Empty Wallets

Why Renewables Offer no Resilient Recovery – Part 2

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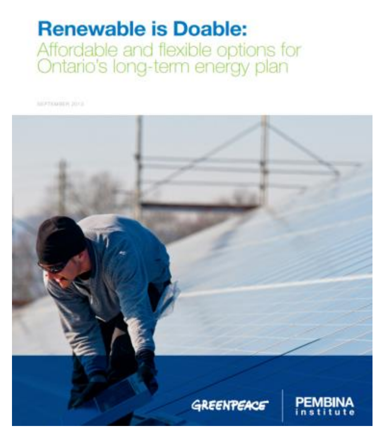
EMPTY WALLETS:
WHY RENEWABLES OFFER NO RESILIENT RECOVERY – Part 2

EXECUTIVE SUMMARY

In a previous report post entitled, *Broken Promises: Why Renewables Offer No Resilient Recovery: Part 1,* I began to respond to the claims of renewable energy advocates that governments should devote far more taxpayers' money to renewables as a way of stimulating economic activity after the current Coronavirus pandemic subsides. Part 1 explained the trends in global energy markets and compared the markets for oil and natural gas with those for wind, solar and biomass energy sources. In this part, I will present an analysis of the costs of renewable energy sources.

Ontario and Germany offer real-life examples of what happens when governments chose to spend billions of electricity ratepayer's dollars on renewable energy sources (i.e. industrial wind turbines, solar photovoltaic panels, and biomass-burning power plants). Both jurisdictions offered feed-in-tariffs whereby renewables generators were given above-market prices for power purchased under long-term contracts. Renewables also received "first-to-the-grid" rights and many other subsidies and advantages not available to conventional energy suppliers. The rates for residential consumers in Ontario doubled after the Green Energy Act was passed in 2009. In Germany, electricity prices rose to the equivalent of Cdn $1.42 per kilowatt-hour (kWh), nine times the price that would have applied with no solar and wind capacity. If people in Canada were forced to pay electricity rates at German levels, the annual household bill would be over $4,600. In Ontario, the cost of the Green Energy Act contracting is over $4 billion per year.



Renewables were heavily promoted in Ontario by environmental groups as a less costly energy solution.

The cost of new renewable energy added to the electrical grid is a subject of great controversy. Under the "levelized cost of energy" (LCOE) calculation, which attempts to measures all costs over the life of an investment, the cost of wind and solar energy to be added in 2025 has been declining rapidly. That analysis, however, has been strongly contested for what it leaves out, notably the systemic, or grid-wide, costs of intermittent energy. To illustrate, electricity that can be supplied by a wind generator at a levelized cost of 6 cents per kWh is not "cheap" if the output is available primarily at night when the market value of electricity is only 2.5 cents per kWh. The cost reductions wind and solar have experienced so far are nearing the limits of what physics allows.

The consideration of costs would be incomplete without taking into account the extraordinary subsidies and other advantages granted by governments. **From 2010 to 2019, total U.S. federal government subsidies for wind were $36.8 billion and for solar energy were $34.4 billion.** When measured in terms of per unit of electricity generated, **the subsidies were U.S. $82.46 per MWh for solar and $18.86 per MWh for wind**. Unfortunately, comparable figures are not available for Canada.

Modern biofuels, which include ethanol and biodiesel for transportation and woody biomass for electricity generation, are not economically viable in the absence of government subsidies or mandates. Biodiesel costs about U.S. 55 cents per liter to produce, or 20% more than corn-based ethanol. The long search for a technological breakthrough that would lower the cost of cellulosic biofuels has not succeeded. **Today, if a commercial-scale plant were available, cellulosic biofuels would sell at U.S. $35 per gallon, more than ten times the price of gasoline in the U.S. today.**

Because woody biomass is based on plant growth, it is treated under U.N. greenhouse gas accounting rules as having zero emissions. In fact, a recent U.S. study found that **a biomass-fueled electricity generation plant emits 50 to 85% more than a coal plant, and 300% of a natural gas-fired plant.**

The declining capital and operating costs are more than offset by the extremely high grid system management costs of introducing solar and wind. They represent low-productivity energy sources that are not self-sustaining, use a disproportionate amount of land, have deleterious environmental effects, and pose risks in terms of the stability and reliability of energy supply.

