EB-2016-0152 Sustainability-Journal Comments re. Revised Draft Payment Order (Procedural Order 10)

The Ministry of Energy has defined conservation as the most productive means of matching energy supply and demand in Ontario. Following up on that choice thermal storage provides a means of radically reducing the demand for electricity at a cost that would be many billions of dollars less expensive than the current power generation cost. That does not inconvenience the consumers – they will still have warm homes thanks to the heat extracted from the summer air and they will still have electricity when they need it thanks to the ability of thermal storage systems to also store electricity. What is changed is the need to meet the current summer, winter and daily electricity demand peaks. By reducing and flattening those peaks the power demand could be radically reduced without altering the amount of energy that is delivered to consumers. If the peak power demand can be reduced to, say, 10,000 MW then that need could be substantially and permanently met using the existing renewable energy sources, including hydro power, wind power and solar energy. There would be no need for expensive nuclear power and no need for using natural gas to heat our homes or for peaking generation plants.

It could be argued that the gas-related GHG reductions that would result from eliminating natural gas are the responsibility of the Ministry of the Environment and Climate Change so they are not relevant to EB-2016-0152. However, the federal government has decreed that fossil fuels should by some appropriate means be subject to a surcharge of $50 per tonne of GHG. As argued in the Sustainability-Journal submission on EB-2018-0085 the long term release of methane from fracking that will eventually reach the atmosphere exceeds 3000 megatonnes of GHG per year. At $50 per tonne that will cost 50x 3000 = 150 billion dollars per year, to be apportioned between heating and power generation applications.

The OPG application and the IESO plans call for eight of the present nuclear reactors to be permanently taken out of service. However, neither organization has explained how that generation will be replaced so it is not possible to identify the apportionment between thermal and electrical applications. Seven of the eight reactors are covered by EB-2016-0152 so it is reasonable to estimate that the direct costs of the “GHG tax” will be measured in the tens of billions of dollars per year. The indirect costs (i.e. the balance of the 150 billion dollars per year) hinge on the potential to deliver thermal energy from thermal stores in place of using peak electrical power to meet those needs. If the storage option is blocked then all 150 billion dollars should be charged to any decision made for EB-2016-0152.

The opportunity for consumers to make the choice to use storage instead of using nuclear power is indeed being blocked. A consumer who contemplates building a thermal store to eliminate his/her need for nuclear power is obliged to pay an average of 9.97 cents per kWh in a “tax” (via the Global Adjustment) that is paid out to OPG and Bruce Power in spite of their choosing an alternative that would eliminate that cost. Collectively we can take one of two roads – if that 9.97 cent/kWh discriminatory tax were eliminated then it would be economically feasible for consumers to build thermal stores at no cost at all to the power generation industry – or we can punitively tax the potential storage facilities in order to protect the status quo of the electricity industry.

Any new technology for producing electricity on an open competitive basis faces the daunting prospect that they will at best be paid an average of 1.58 cents per kWh and their customers will moreover be charged the extra tax of 9.97 cents per kWh. The government-run power industry is taking a “we win –

you lose" approach to blocking both competitive electricity suppliers and to the competition from conservation. Note that storage systems can be applied on any scale, with proportional benefits being achieved in accordance with the depth of market penetration. There is no upper limit on the potential application of storage systems that utilize local thermal energy sources. The amount of summer heat that could be extracted from the air, for example, is well in excess of any likely thermal energy demand.

The discussions under EB-2016-0152 have largely centered on non-substantive considerations:
* should the date at which the new rates apply be retroactive?
* has a threshold been met that warrants reconsideration of the interim decision?
* what smoothing process should be employed?

All of the smoothing proposals are based on the assumption that the use of nuclear power will continue on a steady basis for the forseeable future. If we switch away from nuclear generation to conservation (as the Energy Ministry itself has recommended as a matter of principle) then there is a very large risk that smoothing will result in high up-front expenditures that will leave us with generation facilities that will be stranded assets that will not be needed in the future, thus jeopardizing the smoothing process.

The OEB Procedural Order No. 10 admonishes participants from treating the Review as an opportunity to rehash old arguments unless there is genuine new data that warrants reconsideration of the principles. In the oral hearings Sustainability-Journal argued that theoretically we should expect that the GHG from fracked methane would in the future be much higher than what is presently being reported by the Environment Ministry. What has changed is that in the intervening year clear evidence has been reported in the science literature that shows that the theoretical fears have come to pass – that the GHG related to Ontario's uses of natural gas is now reaching the surface and will in time amount to over 3000 megatonnes of GHG per year. While OPG's generation via its thermal plants is not directly at issue under EB-2016-0152 the consequences of the removal of natural gas as a major component of our energy mix will have fundamental consequences for nuclear generation and lesser and more positive consequences for OPG's hydro power Payment Rates.

