Backgrounder:

"No Worker Left Behind"
In Transition to a Low Carbon Economy

07/07/20

General Intent:

The 2017/18 survey of senior registered Liberals expressed concerns in the top 5 regarding the availability of quality job options, the transition to a 21st century economy, and the environment/climate change.

Our intent is to attack the nexus of these three top five concerns, and to do so in a manner that will accelerate Canada's climate change plans while ensuring that the economic angst felt by workers in high GHG sectors is relieved insofar as possible. Bringing these high GHG sector workers "on board" and providing them with comparable economic options is the right and just thing to do, and will advance Canada's GHG efforts both by reducing resistance to necessary changes and creating a pool of skilled workers for the 21st century economy.

This paper provides the justifications and details with regard to the specific recommendations contained in the resolution.

The emphasis is on retraining the workers in high GHG sectors concurrent with government actions to create new 21st century jobs for the workers. In order to accelerate our transition efforts, government must invest in both.

The Workers:

Our primary concern is with the workers who do not already have a post secondary education. These workers contribute tremendous value to the economy with different talent and skill sets that are not as easily transferable in a career shift.

In this post-industrialization era, the labour market has significantly shifted toward the service and knowledge-based sectors. The concomitant rise of an authoritarian form of populism has challenged assumptions about economic policy, in that it has caused society to be more attuned to the so-called "losers" of dynamic capitalism and the process of creative destruction of wealth which it fosters. The rise of this political populism is driven in large measure by a growing sense of economic precarity on the part of the working-class people, particularly men; the economic conditions that have contributed to the sense of precarity have developed without adequate attention and discernment on the part of the policy makers. (Sean Speer, Forgotten People and Forgotten Places: Canada's Economic Performance in the Age of Populism, a report written for MacDonald=Laurier Institute, 2019, hereafter referred to as MLIFGFP, https://macdonaldlaurier.ca/files/pdf/MLI_Speer_ScopingSeries1_FWeb.pdf)

It is well to recall the assessment by Richard Hofstadter in The Age of Reform (1955): "One of the primary tests of the mood of a society at any given time is whether the comfortable people tend to identify psychologically with the power and achievements of the very successful or with the needs and sufferings of the underprivileged." When leaders neglect the second option, populism takes root.

Some of the principal findings of the research reported in MLIFPFG are:

•Challenges are most acute for working age men without post-secondary qualifications whose labour market outcomes outside of the oil-producing provinces have for some time resembled those in the poor regions of the US.
•36% of Canadians do not have university or college qualifications, nor have they completed an apprenticeship. This figure embraces 6.7 million people in the age range 25-64.
•The economy is producing fewer opportunities for people who have neither the aptitudes nor credentials to participate in knowledge-based sectors. The result is a bifurcating labour market.
•The urban/rural divide is increasingly the most important economic, cultural and political fault line in our society. Rural areas hold 18.7% of the population and are home to lower levels of employment (2.5% less than the national average), of labour force participation, of income, of education (among the lowest in the OECD).
•Level of employment in Alberta in 2014 was 7% above the national average, but fell to 2% above in 2019.
•Major concerns of people do not involve inequality in income, but rather fairness, work opportunity, particularly a demand for meaningful work.
•Speer identifies rural Quebec, rural areas of the Atlantic provinces and the Ontario towns of Thunder Bay and Sudbury as particularly hard hit in the present climate. Parts of Alberta have now perhaps joined that group.

If we accept that this is the situation, what are the solutions? An interesting initiative: It is termed Iron & Earth (https://www.ironandearth.org/).

In the following we paraphrase material from their website. Iron & Earth is a worker-led not-for-profit organization committed to empowering oil and gas, coal, and indigenous workers to build a renewable energy economy It consists of energy workers who are excited to build renewable energy projects.

Iron & Earth is led by oilsands workers committed to incorporating more renewable energy projects into their work scope. The organization was created during the spring of 2015 when oil prices started to fall. They were losing work and the moment served as a catalyst to realize a shared vision for a sustainable energy future for Canada. They founded Iron & Earth as a platform to engage in renewable energy development issues and to empower them to advocate for an energy future they could be proud of creating. The membership has grown to include workers from a variety of industrial trades, including boilermakers, electricians, pipe fitters, ironworkers, and labourers.

An important element in their program is a plan for upskilling. Skills of workers from the oil, gas and coal sectors can be transferable to the growing renewable energy sector. They feel that upskilling programs should be led by the federal government, tailored at the provincial level, and implemented through unions, educational institutions and training providers across the country, while respecting and honouring Indigenous treaties.

