A Transformation Manifesto for Albertans to reduce GHG Emissions from O&G

"If Hitler invaded Hell, I would at least make a favourable reference to the Devil in the House of Commons."
- Churchill

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Abstract

Maximum reduction of GHGs in the minimum of time with a minimum of effort require that all technologies, methods and means be considered as options, including more efficient use of hydrocarbons. Improved utilization of oil & gas offers the prospect of rapid reductions in GHG emissions at a modest cost per tonne with no new technology, and can be supported by existing infrastructure.

The transformation of the global economic system to zero and then negative net greenhouse gas emissions (GHGs) to mitigate climate change is the most ambitious and far-reaching program in the history of civilization.[1] Advocates for oil and gas have to some degree been treated as the devil: the enemy to be exterminated.[2] Opponents argue the industry must shut down and resources left in the ground.[3] There is an alternative. Oil and gas interests can lead and advocate for reduction of GHGs by transforming how hydrocarbons are used with new, lower GHG strategies.

Maximum reduction of GHGs in the minimum of time with a minimum of effort[4] requires that, a priori, there be no Saints or Sinners. All technologies, strategies, methods and means for lowering GHGs need to be considered and dispassionately evaluated and benchmarked.

[1] The opinions herein are the writers', not those of WISE or other agencies with which the writers are affiliated.

Technologies that meet the feasibility test of economic, political and logistical practicality for a particular situation need to be considered, and when appropriate, applied irrespective of whether they involve the use oil and gas. No solution will necessarily be right for all circumstances or jurisdictions in the quest for reduction of GHG emissions. Oil and gas may play a critical role as transitional fuels to a greener world in many places where a high-quality infrastructure is already established.

Technologies arbitrarily and uncritically labeled "renewable", "sustainable", or "clean"[5], such as solar,[6] wind,[7] biomass, geothermal, and hydro[8], should be treated no differently than "dirty" or "fossil"[9] technologies like coal, oil and gas in terms of assessment of environmental impact[10] and renewability.[11] Properly assessed and implemented, the oil and gas sectors can greatly improve their environmental performance relative to so called "clean" or "renewable" options.

Proposals that narrow choices by limiting options to those that "fit" into existing institutional arrangements[12], or meet social,[13] political[14] or ideological[15] objectives that detract from the goal of rapid, certain, economic[16] and logistically feasible reductions in GHGs have no place when climate science informs us that a climate emergency[17] is upon us. Alberta's goal should be, simply put: bring emissions down, by doing what we have to do.

Advocacy for the elimination of existing industries like coal, oil and gas, without well-thought-out alternatives with logistically and economically feasible implementation plans for transitioning personnel and resources to viable alternatives leads to active resistance[18] that delays addressing climate change.[19] Furthermore, transitions, or "leaps" that require substantial resources, whether in the form of ongoing subsidies or new infrastructure, will not find a ready audience when the majority of OECD nations face fiscal and other constraints.[20] The issues of economic, political and logistical feasibility mean that to date, only baby steps have been taken toward a zero net carbon economy.[21]

If "Leap" is out of the question, the question becomes "What can be done with what we have at hand, with existing, proven, deployable[22] technologies?" And most importantly, what ideas are most feasible and can be implemented quickly?[23] Have we made best use of our existing infrastructure? Have we deployed our resources for "best outcomes" in terms of GHGs? The answer seems to be no. We have not exhausted the means to make best use of what we know and have on hand and use worldwide: oil and gas as primary energy sources. That is where we need to start.