The new evidence is in the form of recent underground, surface, aerial and satellite measurements that show a rapidly increasing rate of emissions to the atmosphere, of measurements from deep water wells that show that the increases are due to underground releases as opposed to surface generation (which produces no ethane), and to a world-wide trend in methane reported by NASA that shows that the rate of release is now accelerating, indicating that the transit of methane from the 2 km deep production site has now reached the point where some of the escaping methane has now reached the surface. In addition, a new proposal for an application for grid regulation for OPG has introduced the potential to make a fundamental change in Ontario's use of fossil fuels for transportation. The proposed grid regulation integrates charging stations for electric vehicles, using the vehicles' batteries for a few minutes during grid deficiency periods. This solution is orders of magnitude less expensive than the IESO-preferred approach of using dedicated batteries for that purpose. The integration would create a large network of charging stations, which is a prerequisite to achieving widespread adoption of EV's.

Out of Context?

The Ontario electricity grid is a government-run monopoly that has an inherent conflict of interests: should the ***quasi-commercial*** supplier agencies operate to sustain their own revenues or should those same ***quasi-government*** agencies take advantage of opportunities to cut their costs, and hence their revenues?

In principle the Ontario Energy Board was created to balance those two opposing pressures but in practice it is extremely difficult to address this question, particularly in cases where several of the agencies are concurrently involved in issues (like conservation) that cross the boundaries between the agencies.

To illustrate the point, the IESO is currently asking for public comments on its practices, to which Sustainability-Journal responded with an outline (Missing the Mark) for achieving conservation on a very large scale. The IESO responded that its mandate did not cover such conservation measures even though the Ministry of Energy had very clearly stated that conservation should be given top priority. A second outline was issued (IESO Mandate) to which there has been no response.

The IESO suggested that proposals for conservation or for reducing GHG should be directed to the Ministry of Energy or to the Environment Ministry. Letters were sent to both, to which there have been no responses from the agencies. The text of these submissions have been included in the Appendix.

The OEB regulates some of the activities of some of these agencies but the individual responsibilities are walled off in a way that obstructs the consideration of the inter-agency consequences. In the case of OPG they effectively have a contract to produce X GWh of nuclear power without regard to how much power will actually be needed, whether it is needed at a constant rate or not, and regardless of the existence of cheaper alternatives. The public's preference might be to adopt an alternative that would be cheaper by tens of billions of dollars and be cleaner for GHG's but that debate is not even on the table. ***Since all of the producing/distributing agencies have business interests of their own it is particularly important that the OEB should at least be willing to listen to arguments from the public for systems that could achieve cost reductions and environmental protection for interactive changes that impact multiple agencies.***

Ron Tolmie
Sustainability-Journal
217 Petrie Lane
Kanata, ON K2K 1Z5
(613) 271-9543

Appendix

Sent to the IESO in response to their request for comments.

Missing the Mark

Exergy stores can heat and cool our buildings, provide domestic hot water, provide motive power for our cars, trucks, buses and trains, and can provide cleaner, cheaper, more stable and sustainable power. For all of those applications they could readily be applied on a scale that would in time almost completely eliminate Ontario's need to use fossil fuels. Exergy storage could reduce the global costs of those energy needs by many billions of dollars but under current policies almost the entire cost of building exergy stores is put on the shoulders of the building owners. The theoretical result may be huge global cost savings but they are shared by the entire province, with only a tiny fraction of the

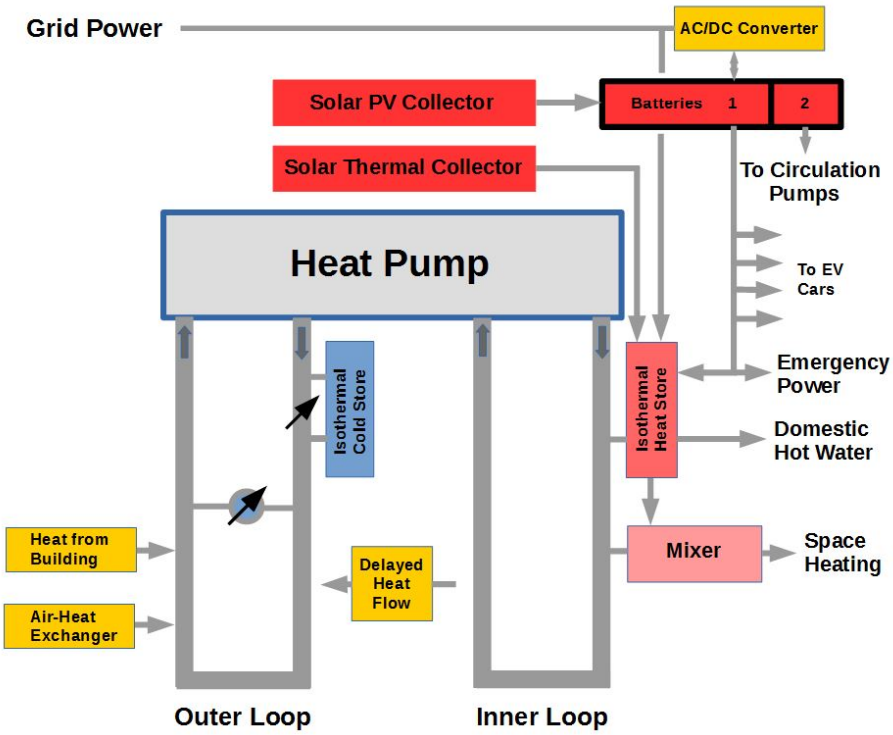
electrical benefits going to the building owners, so there is really no incentive in place for them to build the exergy stores.