That type of solution, with proper funding support, attacks a significant portion of the issue. However, there are many more workers for whom such an option simply won't work. They may not be in a union, may not already have a trade or apprenticeship, may not have easily transferable skills and are likely to be in a position where the economic status of their families renders re-training periods impossible. That family economic status may also preclude mobility to seek employment in another community/province.

Thus for a large chunk of workers in high GHG industries, when we phase those industries out, those workers see the destruction of their family's economic prospects as the outcome. Little wonder many of those workers oppose actions on climate change, as they face not only lifestyle changes, but perceive that their family's economic status and retirement prospects will be destroyed.

The conundrum they face is one where social safety net supports and educational opportunities are not geared to their needs. Older workers may be close enough to look forward to pensions. The education systems and their supports are geared toward youth. That leaves a large gap for the 30-60 year old cohort.

Typically, acquiring a new skill set requires completion of a two year program. If we look at something like an auto-body technician it is a two year course, and tuition alone is $5-6,000 at an institution such as Okanagan College. Not all of the displaced workers will be accommodated by new industries, nor will those new industries necessarily be in the worker's community. E.I. will cover a maximum of 45 weeks IF the worker is approved for a limited range of options (typically set by provincial governments). Depending on the date of lay off, a dis[placed worker may find that 12+/- weeks of that E.I. has already been consumed before they can start the course. That leaves the worker with 71 weeks of zero income, and facing a tuition bill of $5,000+. In addition, the options for that coverage may not suit the interests and/or innate talents of the individual worker.

In order to properly look after these displaced workers, we need to expand their options, provide E.I. through to the end of an accredited trade retraining course – from their lay off date, and provide tuition coverage.

The workers themselves will have a sense of what trades are in demand in their community and match with their abilities – they may make a poor choice in small percentage of cases, but assistance with making that choice, at the local level, will minimize that factor. The workers should be free to choose any accredited 2 year training course as their individual options, talents and potentials will vary hugely.

The role of government in transformational change:

We have a panoply of government incentives ranging from EV subsidies to FITs (guaranteed feed in tariffs) and everything in between. R&D subsidies and other options are also widely available. We also have carbon pricing as a Pigovian incentive. Yet the pace of change in reducing GHG emissions in Canada remains stubbornly low.

From the perspective of “working stiff” that pace of change in also very limited in producing promised

employment options. A good part of that is because the bulk of changes are overwhelmingly dependent on imports. Solar panels, BEVs, battery systems, wind turbines, etc. are making a difference, but the preponderance of those 21st century technologies are not made in Canada.

Some areas of Canada have embraced these technologies, and discovered unintended consequences – including skyrocketing electricity costs that not only hurt consumers, but act as a disincentive to industrial investment. Consumers don't care about "electricity generating costs" - they care about what shows up on the delivered cost to them on their monthly bill.

That adds to the skepticism that many working have about directions for a low carbon economy. They perceive higher household costs, fewer employment options as the outcome of GHG reduction – and the evidence on the ground is backing that up in the short term.

The key element missing has been the lack of government investment in the lynch pin requirements.

There are areas in the economy where government operated businesses are the lynch pins to success. These are the narrow businesses where as a private business model either the R.O.I. is too long term (e.g. hydro electric – which is an inter-generational investment) or there is no R.O.I. (e.g. BC Ferries) making them entirely unattractive for private investment. In these cases, however, they are good investments for government as the upstream and/or downstream benefits are very high – yielding an indirect investment return for governments in terms of cash flow and importantly in job creation by enabling industries.

Increasingly, risk capital for key large projects has become difficult for Canada to attract. Two recent examples are the Trans Mountain Pipeline, and the Keystone XL pipeline – where private interests bail in the face of rising risk – and governments have had to step in and provide the risk capital.

Looking around internationally, we see state owned enterprises being dominant in the investment landscape. Not just the obvious ones, like Statoil or CNOOC, but even here in Canada our pension funds have become virtual state owned investment companies. (Canadian government pension funds own large stakes in things like airports in other countries.)

Thus it is logical that if we want to accelerate Canada's GHG reductions, create jobs and new industries, government in Canada is going to have to directly invest in lynch pin sectors that will enable and support upstream/downstream industries to flourish and create jobs (and tax revenues!).