Extant energy systems that rely on "fossil" fuels like coal, oil & gas were designed at the dawn of the industrial age. A century of falling real prices of energy has resulted in energy systems that are wasteful.[24] At present, GHG emissions effectively have a zero price worldwide[25] and there is no political consensus to raise the price sufficiently to dramatically cut emissions. There is ample scope to begin the process of re-designing and engineering our "fossil" fuel based energy systems with lowering GHGs as a primary design goal.[26]

"Fossil" energy systems' dominance has resulted in technologies that require high-grade energy at low prices.[27] For stationary sources like electricity or piped natural gas, the infrastructure requires supply to be cheap and available on demand and distributed via the "grid". Transportation predominantly requires liquid fuels[28] that are compact, easily and inexpensively transferred and stored, and widely distributed.[29]

"Clean" technologies such as wind, solar, etc., fit awkwardly at best with an infrastructure designed for and dominated by "fossil" fuels. Wholesale introduction of low density energy sources that provide intermittent energy require complementary "balancing" with more traditional sources or the introduction of grid-scale storage systems.[30] For transportation, renewable applications are limited to vertical markets like electrified intra-city trains or storage of energy in expensive, inconvenient batteries in electric cars.[31] The lack of an infrastructure of charging stations and sufficient power supply to neighborhoods are major impediments to large-scale electric vehicle adoption at this time

No technological breakthroughs are expected in non-hydrocarbon based transportation, beyond existing niches, in the next 20 years. Petroleum-based fuels will remain dominant in land and air transportation for the foreseeable future, beyond 2050, particularly for developing countries. Does it matter that we continue to use petroleum if it is carbon neutral?[32] If not, then why not take a step toward that goal by lowering GHGs from petroleum use now?

Without a technological breakthrough or catastrophe, Alberta's economy will be dominated by exploration, extraction and processing of hydrocarbons beyond 2050. Rapid reduction of GHGs from oil sands oil to below that from conventional oil is a priority for many reasons, including protecting our export market, the source of many social and economic benefits for all Canadians. Imagine if there were no difference between Canadian and Venezuelan oil price and quality delivered to a US Gulf coast refinery, but Canada's oil had 10% lower GHG emissions. Which product would be preferred? Beyond that, addressing GHG emissions upstream is not enough when about 80%[33] of GHG emissions from petroleum are from consumption.[34]

Alberta's oil and gas industry and government can, and must, engage in the debate and lead the transformation to lower GHG emissions by more efficient and effective use of petroleum from well to wheels for transportation; and likewise, for applications presently served by GHG-emitting sources of grid electricity and natural gas. Otherwise, Peabody Energy's present[35] is Alberta's default pathway for the future.

Alberta must become the technological leader and play a leading role in crafting new institutions, developing and introducing new systems for reducing GHG emissions from oil and gas from well to wheels, or well to burner. Around the world, no one else is doing that; not the US, not Saudi Arabia, not Russia, or anyone else. By achieving this goal, Albertans can guarantee their market for low GHG oil & gas, and become a premium priced supplier to the

world, with assured demand for premium priced petroleum for new pipelines East, West, and South, and become the world's premier supplier of GHG mitigation technologies to the world petroleum industry.[36]

Petroleum and natural gas, when properly used, measured and benchmarked against alternatives for GHG emissions, are competitive today with many so called "clean" alternatives.[37] Likewise, existing and proven technologies can be redeployed to drastically reduce GHGs from wasteful use of grid electricity and natural gas in stationary applications.

Considerable scope exists to drastically lower GHG emissions from petroleum and natural gas through creative changes in institutions. Indeed, the cost to reduce GHG emissions per ton by improvements in the oil and gas sector is lower, easier and more readily achievable than with many other alternatives such as those proposed in the "Leap Manifesto".[38] For example, natural gas exports from Canada could greatly help China and India in reducing their coal consumption in the interim period of transition from a "carbon-heavy" energy world to a "carbon-light" future.[39]

Making better use of oil and gas is only an interim solution, but it is a solution that we know, and it can lead readily to important changes. And it has the benefit of preservation of jobs in Alberta and Canada in general, creating wealth to invest in new infrastructure, and buy us time to find, and then be able to afford something better sooner, rather than later. Getting other nations on board is a challenge that Canada can lead. This transformation can begin to have major impact within five years. No other feasible alternative offers us a faster pathway for large-scale reduction of GHG emissions.

Oil and gas may be painted as the Devil, but it is a devil we know how to manage. Better our devil than their devil.

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[1] Comparable changes in international regimes are the creation of the post-WWII political and economic order that resulted in the establishment of the United Nations and the Bretton Woods agreements to set up IMF, IBRD, etc.