One of the consequences of building exergy stores would be large reductions in Ontario's average and peak power demands, leading to big revenue reductions for Ontario's government-run power monopolies. Not surprisingly those agencies have for years refused to even listen to explanations of how such stores function and how they could save billions of dollars, reduce GHG's, and provide a more sustainable energy supply system. **The IESO has been the worst offender of all.** For example, the IESO is currently considering the funding of a pilot project at the Saunders Power Station that will use batteries to regulate the grid. Such batteries are much more expensive than an exergy store and they need to be replaced every 13 years, a cost that is eliminated in the exergy store alternative. On a much larger scale, ANY alternative that eliminates the peak demands for power for heating and cooling applications could reduce Ontario's peak power demand by more than a factor of two, reducing the capital and operating costs in proportion. Exergy stores have the capacity to provide the heating and cooling with ZERO power demand during the grid's peak demand periods so they would do the job.

The principles of exergy storage have been extensively covered in the science literature[(1)] so they will not be repeated here. The diagram below illustrates one implementation of the concept. The heat is extracted from the summer air and from the building's AC system and is initially stored in the outer ring of ground heat exchangers. At times when excess power is available (primarily at night) a heat pump transfers the heat into the inner ring of ground heat exchangers and the electricity used to drive the heat pump is thus stored, boosting the exergy of the storage core. The electricity is effectively recovered in the winter because heat can then be extracted from the core without the need for any grid power. In the summer the ground around the outer ring is chilled because heat is being withdrawn from it and from the cold isothermal tank, so building cooling is a freebie.

In the process there are other freebies that are natural advantages of the concept. If you put an electric heater into the hot isothermal tank then that can be used to regulate the voltage of the grid by modulating the power load. An exergy store can store up to 1,000,000 kWh or more so it has adequate capacity to handle the local grid overvoltage. Severe undervoltage is handled by the batteries of the plug-in EV's, just as the fixed battery of the Saunders system does, but the batteries can be five times smaller and their replacement cost is zero for the grid operators. In another freebie example, the hot and cold isothermal tanks flatten the daily load fluctuations and in doing so they can free up thousands of megawatts of ponding storage that is presently being used to match the fixed output of the nuclear power stations to the widely fluctuating daily load pattern. The electricity storage capacity that has thus been freed can be used for irregular renewable power sources like wind turbines, solar panels, weather-related hydro surges, etc.

(1) Compact Exergy Storage Systems



Exergy stores provide thermal storage in two ways: via the heat stored in the core and via the wave of heat that flows out of the core and that reaches the outer ring by the winter, at which time the heat pump returns the heat to the core, stabilizing its temperature. The electricity storage takes many forms:

1) storage used for grid regulation as explained above

2) seasonal storage that flattens the summer and winter demand peaks

3) year round storage that matches supply and demand for applications like hot water and EV power

4) diurnal storage that flattens the daily grid load pattern

5) virtual storage via freeing of the hydro ponding storage for RE applications

6) controllable demand shift storage that can minimize demand peaking

Some of the features are not self-evident. For example, the heat pump in an exergy store works throughout the year and at a relatively low power level. That makes it easy to drive it with a small solar collector and also to use much shorter ground heat exchangers than are needed for conventional GSHP systems (the ground heat exchangers are the most expensive component). The system can use solar thermal panels to inject heat directly into the hot isothermal tank, boosting its temperature for DHW and reducing the use of electricity for driving the heat pump. Because of its higher efficiency such a solar thermal panel will make a bigger net contribution to the electricity supply than a solar PV panel of similar size.

Between them these six storage capabilities provide the means of dealing with the primary energy issues in Ontario: how to heat and cool our homes, how to power our cars, and how to generate electricity without using fossil fuels. The six storage methods can be used concurrently with very little interaction so their productivity is very high and the cost is low. **However, none of the six methods can be employed, or even demonstrated, without the active participation of the IESO and the other supply monopolies.**

To date the IESO has refused a great many requests to discuss the technology, to hear presentations at the local Ottawa advisory meetings, to include exergy storage in their RFP's, or to even mention the topic in their reports. No one from IESO has advanced any technical or economic reasons for their opposition to the concept. The IESO has simply buried the topic in their plans and publications. The obvious observation is that building exergy stores would radically reduce the revenues of the IESO, OPG, Hydro One, etc., which raises the question of whether this obstruction is intended to protect those revenues at the public's expense. Or, to put it more bluntly, is the present *"Market renewal and non-emitting resources"* purely an exercise in hypocrisy?