The ultimate energy and climate policy considerations should be the ones that are almost never taken into account by governments in Canada and other OECD countries – the costs per tonne of GHG emissions avoided and the marginal benefits of lower emissions on the climate. If they were, it is unlikely we would invest in renewables at all.

EMPTY WALLETS: WHY RENEWABLES OFFER NO RESILIENT RECOVERY

PART 2

In a previous report entitled, *Broken Promises: Why Renewables Offer No Resilient Recovery: Part 1*, I provided the first installment of a response to the claims by advocates of renewable energy sources that governments should devote far more taxpayers' money to renewables as a way of stimulating economic activity after the current Coronavirus pandemic subsides. Part 1 explained the trends in global energy markets and compared the markets for oil and natural gas with those for wind, solar and biomass energy sources. In this part, I will present an analysis of the costs of renewable energy sources.

This subject has been addressed many times by different experts. Rather than trying to duplicate their efforts, I will provide condensed versions of the central findings of others, along with references to the sources of information so that readers can delve into the issues more deeply if they wish. I also will follow a simplified approach to communicate how the costs of electricity may vary for consumers depending on the assumptions one uses about renewable energy's role in supplying the needed electricity.

The average household in Ontario uses 9,500 kilowatt hours (kWh) per year of electricity. I will use this benchmark to calculate the cost of renewable energy sources.

I will not address here the environmental costs imposed by renewable energy production and use.

The Financial Costs of Electricity to Consumers – Some General Points

There are many components in the costs that electricity consumers pay. These include;

The capital costs. These are the costs of constructing the generation facilities. They are usually paid up front before the project begins operating and are depreciated over time, often as determined by the accounting practices dictated by regulators;

The operating and maintenance costs. These are the costs incurred during the generation, or production, phase; these include notably the costs of fuel, salaries, and other variable costs, and repairs;

The costs of building, operating and maintaining the transmission and distribution facilities;

The costs of ensuring the reliability and security of supply of the system, including the costs of balancing energy sources, the costs of providing backup capacity when needed, and the costs of energy storage;

Taxes and special charges; and

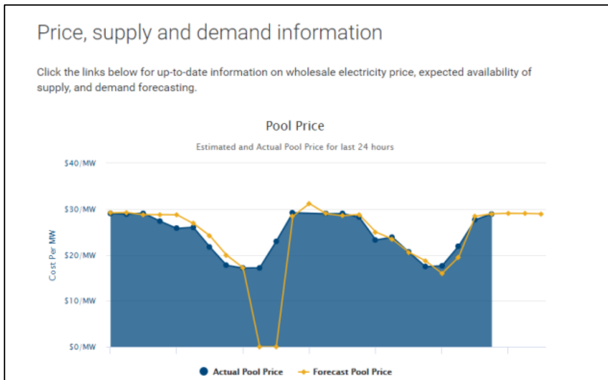
The regulated rate of return to the utility owner.

Total expenditures offer a measure of the costs incurred by the contracting utility over the life of a contract.

Image licensed from Shutterstock

The costs to electricity consumers are subsumed in the electricity rates. Rates, however, bear only a general relationship to costs. Regulators generally require that the utilities incurring the costs of generation from different sources roll them into one, so that the average of those costs is used as the basis for setting rates to different categories of ratepayers. Thus, wind and solar energy costs are averaged in with the costs of hydro, nuclear and natural gas-fired generation to dampen their effect. Regulators then set different rates for the classes of ratepayers – industrial, commercial, residential and so on. Large industrial users in Ontario and in many other jurisdictions pay lower rates per kilowatt hour (kWh) than do residential and commercial users. This system effectively hides the "marginal cost" of the most expensive sources of generation and shifts a higher share of the overall cost burden onto homeowners and small businesses.