[2] There is a tendency to accuse the petroleum industry of wrongdoing and liability for environmental damage in the same manner as happened with the tobacco, asbestos, and lead industries. Should such a movement gain momentum, cooperation with the industry in climate change will be difficult, yet many of the petroleum industry's technologies are elements in the path to a low-C economy (geothermal, energy storage, CO_2 sequestration, CH_4 replacing coal…). See also: Shearer, C, "On Corporate Accountability Lead, Asbestos, and Fossil Fuel Lawsuits" New Solutions, August 2015 vol. 25 no. 2 172-188; doi: 10.1177/1048291115583306

[3] Carbon Budget, ORNL.

[4] Measured by cost to mitigate/reduce GHGs per tonne, costs vary widely. The switch from coal to lower cost natural gas by power plants has lowered US GHG emissions. But, the economic and social costs are often neglected. Redundant miners are unlikely to find comparable jobs in their lifetime. Peabody Energy and other coal producers are bankrupt and are unlikely to meet their environmental, pension and other liabilities.

[5] Labels of "renewable" and "clean" uncritically applied here.

[6] Solar panel manufacturing is dominated by China using electricity generated predominantly from coal. The raw electrical "payback" from energy input to output is estimated at a range of 3-4 years by NREL.

[7] Wind farms near populated areas create objectionable noise and are regarded as eyesores.

[8] Hydro dams have a finite life before they silt up or become unusable. Construction, including the use of concrete, generates GHGs. Furthermore, if a large area of forest is flooded, the amount of carbon absorption capacity lost needs to be added to its footprint as an ongoing expenditure.

[9] "Fossil" presumes that it is finite. How finite a resource might be is not fixed, but is a function of the technologies available, and that is changing continually. So called "renewables" may also be based on finite resources, as in the case of hydro power.

[10] The National Renewable Energy Laboratory (NREL) conducted a series of meta-analyses of studies of the lifecycle GHGs from conventional and "renewable" technologies. Detailed studies of wind, solar photovoltaics, concentrated solar power, nuclear, coal, and natural gas can be found in the same series including studies of biopower, geothermal, hydropower and ocean energy. An issue with the study is that it is based on per unit energy generated, rather than on how it is used. Suppose an identical kWh of energy generated by conventional sources is highly efficiently used, while the same kWh generated by "renewable" sources is not efficiently used; under such circumstances, asymmetry arises.

[11] Lifecycle assessment of GHGs emissions from each technology will include many issues including upstream (raw materials extraction, manufacture, construction), fuel cycle (resource extraction, processing, delivery) or "foregone carbon sink costs", O&M, and downstream (decommissioning, disposal, etc.) See: NREL By this standard, there is no known technology that is absolutely "renewable" or "clean".

[12] E.g.: generating solar electric power to feed into the grid at 600VAC.

[13] The "Leap Manifesto" prioritized indigenous people for subsidies without reference to cost per ton GHG mitigated.

[14] The Leap Manifesto (endnote 13) requires "…opportunities of this transition designed to systematically eliminating racial and gender inequality."

[15] Op. cit. refers to "profit-gouging of private companies".

[16] Present Feed-In Tariff Programs all presume that substantial subsidies will have to be paid for deployment of "renewables". See present Alberta subsidies. For a province facing severe deficits, funding large-scale conversion to solar or wind powered electric generation seems not to be an option.

[17] See Hansen, et. al. "Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2°C global warming is highly dangerous"

[18] See Climate deniers.

[19] No US Administration has been able to convince Congress to pass new comprehensive legislation dealing with climate change since the Clean Air act of 1970. The vast majority of climate action has been handled as Executive action such as the EPA deeming CO_2 as a pollutant.

[20] See IMF warning re world debt here. In addition, the EU is facing illegal immigration and terrorism that are resulting in severe budget issues.

[21] Hansen, op. cit., points out that the Paris accord will be wholly inadequate to deal with the climate emergency.

[22] NASA, Technology readiness levels.