In the near future Ontario will be permanently closing eight of the province's nuclear power reactors and temporarily shutting down all of the remaining reactors for lengthy (and very expensive) refurbishments. The substantial reduction in baseload baseload power capacity, the need for extra power in the summer and winter, and the need for diurnal peaking generation will primarily have to be met by fossil-fuelled generation, leading to much greater GHG emissions. That problem is greatly aggravated by Ontario's ongoing switch to the use of shale gas. The methane that is released by the fracking process but that is not captured will eventually reach the surface, in time bringing the GHG levels to values that are orders of magnitude greater than the GHG that is produced by burning the gas. Unfortunately, Ontario is turning a blind eye to those upstream emissions, which exacerbates the problem.

Ontario has withdrawn its support for the development of the ACR1000 power reactor and the federal government has virtually closed down AECL so Canada has no native successor to the CANDU reactors, which are nearing the end of their lives. Any replacements will certainly be extremely expensive and are likely to go through construction pains similar to those being encountered with the Areva reactors in Europe. It is questionable whether the nuclear option is sustainable, especially considering that Ontario's future power needs could readily be met by making more efficient use of Canada's hydro power combined with exergy storage systems. Fossil-fuelled generation is intended to be phased out ASAP, leaving Ontario with no long term plan for future sustainability so long as it continues to obstruct exergy storage systems.

Nominally, Ontario power policies are intended to achieve three primary objectives:

1) to provide adequate, stable and affordable electricity
2) to contribute to the planned 80% reductions in GHG by 2050, and
3) to ensure that the electricity supply system is sustainable.

The existing IESO plans completely fail to meet all three of those objectives.

Ron Tolmie
tolmie129@rogers.com
(613) 271-9543

Sent to the IESO in reply to their reply that Missing the Mark was outside of their mandate. (No reply)

The IESO's Mandate

The IESO response to the article "Missing the Mark" was that it is "beyond the mandate of the IESO".

The Ontario Ministry of Energy has outlined its own objectives, explaining:

"As the province plans for Ontario's energy needs for the next 20 years, conservation will be the first resource considered."

The Ministry of Energy outline continues: ***"Conservation is a key part of our collective effort to lower greenhouse gas (GHG) emissions. It is also the province's most cost-effective energy resource, and it offers consumers a way to reduce their electricity bills. The least expensive type of energy is the energy we don't use."***

About half of Ontario's electricity is used for thermal applications such as cooling, heating and domestic hot water. ***Missing the Mark*** showed how that half of our electricity consumption could be eliminated by utilizing stored heat, and in doing so it would reduce both the capital and operating costs for electricity generation by many billions of dollars, it would radically reduce the related GHG emissions and the result would be much more sustainable systems for both electricity and for heating/cooling.

Thermal storage systems exactly meet the Ministry of Energy's primary objective. However, cutting the electricity demand in half could also cut the generation revenues in half, leaving organizations like the IESO in a position where they inherently have a conflict of interests – do they protect their revenues or do they support conservation? In this case they have made it very clear where their preference lies.

Thermal storage systems also have the potential to store electricity on a very large scale as outlined in Missing the Mark. Storing electricity makes it possible to shift demand from high-demand periods to low-demand periods, to utilize the hydro spring river runoff, to handle the intermittency of wind turbines, to facilitate the repurposing of hydro pond storage, to provide grid regulation, etc. Again, the IESO has a conflict of interests. Those measures would all make the existing generation systems substantially more productive, again reducing revenues at little cost. By linking the two forms of storage Ontario could eliminate its use of fossil fuels for both thermal and electrical applications, and could also retire its fleet of nuclear power reactors as well.

To understand the economic significance of these reductions we need to bear in mind that the cost of Ontario's electricity generation system is primarily determined by the power generation target, not the energy delivery objective. If we need 30,000 MW of power to handle the potential peak power load but we utilize storage to both reduce and shift that load then we might reduce the peak power demand to, say, 10,000 MW, reducing the capital and operating costs for the generation facilities in proportion. Since the required facilities already exist the net investment is reduced very nearly to zero. The cost of