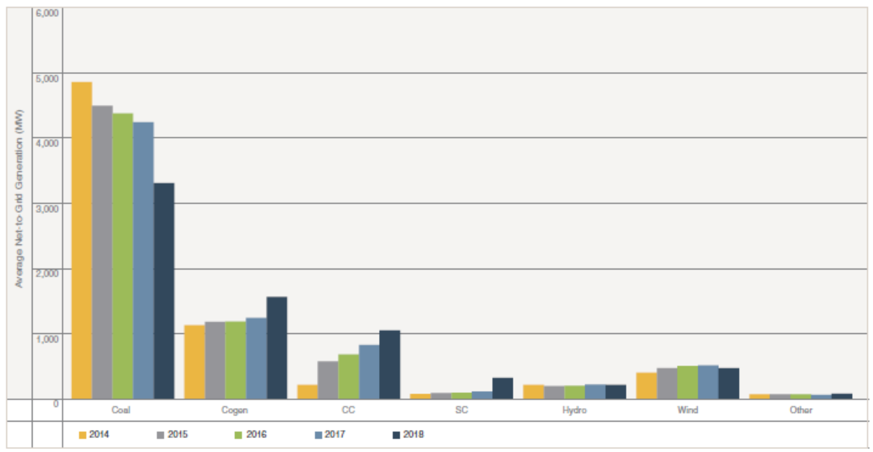
It is important to distinguish between the costs of electricity sources and their value. Value is often a function of the pattern of electricity demand. Electricity is needed to provide a wide range of energy services used in a modern economy, and the volume demanded varies considerably from hour to hour, day to day and season to season. Electricity generation sources that are constantly available and can be varied to match the changes in demand are far more valuable than generation sources that cannot do that. The fact that most conventional (fossil fuel, hydro and nuclear) generating technologies are "dispatchable" enhances their value. This means that they can be controlled by the system operator and can be turned off and on based primarily on their economic attractiveness at every point in time both to supply energy and to supply network



An example of 24 hour fluctuating demand and price from the Alberta Electric System Operator (AESO) – Screenshot of May 23, 2020 11:27 AM. https://www.aeso.ca/market/market-and-system-reporting/

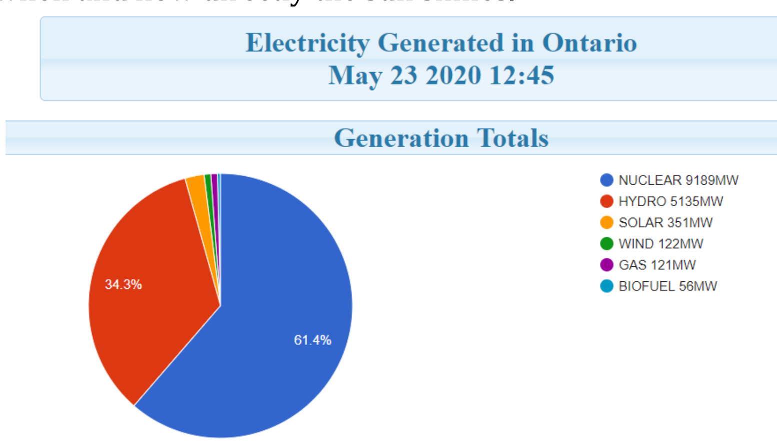
reliability services (e.g. frequency regulation, spinning reserves). Conventional dispatchable generators are typically scheduled by the system operator to meet demand by dispatching the generators with the lowest marginal cost first and then moving up the "dispatch curve", calling on generators with higher marginal costs until demand for energy is satisfied.

FIGURE 12: Annual average net-to-grid generation by technology



Most power grids operate on a mix of sources of power generation. Source: AESO 2018
Alberta's power grid uses coal, cogeneration (waste heat from industrial processes like the oil sands), combined cycle natural gas plants (CC), simple cycle natural gas plants (SC), hydro, wind and 'other' (biomass and solar).

The value of electricity generation sources can also be affected by differences in capacity utilization. Some generation sources, like nuclear energy, are able to produce at very high rates of utilization, often exceeding 90%, whereas fossil fuel based generators typically operate at about 85%, and renewable energy sources at much lower rates. Wind and solar energy capacity utilization varies sharply over time depending on when and how hard the wind blows and when and how directly the sun shines.



Ontario's power grid employs nuclear, hydro, solar, wind, natural gas, and biofuels.