[23] Technological feasibility is necessary, but not sufficient. Economists have long argued that a carbon tax of USD $200/tonne or higher is required to "kick" their econometric models into transition mode, but that sum appears politically unfeasible. Similarly, advocates for "mass transit" must address overwhelming rejection of that mode in favor of transportation by private spaces "at your convenience"; massive mass transit acceptance requires massive cultural changes in an infrastructure designed for the personal vehicle Other broad issues, such as logistics, often are ignored. If there were a mass society movement toward "renewables", what are the logistics of training new technicians and personnel, plus retraining redundant workers? Then there are issues of economic viability, a subject of heated debate.

[24] Energy prices have fallen since the industrial revolution in real terms, with petroleum falling the least. The fall is particularly dramatic relative to incomes, which have steadily risen.

[25] Where they exist, carbon taxes are so low as to be negligible factors in energy pricing. For carbon taxes to have a major impact on transforming existing institutions, they may have to rise above USD $200/tonne

[26] For example, all new "fossil" fuel based systems can be redesigned with implicit rising costs of GHGs over their economic life, beginning with a "base" design C-cost of USD$200/tonne.

[27] Most positive characteristics offered by "fossil" fuel based systems, such as ease of handling, use, high energy density, high thermal gradient, easy storage, are inherently difficult for alternatives like solar and wind to match.

[28] The difficulty of establishing a new energy system can be seen in how slowly the industry is introducing natural gas fueled trucking despite the widespread availability of inexpensive natural gas in North America. The industry was unable to settle on either a liquefied or compressed natural gas infrastructure. See map of infrastructure here.

[29] Any proposal that requires new infrastructure (e.g. charging stations, non-traditional filling stations for hydrogen, etc.) will experience delay in adoption and implementation unless the advantages are obviously, as was the case for replacement of the typewriter with word processors --- and even that took 30 years. If there is a climate emergency, we don't have 30 years.

[30] Even though cost-competitive on the generation side, the intermittency and variability of wind and solar power means that utilities must also have available large variable power sources like hydro dams or natural gas plants that can be rapidly brought online to balance supply and demand and insure uninterrupted delivery.

[31] In many markets like China or India (even Alberta to a degree), electricity generation is predominantly from coal; hence electric vehicles in those jurisdictions can result in more carbon emissions compared to conventional vehicles.

[32] Supposing petroleum by pyrolysis of wood becomes economically viable, it would be both "renewable" and carbon neutral, though perhaps not feasible agronomically or economically.

[33] Estimates vary around 15 to 20%.

[34] See: OPGEE: the Oil Production Greenhouse gas Emissions Estimator. Here.

[35] Peabody Energy declared bankruptcy April 11, 2016

[36]Oil and gas products that embodied low carbon emissions may become a premium priced product and be in broad demand when trade regimes take into account imported (embedded) emissions. See: Steinberger, J. K., et al. "Pathways of Human Development and Carbon Emissions Embodied in Trade (2012)." The Globalization and Environment Reader (2016): 396.

[37] The Leap Manifesto advocates for "High speed rail powered by renewables and affordable public transit" without reference to the carbon emissions and inefficiencies inherent in such systems when they run at a fraction of capacity at "off peak" times.

[38] For example, technically, it is possible to cut fuel consumption for an average commuter by 30% within 5 years without any new technology.

[39] Natural gas is criticized because of fugitive CH_4 emissions that, in the short term (20-50 years), have a high GHG impact. First, claims that it is worse than coal have been exaggerated. Second, it is now technically feasible to detect CH_4 emissions remotely, and the technology to reduce these emissions is straightforward. Regulatory enforcement is needed, but (for example) it is hard to regulate Russia; even in the USA Bakken shale oil play, massive emissions and flaring were permitted by state governments and the EPA did nothing. Third, because of many other problems (externalities) with coal, such as much higher CO_2 per kilowatt, huge PM2.5 emissions with severe health impacts, coal mine accidents, CH_4 release from coal mines, desulfurization sludges, coal washing tailings and waste ponds issues, etc., the overall benefits from conversion of power generation from coal to CH_4 seem convincing.