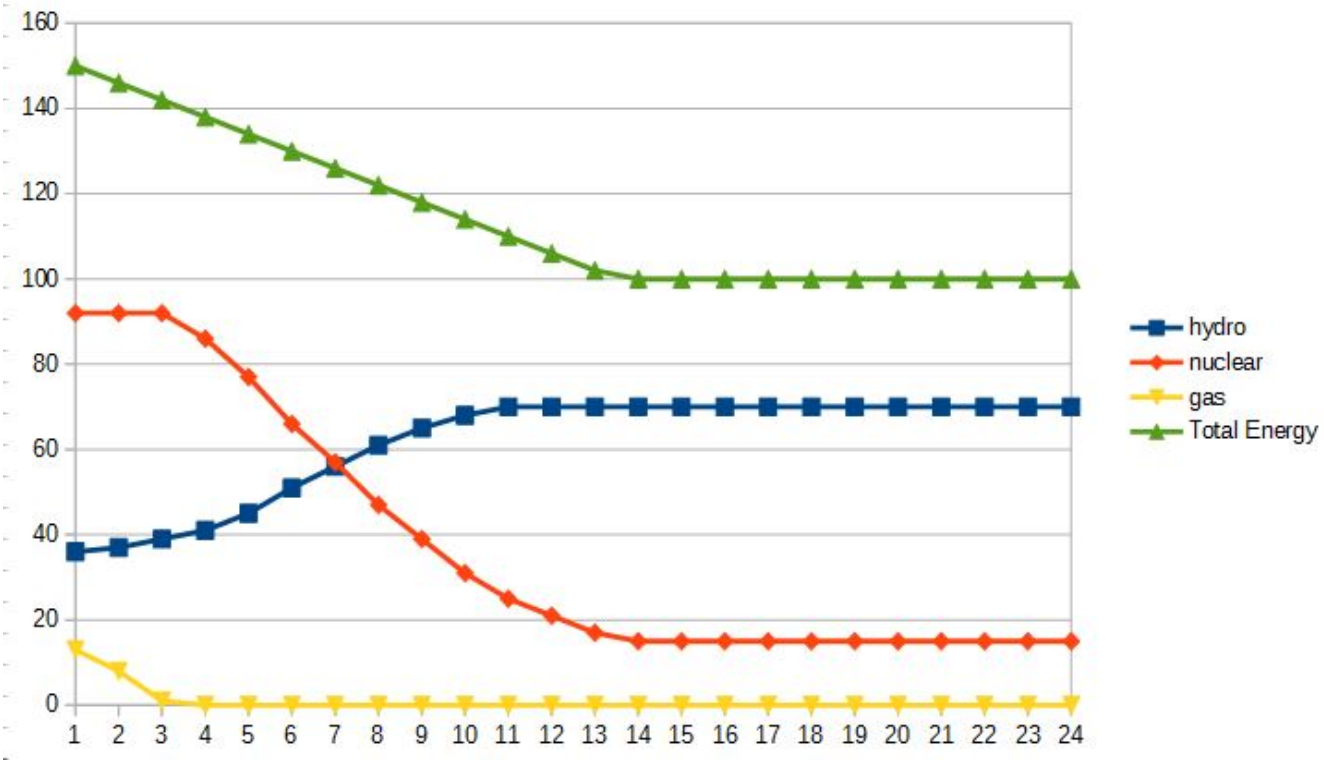
the storage capacity is mostly covered by building owners whose primary interest lies in storing the heat – the storage of electricity is a free side benefit.

Scaling

Dual thermal/electricity storage systems (called exergy stores) can be employed on any scale ranging from a single building to covering the whole province. That makes it very easy to phase in the use of exergy stores at any desired rate, and with any desired end objective. Exergy stores can be built in a matter of days so there is no long gestation period like that encountered with nuclear power stations. However, the feasibility of building such stores depends on the Ontario government's willingness to follow its own policies. The generation monopoly can (and does) impose obstructions that make it difficult to build such systems, starting from blocking even the consideration of employing such stores, which is the point of this current discussion. The benefits of electricity storage are realized primarily by the cost reductions/generation efficiency gains of the generation facilities themselves so if the IESO et al choose to turn a blind eye to those gains then the benefits are lost.

An inappropriate tax

According to the IESO web site the Global Adjustment (which is the primary means of funding nuclear power) averages 9.97 cents/kWh and the cost of hydro power averages 1.58 cents/kWh, for a total average cost of 11.57 cents/kWh. In effect we are paying an 86.2% tax rate to subsidize the cost of nuclear power. In the process any generation supply that might compete with nuclear power is paying that tax to the nuclear generators (with some pet government exceptions). Ontario has no need of nuclear power. If we switched to using stored heat and electricity then the demand reductions and efficiency improvements would be sufficient to allow the reactors to be permanently shut down on the dates at which their CNSC permits expire – all of which are pending in the near future except for one of the Darlington reactors. The graph below illustrates how that would unfold.



The green line shows how the total electricity demand will fall as storage is implemented. The use of fossil fuels for generation will disappear within 3 years but it will take 15 years to displace the use of natural gas for heating applications. The wind turbine contribution is not shown but it was included in the figures, using a straight line projection for the future. There would be a solar PV contribution but it is not shown in this graph because it would be behind the meters. The numbers are based on the IESO data, with the reactor shutdown dates being determined by the CNSC permit expirations. Small adjustments were made in those dates to make the nuclear curve smoother. The Pickering stations are shown as being shut down according to the dates proposed to the OEB. The red line shows that there will be a residual need for some power that could be provided via imports from Quebec, including power for which negotiations are currently underway. Note that Quebec will have a very large surplus of power available once it too takes advantage of exergy storage.

Transportation

Over the coming two years new models of EV's will be introduced at the rate of nearly one per month. While it will take many years for the electricity demand for EV's to become a major factor the means of actually achieving the needed recharging capacity is an immediate problem, and it directly involves the IESO. The most efficient way of building recharging stations is to integrate them with distributed grid regulation systems that can be built into exergy storage systems. Integrated regulators are about two orders of magnitude less expensive than the IESO-preferred approach of using single purpose battery regulation and they are located at the load end of the supply chain, which is preferable to integrating them with the supply system (which implies high distribution costs and waste).