The value of electricity can be affected by whether total electricity generation capacity exceeds probable demand. In many places, renewable energy generators have been given contracts that assure them preferential access to the grid when they are able to produce; in those circumstances, the available generation may exceed the electricity demand in that jurisdiction, and the system operators may have to either curtail generation (i.e. pay generators not to produce) and/or export the surplus electricity to neighbouring utilities at distressed prices. The losses on export sales and the costs of curtailment are then added on to ratepayers' bills. When wind and solar generators produce power at the same time as other generators in excess of demand, the oversupply also reduces the market value (i.e. the wholesale market price of electricity) and thereby reduces the value of all power in the system.

Generation Costs of Renewable and non-renewable Energy Sources

To illustrate, we will use historical rates offered to renewables producers under the Ontario government's feed-in-tariff program authorized by the Green Energy Act of 2009, and the average cost of electricity generation by source in Ontario for 2019, as estimated by electricity expert Scott Luft.

The initial rates offered to wind turbines under 20-year, and, in some cases, 50-year contracts were about $135 per megawatt hour (MWh). In 2010, just after the Green Energy Act was implemented, the averaged costs of all conventional energy sources were $655 per MWh, or $622 per year for the typical household. **If a homeowner used only wind energy, his or her annual generation costs alone would have been $1,235, almost twice the average cost of all sources. The initial rate for solar PV panels was $800 per MWh. If a homeowner had been exclusively reliant on solar energy, his or her average annual commodity of electricity cost would have been $7600.**

The rates guaranteed under Ontario's feed-in-tariff program declined over time, but still stayed above the rates paid to existing conventional energy sources. Fortunately, no new contracts using feed-in-tariffs have been signed since 2017.

Scott Luft, an expert on Ontario electricity markets, on May 3, 2020 provided an analysis of the estimated production and costs for "green energy" in Ontario over the period 2010 to 2019[1]. **In 2019, industrial wind turbines produced 8.4 terawatt hours (TWh) of electricity at a cost of $1.517 billion, for an average rate of 18.1 cents per kilowatt hour (kWh). Solar energy in 2019 provided 3.0 TWh of electricity at a cost of $1.368 billion, for an average rate of 45.6 cents per kWh.**
Luft's comment on the consequence of Ontario' pro-renewables policy is compelling.

"The only easily quantifiable benefit is the market revenue, which averaged less than $20 per megawatt-hour (MWh) at the Hourly Ontario Energy Price (HOEP) - or 2 cents/kWh - over the past 5 years. This is not great, as the contracted cost averages over $200/MWh during the same period. Due to the massive excess of supply in Ontario the HOEP is not a great indicator -

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[1] Scott Luft, *Consequences of Ontario's Green Energy Act warn against creating green new deals as stimulus*, Cold Air blog post, May 3, 2020

but even at $45/MWh (roughly the regulated rate for publicly owned hydroelectric generators) the losses are over $3.35 billion annually - for all of 20 years (and some of 50).

The cost of the Green Energy Act contracting is over $4 billion a year. The loss, after detracting for market rates and considering hand-wavy other benefits, is between $3.25 and $3.8 billion annually (including biomass). These are simply facts."

WWF

August 01, 2007 11:00 ET

WWF-Canada-Renewable Is Doable: Re-Analysis of Government's Own Data Shows Ontario Can Keep the Lights on Without Coal or Nuclear

TORONTO, ONTARIO--(Marketwire - Aug. 1, 2007) - A cheaper, cleaner, and less risky option than the current nuclear-reliant Ontario electricity plan, is doable, according to a state-of-the-art modelling analysis commissioned by WWF-Canada and the Pembina Institute and released today.

"Ontario can keep the lights on while saving consumers money and cutting greenhouse gases in half," said Cherise Burda, Ontario Policy Director with the Pembina Institute. "This study shows in vivid detail that there is a cheaper, safer, and greener way to power our future."

https://blog.friendsofscience.org/wp-content/uploads/2019/06/The-Ontario-Electricity-Legacy-FINAL.pdf

This report by Robert Lyman documents the destructive economic consequences of the Green Energy Act.