The low carbon sector open possibilities:

Many of the currently popular options for GHG reduction, wind turbines, solar panels, battery EVs, Li batteries etc. are "horses that have already left the barn". It will be very difficult for Canada to achieve high standing in these areas – if not impossible.

That said, there are a number of niches that suit Canada's future that are still open.

1. Hydrogen Hydrolysis:

Hydrogen production by electrolysis is being put into use in some smaller jurisdictions as an energy storage system for electricity generation from intermittent sources. https://horizon-magazine.eu/article/hydrogen-use-doesn-t-emit-carbon-its-production-often-does-could-soon-change.html

While this is a laudable use, it does not get to the core potential of hydrogen utilization, which is in the massive fuels markets for home heating and transportation.

However, what it does demonstrate is the potential to utilize hydrogen production by electrolysis to smooth, stabilize and improve the economics of intermittent source electricity. In essence that is "low hanging fruit".

In the Canadian context, we are faced with long distances for transportation, high needs for home heating – which are overwhelmingly fossil fuel based, We also have significant numbers of remote communities that rely on diesel fueled electricity generation.

Also in the Canadian context we have grid jurisdictions that are losing substantial amounts of money selling off peak and surplus electricity at low or zero pricing. That reality is driving up actual used electricity prices for businesses and consumers – costing the country potential jobs and making life less affordable. It is also costing the provincial governments considerable sums in terms of lost revenues, and subsidies for citizens.

Electricity consumption generally follows a usage pattern similar to this:
https://www.energyvanguard.com/blog/electricity-demand-and-the-duck-curve

and note that in the second chart they show an even more difficult to manage grid electricity demand curve induced by the introduction of household roof top solar panels (self generation by consumers and businesses).

Peak demands must still be met either through storage (which introduces costs and inefficiencies) or usage curtailment (brown outs and blackouts in the worst case) through T.O.U. Pricing. In both scenarios businesses prices for businesses rise dampening job growth (and wage potentials) and consumers pay higher prices – making life less affordable.

Higher electricity prices make "green" alternatives less competitive. In the Canadian context, home heating in the province with the lowest electricity prices – Quebec – is dominated by clean hydro electric heating. West of Quebec fossil fuels dominate the home heating markets, as natural gas (even with a fairly robust carbon tax such as BC has) are still the cheapest alternative. It should be noted that the capital cost and operating cost of retrofitting from fossil fuel home heating to electric heating is prohibitive for many Canadians.

The demand curve expresses itself in wholesale electricity prices inversely.
https://www.aeso.ca/market/market-and-system-reporting/

That price expression is important when considering the potentials of hydrogen, in that hydrogen as a

fuel needs to priced as close as possible to $1 USD per Kg as possible. When electrically produced from renewables, at profitable electricity prices, the cost is $3+ USD per Kg. https://www.iea.org/reports/the-future-of-hydrogen

The possibility exists however, of utilizing the inverse price relationship to the demand curve (which is likely to become more pronounced with further introduction of roof top solar) to produce hydrogen through electrolysis by utilizing surplus electricity at a low price, regulating the demand curve not by TOU pricing or direct curtailment which have deleterious economic impacts for both businesses and consumers. At the same time, for electricity generators a low price guarantee for surplus power would allow them to moderate their electricity prices as a facility run 100% of the time at full capacity (whether it be wind, hydro, nuclear, gas or coal) will lower their incremental costs and increase revenues.

This analysis indicates that such an approach is not competitive, but it was done based on European electricity prices – which are quite high: https://www.sciencedirect.com/topics/engineering/hydrogen-production-cost

At 50% utilization, with electricity at 40-50 Euros per MWh (about $60 CAD per MWh) they appear to come up with prices of $4-7 USD per Kg for hydrogen. Hydrogen for vehicle use becomes really competitive at $2 USD per Kg. (current US wholesale gasoline price is about $1 per gallon and 1 Kg of hydrogen is equivalent, but hydrogen vehicles are roughly twice as efficient as gasoline vehicles).

Now if we factor in two key elements, the predominance in Canada of public utility generation, and the much lower cost averages for Canadian electricity, we see a different picture.

First we need to consider this type of factor:https://business.financialpost.com/commodities/energy/use-wasted-excess-electricity-to-power-economic-growth-engineers-urge-ontario

There are public returns to be had in at the very least using the sold for zero energy to produce hydrogen as a salable commodity and at the same time improving the economics for publicly owned utilities by placing a floor under prices. It makes no sense that we are subsidizing US consumers and industries.