Nearly all of the upcoming EV models have short ranges, generally amounting to less than 300 km. For such vehicles to be attractive we will need to provide charging points that are even more densely

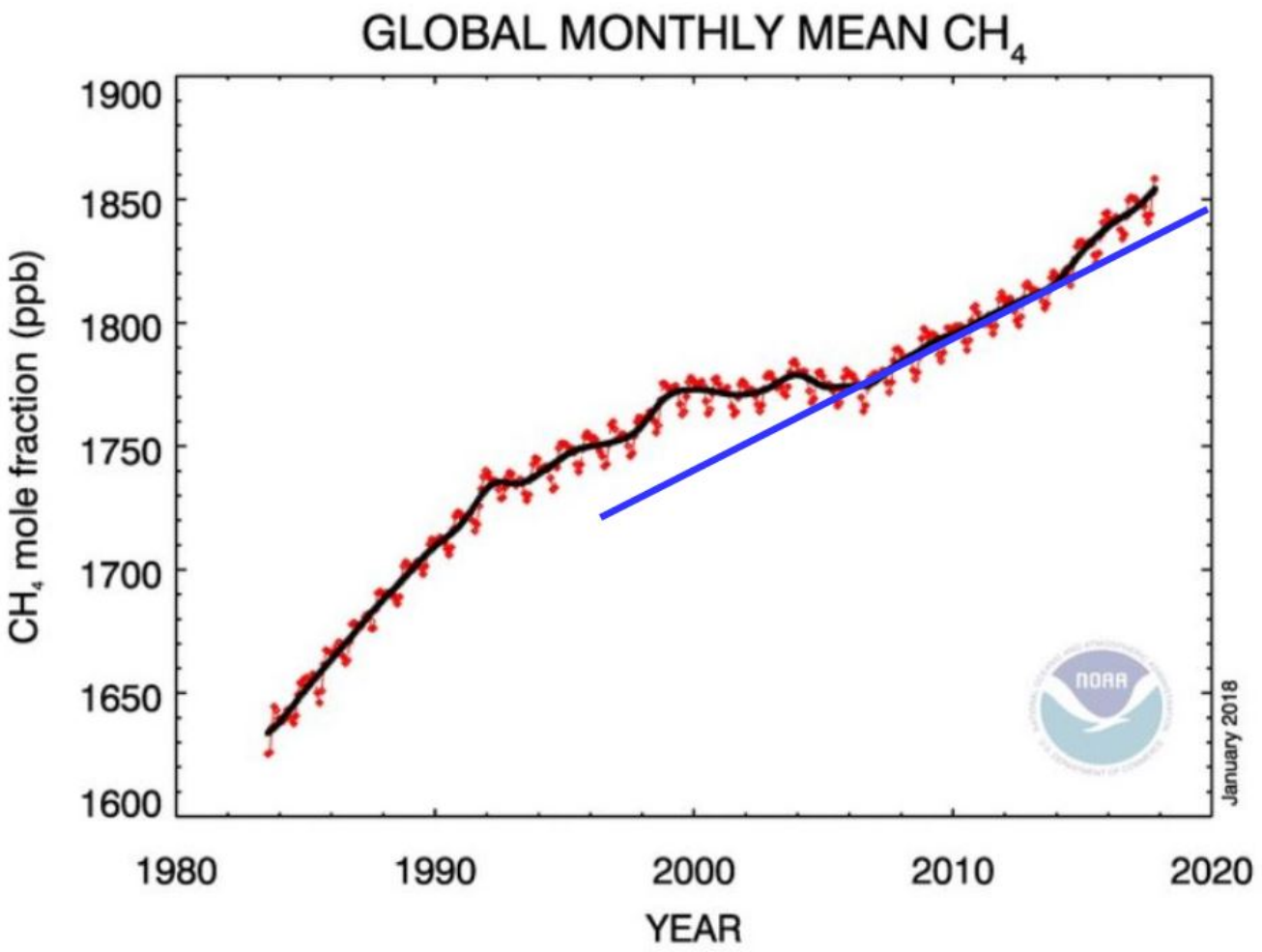
distributed than gas stations. That will be a major challenge considering the small related demand for power. If it provides the charging points then Ontario could restore its car manufacturing industry and it could make a major reduction in GHG emissions from transportation, but that will require that the IESO play its part. Unfortunately, the IESO has been reluctant to do that, arguing that its role is to perpetuate the status quo for electricity supply.

Why the IESO has no choice

If Ontario proceeds with its plans to refurbish its Darlington and Bruce reactors then it will almost certainly find that they will become stranded assets even before the refurbishments are completed. The problem lies with how we heat our homes. The overwhelming choice in Ontario is to use natural gas, most of which currently comes from the Marcellus fracked gas source. Two new pipelines (Rover and NEXUS) are currently under construction and they will soon bring our share of fracked gas to 100%. In the fracking process about half of the released gas is captured and the other half is released into the surrounding ground, which is about one million times more permeable than the shale from which the gas was extracted. Once the gas is mobile there are many mechanisms, such as porous rock layers, faults, water adsorption, failed drilling pipes, etc., that will enable the gas to eventually flow to the surface.