Lessons from Europe

Ken Gregory provided a very useful illustration of how increasing levels of wind and solar power have affected electricity prices to consumers. See his article here:

https://blog.friendsofscience.org/2020/01/17/solar-and-wind-power-cost-about-9-times-that-of-electricity-from-other-sources/?highlight=ken%20gregory

In summary, the cost of overcoming the variability, intermittency and unreliability of solar and wind electrical power is so high that it has raised the average residential electricity price in Germany to 32 Euro cents per kWh (Cdn 49 cents per kWh). The effective solar plus wind price is 93.7 Euro cents per kWh (Cdn $1.42 per kWh), 9.2 times the electricity price that would exist with no solar and wind capacity. For the

average Ontario household, the annual electricity bill at Germany's current rates would be Cdn $4,655.

Since 2008, European Union household electricity prices have been well over those in the Group of 20 countries and are now more than double them on average. In addition, EU28 industrial electricity prices are now nearly 50% higher than those in the G20 and are actually higher than domestic retail electricity prices in the G20. Only very extensive tax relief (i.e. subsidies to energy intensive industries) has prevented an even largely flight of industry than has already occurred.


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Brussels fears European 'industrial massacre' sparked by energy costs

Europe's industry is being ravaged by exorbitant energy costs and an over-valued euro, blighting efforts to reverse years of global manufacturing decline.

Mr Tajani warned that Europe's quixotic dash for renewables was pushing electricity costs to untenable levels, leaving Europe struggling to compete as America's shale revolution cuts US natural gas prices by 80pc. Photo: © Alamy

https://www.telegraph.co.uk/finance/financialcrisis/10295045/Brussels-fears-European-industrial-massacre-sparked-by-energy-costs.html

Projecting the Costs of New Generation

In the United States, the Energy Information Administration (EIA) reports on the comparative costs of different generation sources on a "levelized" basis. The levelized cost is essentially the expected real total cost (capital plus operating costs), in terms of dollars per megawatt/hour (MWh) of different new generation technologies over the lives of the plants. The EIA updates these figures every few years. In a previous blog article, I described outcomes of the analysis prepared in 2017 projecting the costs of new generation sources in 2022.

https://blog.friendsofscience.org/2018/02/06/renewable-and-conventional-energy-generation-comparing-the-costs/?highlight=renewables

In February 2020, the EIA published an updated analysis for the cost of generation technologies entering service in 2025. The total costs shown are for capital, operations and maintenance and transmission. The following table compares the LCOE projections from the two reports.

Table 1

U.S. Average LCOE ($/MWh) for Plants Entering Service in 2022 and 2025

Plant Type	**2022 Total**	**2025 Total**
Dispatchable		
Gas Combined Cycle	57.3	36.61
Non-dispatchable		
Wind – Onshore	63.7	34.10
Wind – Offshore	157.4	115.04
Solar PV	85.0	30.39
Hydroelectric	66.2	39.54

Note that, partly because of lower natural gas price assumptions, the natural gas-fired plants are now projected to have a much lower LCOE, but that, to the surprise of many analysts, both solar PV and onshore wind are projected to have the lowest overall costs. The sharp decline in the projected cost of hydroelectric generation is also very surprising. These figures are the basis for the claims by renewables advocates that wind and solar energy are now at or approaching "grid parity" with conventional generation sources.

Several experts have offered alternatives to the LCOE methodology for measuring the comparative costs of different electricity generation options. In July, 2016, the Institute for Energy Research (IER) observed that a deficiency of the LCOE analysis was the *"absence of any information about the cost of electricity from existing generation resources, even though those resources supply all of our electricity today and most of them could continue to supply reliable electricity at the lowest level for years – even decades – to come".*

Using data from the United States, the IER offered two new sets of data – one comparing the LCOE of existing generation at 2015 capacity factors and that of new generation at actual 2015 capacity factors (in contrast to the EIA-assumed capacity factors) and a bar chart showing their adjustments to EIA's methodology for reporting the LCOE of new resources using actual 2015 capacity factors and updated natural gas fuel price assumptions. (For the details, see my 2018 blog article referenced previously.)