Each province will be different, however in the case of Ontario, there appears to be around $150 million per year in public funds to be gained.

Canadian electricity prices are much lower than European prices. Looking at the AESO reported wholesale prices, it would be relatively easy to achieve an average electricity cost on the order of $20 CAD per Mwh for 50% of the time, and perhaps even for 60-65% of the time if we factor in seasonal variation.

Those two factors indicate that rather than $4-7 USD per Kg as calculated, the Canadian context can yield pricing of about $2.50-$3.50 USD per Kg. Given carbon taxes etc. that yields a per liter gasoline equivalent of about $1 CAD per liter. Add another $.40 CAD per liter for distribution (as a long term number) and hydrogen is in the ball park. Dual track production, 50% from natural gas and 50% from hydrolysis would drop that equivalent price to very close to gasoline.

Public acceptance of alternative vehicle choices is also a different factor in Canada. Many Canadians travel considerable distances by road and have concerns about BEVs best characterized as “range anxiety” and are unsure if battery technology can provide vehicles with the capabilities they want. Not so with hydrogen, where even the heaviest of vehicles (highway transport trucks) can be fueled with hydrogen. FCEV technology is also suitable for heavy equipment from farm tractors through to excavators where heavy battery weights render BEV technology moot. FCEVs using hydrogen can be used to gain consumer acceptance as they can have the same capacity vehicle, at similar ease of fueling – in other words, it would be just about the same except cleaner and quieter.

Canada has a lot to gain from pushing our economy into hydrogen, especially if we can partner with manufacturers to built technology and vehicles in Canada. We can avoid the high cost storage solutions for intermittent source electricity and at the same time drop our transportation GHG emissions in Canada's long distance context.

Large scale hydrogen hydrolysis plants can have immediate upstream benefits in some jurisdictions (e,g. Ontario) and have the potential to create a whole new class of industrial work in Canada downstream. Developing large scale hydrogen hydrolysis plants would have positive direct impacts on existing construction, fabricating and associated industries – adding to their portfolios of expertise.

2. Enhanced Geothermal Systems:

In direct usage EGS electricity production in would likely not be very competitive in mainstream Canada at this time. Current estimates put electricity generating costs for EGS at about $.11/kWh – but with the potential to drop to $.06/kWh with development of the technology. Those kinds of costs could possibly find niches in some areas of Canada's north. Certainly in other countries the cost of EGS once developed would indeed be competitive, or even below competitive rates for 24/7 baseline power.

Current experience with EGS suggests induced seismicity is a problem, however in lower population density areas of Canada that are geologically stable the problem would be mitigated as the induced seismicity is not of great magnitude. In the areas of Canada where coal fired electricity production is prevalent, there are many such potential sites.

From a worker perspective, EGS is a good match. The skills required line up very closely with many aspects of fossil fuel production, deep drilling, pipe fitting, welding and fabricating, construction skills for pressurized plants are skills in abundance in the fossil fuel producing areas in Canada. Thus little retraining would be required. Additionally, many of those same workers are used to camp life and traveling significant distances to maintain their livelihoods. That makes the prospects for export of technology and expertise quite attractive.

There are other possibilities for EGS technology surrounding distributed heat plants, greenhouses for food production, etc. which could spark spinoff enterprises.

EGS would be reasonable candidate for putting some displaced fossil fuel workers to work in the short term, and while at the higher risk end of the scale, has potential for creating a replacement set of industries in the long term.

3. Non combustion products from Fossil Fuels:

This is an area where considerable research is being done in the fossil fuel producing provinces. Such efforts are looking at value added products such as carbon fiber, polymers for a variety of uses, and road building materials.

The opportunities and need for lynch pin investments are not obvious at present; however, should such opportunities present themselves, government(s) should be prepared to participate as said non combustion products diverting fossil fuel to low GHG outcome would be a welcome employment stabilizer and provide potential for exports of both the products and expertise.

4. Advanced Safe Nuclear Power:

Nuclear power as a baseline source for electrical energy will continue to be part of the energy mix, and given the magnitude of the energy to be transitioned in the transportation and home heating sectors, will be a required element.

In Canada's context, we have been able to develop a substantial baseline of hydroelectric and as such nuclear has not grown very much. The future prospects for further hydroelectric are, however, not great. Indigenous rights concerns, environmental footprint concerns, fisheries concerns etc. are likely to curtail or eliminate significant further major hydroelectric development. The controversy, subsequent legal battles etc. surrounding BC's site C dam, a tertiary dam on an already dammed river, are an indicator of how difficult it will be to develop further major hydroelectric. Arguably, if site C had been on a wild river, not one previously dammed, site C would never have gone ahead. There is little or no public appetite for damming wild rivers. Yet in BC alone, estimates for the electricity required to transform the transportation sector range as high as 7 new site C dams required.