For the past decade Ontario's share of that underground bubble of uncaptured gas has been growing at the average rate of about 2000 megatonnes of GHG(eq.) per year, growing to about 3000 megatonnes per year as we complete the switchover to fracked gas. To date hardly any of that released gas has reached the surface, thanks to the 2 km depth of Marcellus. However, it has now begun to reach the atmosphere. There have been many sub-surface, surface, aerial and satellite surveys that have confirmed that the methane content of the atmosphere is rising, and it has been established that the increases are due to fracking rather than from the generation of methane at the surface from organic processes. The two can be distinguished by measuring the ethane constituent, which is not produced by the surface processes.

NASA uses a satellite to measure the global methane. They have just released their most recent results (below):



Until recently the dominant trend has been the increase due to fugitive emissions coming from the production pipelines (blue line). However, the graph is now departing from that trend because some of the underground bubble is at last reaching the surface. That trend will rapidly accelerate until it reaches a balance at about 3000 megatonnes per year (for Ontario). That gas was actually released years ago and there is nothing we can do to stop it. Even if we abruptly stopped using natural gas altogether the amounts reaching the atmosphere will continue to expand dramatically. The best we can hope for is to stop the gas production ASAP and hope that our kids will forgive us for our stupidity.

To put the number in perspective all of Canada's GHG emissions from all sources put together add up to 700 megatonnes per year. The 2050 objective is to reduce that by 80%, or to something like 140 megatonnes. If the Paris Climate Change objective were to be honoured then the emissions would need to be reduced to well under 140 MT. Obviously such objectives cannot possibly be met by Ontario because for many years we have been releasing thousands of megatonnes of GHG for the methane contribution alone, and that gas is now beginning to reach the atmosphere. Both the provincial and federal governments grossly misrepresent the "national inventory" GHG figures (which do not include upstream methane) as if they were a measurement of the GHG related to our use of natural gas. So long as none of the released gas had reached the surface an "out of sight, out of mind" mentality has ruled government planning. Now our governments must address the issue. Every year of delay will contribute an extra 3000 MT, none of which will be helped by government agencies that point to one another as the source of the problem.

If we stop using natural gas for heating then the only practical alternative is to use thermal storage of local energy to heat our homes. The energy source might be solar energy, stored solar energy drawn from the ground, or heat extracted from the air. Actually, storage makes it possible for heat extracted from the buildings during the summer to provide a large part of the winter heating. Neither nuclear power nor superinsulation provide economically viable alternatives for large scale use so we will need to use some mix of the local thermal energy sources. The direct consequences will be that the demand for electricity will fall and the generation efficiencies will rise, leaving us with derelict power reactors and a bill for 26 billion dollars.

These are issues that the IESO needs to deal with right now. To fail to do so would impose huge economic and environmental penalties on Ontario residents. The IESO has asked for our advice – now it needs to consider that advice, not dismiss it on the questionable grounds that it does not fit into their mandate.

Ron Tolmie
217 Petrie Lane, Kanata, ON K2K 1Z5
(613) 271-9543

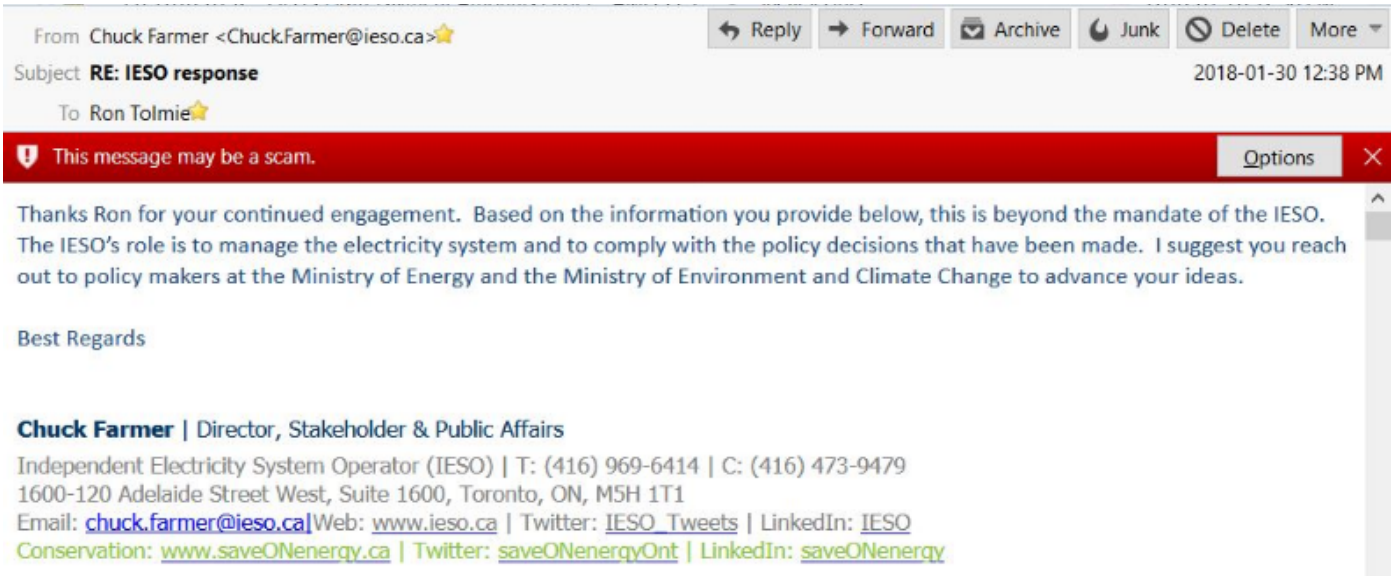
Sent to the Ministry of Energy (No reply received)

