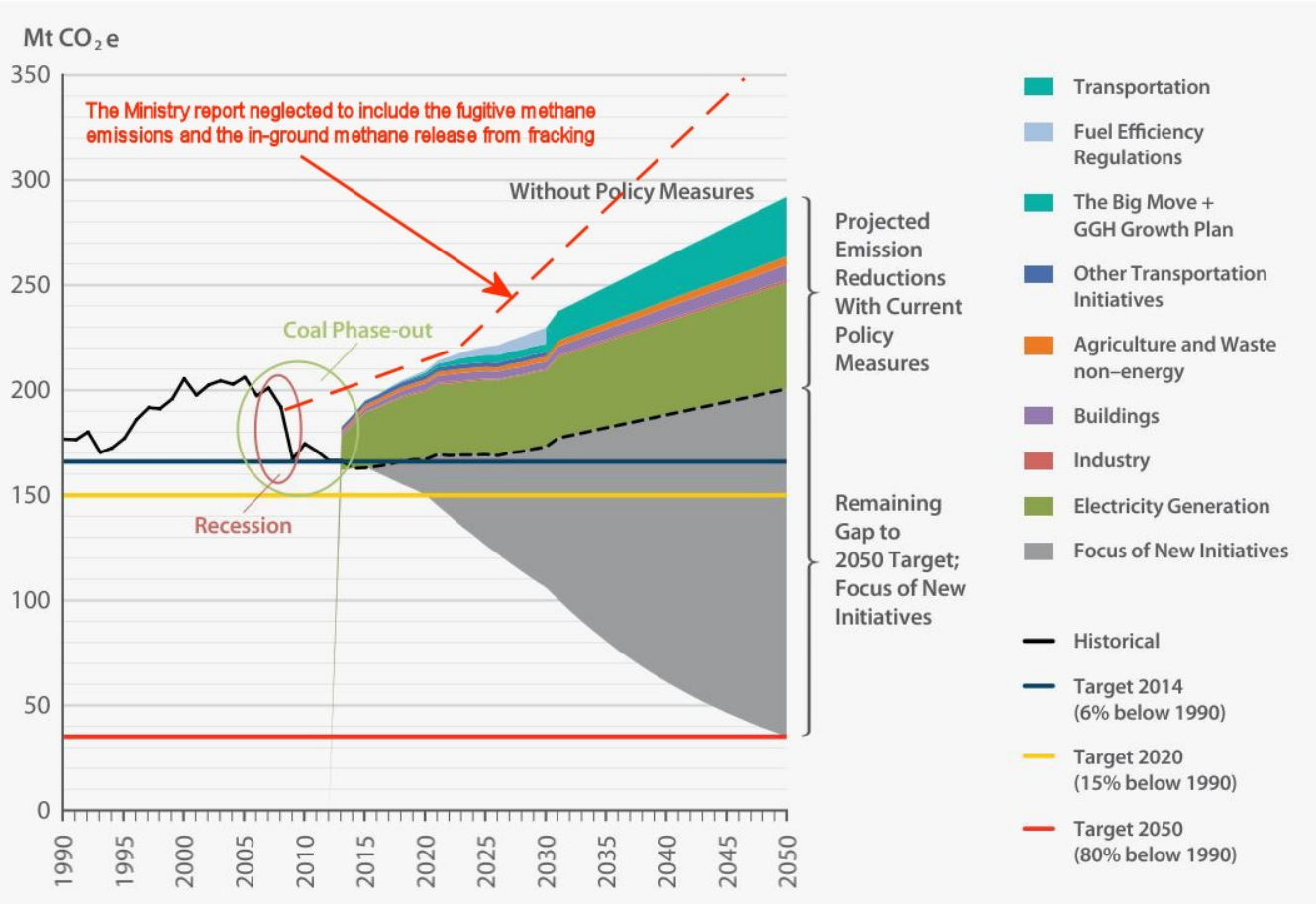
Ontario abandons GHG reduction targets

The Ontario Ministry of the Environment and Climate Change has issued a 2015 discussion paper in which it outlines Ontario's current plans for GHG reduction from 1990 to 2050. Figure 1 from that discussion paper is shown below. Unfortunately what it shows is that Ontario's GHG emissions will increase from the 1990 level of 170 Mt CO_2 eq. to a value that will be well in excess of 300 Mt in 2050 if the emission projections are corrected for errors in their calculations. That is a huge discrepancy from the 2050 target of 35 Mt.



Even with the errors the paper makes the principal point that we should be concerned about. Their calculations (dotted line) predict that after applying the government's policy measures the 2050 emissions will still amount to 200 Mt, which is well above the 1990 level, and a whopping 165 MT greater than the 35 Mt target.

Most of their claimed GHG reduction is attributable to their incorrect assumption that the switch from coal to natural gas for power generation will result in radical GHG reductions. The problem is that they have neglected to include the fugitive emissions of methane that occur upstream of the generators. Most of these fugitive emissions occur outside of Ontario but they would not exist if Ontario didn't use the gas so they cannot be ignored. If you use a GWP of 72 for methane then the GHG emissions will be higher by about 50 Mt, which negates the claimed reductions.