Three factors explain why these estimates provide an entirely different picture of the comparative costs of different generation sources than those prepared by the EIA. **First, they illustrate the significantly lower cost of continuing to use existing generation sources that have already been largely depreciated in terms of their capital costs.** Second, they show the effects of taking into account some of the systemic effects of integrating intermittent generation sources into electricity grids (i.e. the requirement to maintain and occasionally use combined cycle gas plants as backup capacity for the times when wind and solar are not available but demand must be met). Third, they show the results of lower price assumptions with respect to natural gas.

The Institute for Energy Research report, released in July 2016, can be found here: https://www.instituteforenergyresearch.org/wp-content/uploads/2016/07/IER_LCOE_2016-2.pdf

Using the Institute for Energy Research methodology, the best policy and electricity planning approach clearly would be to extend the life of existing generation plants. In this regard, it is interesting to note that many older nuclear plants been up-rated from their original nameplate capacity. In the United States, the Nuclear Regulatory Commission has licensed most nuclear plants for 60 years, and potentially 80 years, of operation.

The Systemic, or Grid-Wide, Costs of Intermittent Energy

A number of analysts have examined the differences between the costs of intermittent and dispatchable electricity generating technologies. A seminal paper was written by Paul Joskow of the Alfred P. Sloan Foundation and MIT in 2011. The paper can be found here.

https://economics.mit.edu/files/6317

In his abstract, Professor Joskow wrote, *"the standard life-cycle cost metric utilized is the 'levelized cost' per MWh supplied. This paper demonstrates that this metric is inappropriate for comparing intermittent generating technologies like wind and solar with dispatchable generating technologies like nuclear, gas combined cycle, and coal. Levelized cost comparisons are a misleading metric for comparing intermittent and dispatchable generating technologies because they fail to take into account differences in the production profiles of intermittent and dispatchable generating technologies and the associated large variations in the market value of the electricity they supply. Levelized cost comparisons overvalue intermittent technologies compared to dispatchable base load generating technologies. Integrating differences in production profiles, the associated variations in the market value of the electricity at the times it is supplied, and the expected life cycle costs associated with different generating technologies is necessary to provide meaningful economic comparisons between them."*

To be more specific, the Joskow paper makes these points:

The LCOE approach is flawed because it treats all megawatt hours supplied as a homogeneous product governed by the law of one price, and thus does not account for the fact that the value (wholesale market price) of electricity supplied varies widely over the course of a typical year.

Different intermittent generating technologies (e.g. wind versus solar) also can have very different hourly production and market value profiles, and indeed, specific intermittent generating units using the same technology (e.g. wind) may have very different production profiles depending on where they are located.

Electricity that can be supplied by a wind generator at a levelized cost of 6 cents per kilowatt hour (kWh) is not "cheap" if the output is available primarily at night when the market value of electricity is only 2.5 cents per kWh. Similarly, a combustion turbine with a low expected capacity factor and a levelized cost of 25 cents per kWh is not necessarily "expensive" if it can be called upon reliably to supply electricity during all hours when the market price is higher than 25 cents per kWh.

In effect, the electricity supplied by conventional plants and by renewable energy plants is not the same product.

Physical Limits of the Technologies Involved

There is no question as to whether the direct costs for producing wind and solar generation plants and equipment have declined over time. In fact, the first two decades of commercialization, after the 1980s, saw a 10-fold reduction in costs. Many believe that the cost reductions can continue indefinitely. This, however, ignores certain physics-constrained limits of energy systems.

Wind turbines, for example, cannot extract more energy than exists in the kinetic flows of moving air. The Betz Limit dictates how much of the kinetic energy in air a blade can capture; that limit is now about 60%. Modern turbines already exceed 45% conversion. While that leaves some potential for additional gains to be made, another 10-fold improvement is not possible.

For silicon photovoltaic (PV) cells the physics boundary is the Shockley-Queisser Limit – a maximum of about 33% of incoming photons are converted to electrons. The best current PVs achieve just over 26% conversion efficiency – thus, close to the physical boundary.

There are no 10-fold gains left. Improvements now are in the range of diminishing returns.