Minister Glenn Thibeault

The IESO has requested that I refer the following issue to your attention. It concerns exergy storage, a technology that can achieve energy conservation on a very large scale, enough to eliminate Ontario's need for both natural gas (for heating and power generation) and nuclear power. The latter would of course drastically reduce or eliminate the nuclear revenues from Ontario's power monopoly, hence the IESO opposition.

Exergy stores store both heat and cold to provide heating and cooling for our buildings, using local thermal energy sources (AC heat and heat extracted from the summer air). The exergy of the stored heat can be boosted which in effect stores electricity on a very large scale. Some of the stored electricity is recovered in the form of electricity but most is recovered by reducing the power demand during peak demand periods. The result would be the elimination of the GHG from natural gas and a radical reduction in the cost of electricity via a switch to existing hydro power resources resulting from the reduction in peak power demand. Exergy stores can also be used to provide electricity for EV's, creating a large network of charging points - a crucial prerequisite for the adoption of such vehicles.

The technology is briefly described in IESO-Outline.pdf, prepared in response to a request for such submissions from the IESO. THE IESO replied with the following message:



From Chuck Farmer <Chuck.Farmer@ieso.ca>
Subject **RE: IESO response**
To Ron Tolmie

Reply | Forward | Archive | Junk | Delete | More

2018-01-30 12:38 PM

This message may be a scam. Options

Thanks Ron for your continued engagement. Based on the information you provide below, this is beyond the mandate of the IESO. The IESO's role is to manage the electricity system and to comply with the policy decisions that have been made. I suggest you reach out to policy makers at the Ministry of Energy and the Ministry of Environment and Climate Change to advance your ideas.

Best Regards

Chuck Farmer | Director, Stakeholder & Public Affairs
Independent Electricity System Operator (IESO) | T: (416) 969-6414 | C: (416) 473-9479
1600-120 Adelaide Street West, Suite 1600, Toronto, ON, M5H 1T1
Email: chuck.farmer@ieso.ca|Web: www.ieso.ca | Twitter: IESO_Tweets | LinkedIn: IESO
Conservation: www.saveONenergy.ca | Twitter: saveONenergyOnt | LinkedIn: saveONenergy

In rebuttal I sent the second response, IESO-Mandate.pdf, that shows how exergy stores function by conserving energy in both thermal and electrical forms. Conservation has been identified by the Ministry of Energy as our best bet for reducing GHG so my contention is that the Ministry supports such conservation measures. The IESO does not agree and it continues to block any significant discussion of the concept in their reviews and programs.

Would you please adjudicate this dispute.

Regards,

Ron Tolmie
217 Petrie Lane, Kanata, ON, K2K 1Z5
(613) 271-9543

Sent to the Ministry of Environment and Climate Change (No reply received)

Hon. Chris Ballard

In the second quarter of this year the Rover gas pipeline is scheduled to come into service to the Dawn Hub. Shortly after that, Ontario's GHG attributable to our use of natural gas will exceed 3000 megatonnes GHG(eq.) per year, based on the current value of 105 for the GWP of methane. Since the source of the gas is deep under the ground most of the uncaptured fracked gas is still in transit so it is currently releasing only a small amount of that methane to the atmosphere. However, there are no serious impediments to its flow so the atmospheric release rate will rise rapidly until it comes into equilibrium with the underground generation rate of 3000 MT/y.

Your GHG data presently reports the National Inventory values of GHG as if they were the actual GHG emissions. That is false. The National Inventory values do not include the upstream methane contribution related to the US source (Marcellus) so they will soon be in error by 3000 MT/y. In recent months clear evidence has shown that fracked methane is escaping from the ground, including the global CH4 measurements being reported by NASA.

There are alternatives to the use of natural gas that produce no GHG at all and that would save many billions of dollars per year if they were used as a replacement for both natural gas and nuclear power. The exergy storage concept that I have described in the papers that I have written will in addition provide for a network of EV charging stations, an essential prerequisite to the switch away from fossil fuels for vehicles.

At what time do you propose to set the record straight?

Regards,

Ron Tolmie

217 Petrie Lane, Kanata, ON, K2K 1Z5, (613) 271-9543