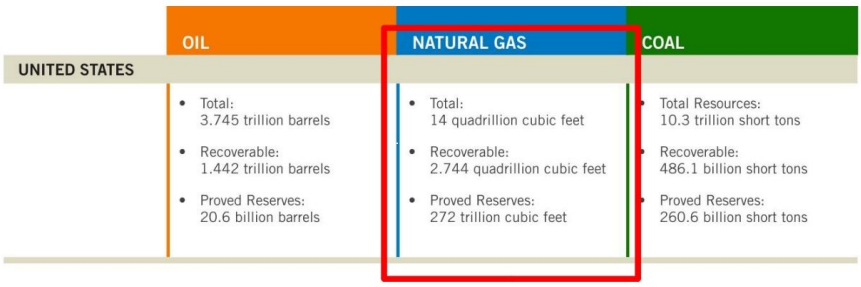
We should certainly not go back to using coal for power generation because coal produces unacceptable amounts of many different air pollutants but we should not be using natural gas as the substitute. For

one thing, the source of natural gas that Ontario has been using (by-product gas from conventional oil wells in Alberta) has now been almost exhausted. The Ontario plan calls for replacing that natural gas with shale gas to be imported from the US and that shale gas introduces a much higher level of GHG from fugitive emissions than the gas that Ontario is currently using.

When it is burned the shale gas does not produce any more CO_2 than the Alberta gas so this difference does not show up in the Environment Ministry's data, which ignores the fugitive emissions. However, the fracking process produces copious amounts of gas during the commissioning process. While it is possible to limit such emissions by using appropriate equipment and processes those measures are very expensive and are not likely to be utilized until the price of natural gas goes up to several times its present price. Even then, there is another problem with shale gas for which there is no known solution.

The fracking process uses fluid pressure to open up micro-fissures in the rock and then injects particulate matter such as fine sand to prop the fissures open. That makes the previously trapped gas mobile so it escapes from the rock. While the well is producing commercial gas much of that mobile gas will be extracted and put to good use but a substantial part of the gas will not be collected, even while the well is in production. When the well is taken out of production then 100% of the remaining mobile gas will be free to migrate to the surface or it will be dissolved in ground water and then carried to the surface by the water flow. There have been many reports of water wells that have been rendered useless by this process.

The problem is that the methane (the principal component of natural gas) is 72 times more potent than CO_2 as a greenhouse gas (some experts believe that 108x is more appropriate, and a 2013 IPCC report put the 20-year value at 86x). If a very small amount of the methane (less than 2%) escapes to the atmosphere then it becomes the primary factor that determines the GHG emissions. At the present time no one knows how much of the mobile methane is reaching the atmosphere (or will eventually reach the atmosphere) but there is ample evidence that the quantities are substantial. Conventional natural gas comes from oil that accumulates in natural structures like domes that seal the gas but shale gas comes from ordinary shale rock and sandstone for which there is no natural encapsulation. It is highly likely that the fugitive emissions will be well in excess of the small amount that might be tolerable, and there is no known way of preventing its escape once the methane has been rendered mobile. The use of shale gas should therefore be totally banned, and in all probability that will happen at some time in the future (and has already happened in many jurisdictions), which will leave Ontario in a precarious energy supply position.



North American Energy Inventory *(from Institute for Energy Research). About 20% of the natural gas is recoverable (ignoring the cost) but only 10% of that is economical enough to be included as Proved Reserves. The result is that for every cubic foot of fracked natural gas that is recovered 3600 cu. ft. of CO_2(eq.) will be released into permeable rock and much of it is likely to escape. This will be in addition to the "fugitive methane" that escapes via the pipeline connection.*

The only other major GHG reduction shown in the Ministry's paper comes from what the Ontario government calls "The Big Move" which refers to their plan to improve the public transportation system in the Toronto/Hamilton area. Their prediction is that the GHG emissions will very abruptly drop in the year 2030 but that will depend on two factors: (1) the availability of sufficient funds to build the new transportation system, and (2) the willingness of the public to suddenly switch from using cars to using buses, street cars and trains. The government's plan will have to take into account the competing concept that we could switch to vehicles that are largely powered by other means that utilize stored energy, such as batteries. If the latter concept prevails then both factors, (1) and (2) will fail to apply (in which case the GHG reductions are likely to be even greater than the Ministry's estimates). Even at this present early stage of the development of battery and hybrid cars their capital plus operating costs are already competitive with gasoline and diesel vehicles so what the government is proposing represents a huge gamble, particularly if it hinges on the argument that it would reduce GHG emissions.