Costs for new hydroelectric facilities are rising, and that brings nuclear power back into a competitive position for baseline scalable power. The demand for new baseline power generation will inevitably grow as sectors such as transportation and home heating shift away from fossil fuels. As hydroelectric gets ruled out, nuclear becomes the lowest GHG option.

The downside in that comparison is that hydroelectric is as much an energy storage system as it is an energy generation system. (BC has tried run of river electricity production, but it has proven very expensive.). A hydroelectric dam can optimize its production by storing energy as more water behind the dam off peak demand, a nuclear plant can not. However, if nuclear is coupled with hydrogen hydrolysis, then some of that downside can be mitigated, with hydrogen hydrolysis providing a partial economic outlet. As a combined system, the economics for nuclear are improved somewhat.

The difficulty is public perceptions of nuclear. In terms of delivered electricity costs, what the consumer actually pays, nuclear is a good reliable 24/7 option. Newer designs are such that safety is not a concern. France, for example, is heavily reliant on nuclear power – yet “France does not glow in the dark”. Canada's nuclear power, while aging and old designs, has not led to “Canada glowing in the dark”.

Unfortunately, for whatever reason, Canada chose to "get out of the game" in terms of safe nuclear a decade ago. Certainly when Canada was really "in the game" with nuclear there were a lot of employment spin offs across the country (the writer worked for a company making components in Burnaby, BC when Canada was building up nuclear capacity). Canada still has some intellectual property rights in the field, although the precise terms of those intellectual property rights are opaque to the writer.

That said, advanced safe nuclear power has a future, and investments in bringing those jobs back to the fore in Canada are an option – and perhaps a necessary one as our current nuclear capacity ages to obsolescence. It would behoove us to then re-examine our position vis-a-vi nuclear energy.

The Energy Poverty Risks:

Energy poverty is a growing societal risk in many countries/jurisdictions, especially those jurisdictions who choose to rely on the simplistic notion of intermittent source electricity (wind, solar, tidal) as the "answer" to meeting GHG reduction targets. By focusing intently on that singular part of the solution, delivered electricity prices rise significantly (e,g. Australians are paying about 3.5 times as much as BC residents) and the resulting cost increase accrues to the lower income portions of society.

Those with greater means are less proportionately affected, and are more readily able to offset the rising grid electricity costs. Single family home owners with the means can install solar systems and energy storage systems. Condo owners and renters generally do not have the means to take advantage of such options, and neither do low income single family home owners.

Perversely, as intermittent source electricity generation reaches a tipping point, additional homeowners of means connecting their solar systems to the grid worsens the problem and the disparity. The effect of single family home owners installing rooftop solar can be seen in the California curve here:
https://www.energyvanguard.com/blog/electricity-demand-and-the-duck-curve
The oversupply during the daylight hours drives down wholesale electricity prices, which utilities must then make up during the rest of the cycle and/or charging more for delivery and distribution.

Similarly, as intermittent sources can not be scaled to suit human activity need cycles, reliable scalable sources that are critical to maintaining grid stability and peak demand supply lose the economics of scale as their overall market declines – forcing them to raise their peak and high demand period prices to compensate.

The high means family with solar rooftop and a power storage system is inured to that, simply drawing down on their storage system during high cost TOU periods. That has the effect of driving up the incremental price needed for peak/high use periods as those high means folks are not paying a share at that time.

The end result is that lower income folks and condo owners wind up footing the bill for the most fortunate in society. Thus we see "energy poverty" where many thousands of people must choose between food on the table or heating/cooling their homes (which has health impacts, especially for seniors).

It should be noted that California, with its high dependence on intermittent source electricity, now has the highest energy poverty rate in the western USA.

Canada needs to be very wary of this energy poverty risk when making our decisions on technologies to pursue, and system balance decisions. Low cost electricity generation does not equal low cost delivered electricity price – and that's what matters.

Glossary:

BEV: Battery electric vehicle

FCEV: Fuel cell electric vehicle

GHG: Greenhouse gas

EGS: enhanced geothermal system

TOU: time of use

R.O.I.: return on investment

FIT: feed in tariff

E.I.: employment insurance