Subsidies to Wind and Solar Energy

The “costs” that are usually attributed to renewable energy generation when calculating capital and operating costs do not include any acknowledgement of the large subsidies and other advantages provided by governments (i.e. taxpayers) to renewable energy sources.

In Part 1 of this series, I listed 24 generic ways in which governments have subsidized or otherwise given significant market advantages to renewable energy sources that are not available to competing conventional energy sources. The number and diversity of these subsidies is so large that it is virtually impossible to estimate the total value of the benefits and market advantages conferred.

The most systematic study I have discovered of subsidies to energy industries in the United States is a paper entitled, *The Siren Song that Never Ends*, by Brent Bennett and others for the Texas Public Policy Foundation. It calculates the U.S. federal government subsidies to energy over the 2010 to 2019 period. The paper can be found here:

https://www.texaspolicy.com/the-siren-song-that-never-ends/

This paper estimates the total subsidies, including tax expenditures (e.g. deductions and credits), direct expenditures (e.g. grants, contributions and low-interest loans) and Research and Development assistance granted to all energy industries. **For the period 2010 to 2019, the total for wind was $36.8 billion and that for solar energy was $34.4**

billion. When measured in terms of per unit of electricity generated from 2010 to 2019, U.S. federal government subsidies were $82.46 per MWh for solar and $18.86 per MWh for wind. The comparable subsidy for oil and gas was 39 cents.

In 2019 alone, wind and solar energy produced 300 terawatt hours (TWh) and 107 TWh of electricity in the US and received $4.3 billion and $4.4 billion in federal subsidies, respectively. In other words, they received about $14.40 and $40.74 in federal subsidies per MWh of electricity generated. That does not include the subsidies from the state governments.

Some experts estimate that government subsidies pay for over 75% of the real costs of renewables but those subsidies do not result in lower rates for consumers, just higher returns for generators.[2]

According to estimates by John Constable of the Global Warming Policy Foundation, the **annual cost to British power consumers and taxpayers in the U.K. alone is in excess of six billion pounds (Cdn $9 billion).**

The Cost of Biofuels

As noted in Part 1 of this series, there is a major difference between traditional biofuels, like wood and animal dung, that is used to cooking, light and heating in many developing countries and the modern commercial biofuels that have been widely promoted as options to reduce greenhouse gas emissions. The latter include, notably, ethanol and biodiesel for use in transportation and woody biomass used in large quantities for electricity generation. While the traditional fuels are usually near at hand and low in cost, the modern variations are not economically viable in the absence of government subsidies and/or mandates.

Biofuels have a low to very low energy density relative to fossil fuels; in other words, you need a lot of biomass to produce much energy. For decades, scientists like Kay Keasling, a synthetic biologist at the University of California, Berkeley, have been striving to lower the cost of biofuels production. In the United States, biodiesel costs 55 cents per liter to produce, or 20 per cent more than corn-based ethanol. The biofuels industry has long sought a technology breakthrough that would lower the cost of biofuels made from cellulosic sources like switchgrass. **So far, according to the MIT Technology Review, the best and most economic biofuels developed would sell at U.S. $35 per gallon (if they were produced at commercial scale, which they are not) , or more than ten times the price of gasoline in the U.S. today.** See the article here:

https://www.technologyreview.com/2018/05/10/2851/the-scientist-still-fighting-for-the-clean-fuel-the-world-forgot/

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[2] Norman Rogers, *Renewable Energy fairy Tales*, American Thinker, February 5, 2020

Ethanol is not a benign fuel. In concentrations above 20% per volume, **ethanol in either gasoline or diesel can destroy engines** that are not specially modified for the fuel. This is also true for some forms of biodiesel. **This is such a hazard that car and truck manufacturers will not honour warranties for most vehicles if the owner purchases gasoline or diesel with more than 10% ethanol**. Governments in North America and Europe have nonetheless resorted to imposing ethanol mandates that require refiners to blend 10% ethanol in fuels, and also provide subsidies to ethanol plants for production.