If shale gas is banned and the conventional natural gas resources are exhausted then we will still need to heat our homes and we will still need a source of peaking power for our power grid. As things stand the Ontario government plans rely on natural gas as the province's primary source of energy, with nuclear power providing more than half of our electricity. Exergy storage systems (described in http://sustainability-journal.ca , Nov/14 and following) could readily and sustainably meet Ontario's needs for thermal energy and as a side benefit they could increase the output of the existing hydro facilities to replace the gas-driven peaking generators as well. By reducing the peak power demand, flattening the day to night power fluctuations and by increasing hydro generation they could also replace nuclear power. Exergy storage systems would be tens of billions of dollars cheaper than what is currently planned but most of those cost reductions would be achieved via savings in the utilization of electricity, not heat, (see the Sep/14 issue of Sustainability-Journal.ca). The Ontario government controls the electricity generation and distribution system so such a change cannot be implemented, even on a small scale, without the support of the Ministry of Energy.

Ontario has a centrally controlled electricity system in which the generation of electricity is largely handled by OPG, distribution is administered by the IESO, transmission is provided by Hydro One and oversight is provided by the OEB. These agencies are all controlled by the Ontario Ministry of energy. OPG has flatly refused to consider energy storage without giving any reason whatsoever for their refusal, and they have declined to discuss the issue. The IESO has two pilot projects to use storage on a small scale, primarily to facilitate the ramping of the gas-powered peaking stations, but they too have rejected all proposals to employ exergy storage even though such stores were much cheaper per kWh. The OEB recently reviewed OPG's costing plans (EB-2013-0321) but the Board supported OPG's stance that they would not use storage, again without providing any explanation for their decision.

Exergy stores can be sized to handle a single building or a large block of buildings. That makes it feasible to start with a single store and expand the capacity by simply replicating the stores if they work as planned, which means that the financial risks are very small. The only real risk to the Ministry of Energy is that exergy storage could completely displace the LTEP plan to use natural gas and nuclear power. Since that Ministry controls the distribution of electricity it has the power to block any technology that might compete with their existing gas/nuclear regime, and it is currently exercising that power. The consequences are likely to be that Ontario will soon be increasing its GHG emissions by more than 165 Mt/year, and that it will be wasting tens of billions of dollars per year to perpetuate the existing regime, which would not in the long run be sustainable in any event because the supplies of both natural gas and uranium are limited.

The paper puts a high priority on putting a "price on carbon" but carbon is not a hazardous product - it is the greenhouse gases that we need to control. Switching the objective to limit the consumption of carbon just confuses the issue because the greenhouse effect is not related to the carbon content of the gases. It also gives rise to false assumptions such as the claim that we can reduce the problem by reducing the consumption of carbon and by reducing the amount of energy we use. Applying a "carbon tax" would be useless as a measure to encourage the use of exergy stores as a substitute for gas/nuclear because the storage solution is so much less expensive in the first place - the tax would be a trivial disincentive. It is not the cost that is the problem - it is the government's obstructive policies that are at fault.

The paper argues that we should encourage consumers to use less energy. That is 100% in support of the continued use of fossil fuels, and of the rationale that we cannot solve the problem so we should just save face by employing simplistic measures that make token reductions. We need to STOP using fossil fuels in all applications where that is technically and economically feasible. The 80% reduction by 2050 will be impossible if we continue to rely on such measures.

In the same vein the paper argues that we should reduce the consumption of energy via measures like extensions to the Ontario Building Code. If we switch to exergy stores, which use stored summer heat to heat the buildings, then there is no limit to the amount of thermal energy that could be supplied, even if the population were to expand multifold. (Exergy stores could also eliminate the summer electricity peak.) In fact, if we reduced the thermal demands of our buildings to zero then we would also be eliminating the capacity of exergy stores to provide the electricity we need because the exergy stores rely on thermal storage to store the electricity. Again, the paper's authors are really implying that we should continue to rely primarily on fossil fuels and be satisfied with the trivial GHG reductions that they are proposing.

The rationale that is usually advanced (in other reports) for the use of shale gas is that it will provide a bridge source of energy to cover the period from now until we switch to renewable energy. However, the quantities of hydro and thermal energies available for exergy storage systems are more than adequate right now, and the cost of the stores would be substantially less than the cost of building new pipelines to the US and importing the shale gas so that rationale is highly questionable for Ontario.

The MOECC discussion paper makes no effort to show, even in broad conceptual terms, how the 2050 objective might be achieved. It makes questionable claims about the present GHG emissions and about whether the 2014 reduction target was met. Their figures demonstrate that under the current LTEP Ontario will not reach the 2050, or even the 2020 targets. There is no possible way that we could meet those targets if we continue to use natural gas for easily replaceable purposes like heating, yet the LTEP increases our reliance on natural gas. Moreover, the paper does not question the wisdom of relying on expensive nuclear power for electricity when there are cheaper, safer and more sustainable choices available, or suggest the potential for applying those savings to GHG reductions in transportation. We will instead be wasting yet more money to build gas pipelines to the US sources of shale gas.

In short, the Ontario government has abandoned its GHG reduction objectives.