The justification for such mandates is allegedly that increased use of biofuels will reduce GHG emissions. This has been challenged by many studies. Notably, the International Institute for Sustainable Development estimates that the CO2 and climate benefits from replacing petroleum fuels with biofuels like ethanol are basically zero. They claim that it would be almost 100 times more effective, and much less costly, to significantly reduce vehicle emissions through more stringent standards, which of course is already being done.[3]

Biodiesel fuel can be made from soybean, palm, canola, flax, sunflower, and other plants oils. Those crops must be grown on millions of acres of land, using enormous amounts of water, fertilizer, pesticides and energy. Production often entails important social and environmental costs. Oil palm development in Indonesia, for example, causes deforestation, soil erosion, water and air pollution, habitat and wildlife losses, and social unrest.


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There's a Fire Burning in Indonesia So Big It's Releasing More CO2 Than the US Economy

It's a perfect storm for a true environmental catastrophe.

BY CHARLES P. PIERCE

This week's stop on the *Great Climate Change Hoax World Tour '16: Wings Over The Apocalypse* brings us to Indonesia, which is, at the moment, being burned almost entirely to ash.

The use of woody biomass to generate electricity has recently been criticized by filmmaker Michael Moore in his documentary *Planet of the Humans, released in 2020.* Today, Europe produces about 17% of its energy and 29% of its electricity from renewable sources, and 19% from biomass, The rationale for doing so arises from the way the Intergovernmental Panel on Climate Change treats combustion of wood and other renewables for GHG emission accounting practices – it excludes them from a country's total. Interestingly, **a 2012 study by Synapse Energy Economics[4] estimated that the average smokestack of a U.S. biomass plant emitted about 1.67 tons of carbon dioxide per megawatt-hour of electricity generated, or 50 to 85 % higher than emissions from a coal-fired power plant. Carbon dioxide emissions from a biomass plant are more than triple those from a natural gas facility.**

Moreover, as Steve Goreham noted in a recent article,[5]
"But a 2011 opinion by the European Environment Agency described a 'serious error' in greenhouse gas accounting. The carbon neutral assumption doesn't account for CO2 absorbed by vegetation that grows naturally on land not used for biofuel production. In addition,

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[3] Ronald Steenblik*, Biofuels – At What Cost?*, International Institute for Sustainable Development, September, 2007
[4] Jeremy Fisher, et al., *The Carbon Footprint of Electricity from Biomass,* Synapse Energy Economics, June 11, 2012
[5] Steve Goreham, *The Obvious Biomass Emissions Error*, CFACT, February 7, 2019.

forests cut down to provide wood chips for power plants immediately release large quantities of carbon dioxide, but decades of tree regrowth are required to reabsorb released CO2. Substitution of wood for coal in electrical power plants is actually increasing carbon dioxide emissions"

Broader Cost Considerations

The preceding discussion illustrates that the costs of renewable energy production and use can be measured in many ways – the financial costs over the life of the project, the financial costs borne by all parts of the energy system, the costs borne by taxpayers and electricity ratepayers directly and indirectly due to the subsidies paid and the choices foregone, the adverse economic impacts of higher electricity rates, and the other costs to society and the environment. In theory, all these costs are being borne to reduce GHG emissions and thereby delay global climate effects that may or may not ever come. Yet, in some cases, the use of renewable energy actually increases GHG emissions compared to the alternatives.

The declining capital and operating costs are more than offset by the extremely high grid system management costs of introducing solar and wind. They represent low-productivity energy sources that are not self-sustaining, use a disproportionate amount of land, have deleterious environmental effects, and pose risks in terms of the stability and reliability of energy supply.

In energy, economic and climate policy terms, the ultimate measure of costs must rest on an assessment of the costs per tonne of GHG emissions avoided and the related benefits, If any. Unfortunately, in Canada and in most OECD countries where climate policies dominate the public discourse, these factors (i.e. the costs per tonne of emissions avoided and the marginal benefit in terms of climate) are almost never assessed. **The public is asked to accept the claim that all costs are to be borne in order to "save the planet". Yet, renewable energy, accounting for only 4% of global energy use and emissions, cannot deliver on this promise.**

Available for viewing: https://youtu.be/Zk11vI-7czE

About the Author
Robert Lyman is a former public servant of 27 years and a diplomat for 10 years. Lyman's bio can be read here.

About Friends of Science Society
Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens that is celebrating its 18th year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO_2).

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