A Mandatory Energy Transformation Wouldn't Work

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See footnoes at end of text.

What is an Energy Transformation?

Energy is the fundamental need of our everyday life. So much so, that the quality of life and even its sustenance, is dependent on the availability of energy. Hence, it is imperative for us to have a conceptual understanding of the various sources of energy, the conversion of energy from one form to another and the implications of these conversions.

Energy in its various forms may be used in natural processes, or to provide some service to society such as heating, refrigeration, light, or performing mechanical work to operate machines. For example, an internal combustion engine (ICE) converts the potential chemical energy in gasoline and oxygen into thermal energy which, by causing pressure and performing work on the pistons, is transformed into the mechanical energy that accelerates the vehicle and pushes it up hills. A solar cell converts the radiant energy of sunlight into electrical energy that can then be used to light a bulb or power a computer.[1]

Energy transformation is the process of changing one form of energy to another. Changes in total energy systems can only be accomplished by adding or removing energy from them, as energy is a quantity which is conserved, as stated by the first law of thermodynamics.[2]

On the other hand, energy transition is generally defined as a long-term structural change in energy systems. These have occurred in the past, and still occur worldwide. Contemporary energy transitions differ in terms of motivation and objectives, drivers and governance.[3]

However, I am using the terms transformation and transition alternately in this article to mean a transition from hydrocarbons (oil, natural gas and coal) to renewable energy.

The Global Energy Transformation

Increased use of renewable energy, combined with intensified electrification, could prove decisive for the world to meet key climate goals by 2050. Ramping up electricity to over half of the global energy mix (up from one-fifth currently) in combination with renewables would reduce the use of fossil fuels, responsible for most greenhouse-gas emissions.[4]

A study from the International Renewable Energy Agency (IRENA) envisages energy transformation would also reduce net costs and bring significant socio-economic benefits, such as increased economic growth, job creation and overall welfare gains.

Achieving a climate-safe future, however, depends on swift global action. Current plans and policies fall far short. Energy-related emissions have risen around 1% yearly since 2015.[5]

For instance, the flaring and venting of natural gas in the U.S. continues to soar, reaching new record highs in recent months. The volume of gas that was burned or simply released into the atmosphere by oil and gas drillers in the Permian which is the heart of U.S. shale oil production reached 1.28 billion cubic feet per day (bcf/d) in 2018, according to the International Energy Agency (IEA), up from 0.772 bcf/d in 2017. The practice is a disaster on many levels. It is wasteful, it worsens air quality and it exacerbates climate change. Venting gas is much worse than burning it since it releases methane into the atmosphere, a potent greenhouse gas.[6]

Based on IRENA's analysis, energy-related CO_2 emissions would have to decline 70% by 2050 compared to current levels to meet climate goals. A large-scale shift to electricity from renewables could deliver 60% of those reductions; 75% if renewables for heating and transport are factored in; and 90% with ramped-up energy efficiency.[7]

With electricity becoming the dominant energy carrier, global power supply could more than double, the report finds. Renewable sources, including solar and wind, could meet 86% of power demand.

The energy transformation would also boost gross domestic product (GDP) by 2.5% and total employment by 0.2% globally in 2050. Health and climate-related savings would be worth as much as $160 trillion cumulatively over a 30-year period, the report finds. It is estimated that every dollar spent in transforming the global energy system provides a payoff of at least $3.0 and potentially more than $7.0, depending on how externalities are valued.[8]

Separating the Wheat from the Chaff

There is no doubt that climate change is happening. But the continuous bombardment of its destructive impact on the globe by media, environmental scientists and doomsday seers is not only infuriating a huge section of the world's population but it is also putting their backs out.

There were many instances where environmental scientists and University professors have massaged facts and stretched them to breaking point just to justify their research or their political leanings.

Even where events like solar storms are projected to happen with destructive magnitude in the future, why talking about them when even scientists can neither predict their time of occurrence nor will humanity be able to protect itself against their impact. It only worries people unnecessarily about things that may or may not happen.[9]

If solar storms were until recently believed to be a rare occurrence—only happening once every couple of centuries or so, what has changed to make scientists think there is reason to believe they may happen a lot more frequently? Could they let us know the scientific evidence they discovered to justify their claims and to reach the bombastic conclusion that solar storms could be the worst-case scenario for space weather events against the modern civilization?[10]

Moreover, how did astrophysicist and aerospace engineer Robert Coker calculate that the fallout from a severe solar storm could cost up to a trillion dollars? Is his estimate based on real science or fiction? Furthermore, how would humanity prepare against some mythical event that might or might not happen anyway?

Even if hypothetically scientists were able to provide humanity with near real-time information about upcoming storms, such storms could happen so fast that humanity would not have noticed them until the world has gone in smoke.

May be environmental scientists and doomsday seers could temper their doom and gloom projections and let humanity cope with daily life chores rather than worry about scientific hallucinations.

An Imminent Energy Transition Is an Illusion

With the world consuming 100 million barrels of oil a day (mbd) and growing, the notion of an imminent energy transition is an illusion.

Four pivotal principles will govern the global energy scene well into the future.

The first is that there will be no post-oil era throughout the 21st century and far beyond.[11]

The often quoted statement attributed to the former Saudi oil minister Sheikh Ahmad Zaki Yamani that "the Stone Age came to an end not for lack of stone and the Oil Age will end long before we run out of oil" is not strictly accurate. The Stone Age has never ended. It is still with us to this very moment in the form of the stones we continue to use to build houses, bridges and monuments. What has ended is only an aspect of the Stone Age, namely tool-making from stone, which has been substituted for practicability by bronze and metal tool making with the advent of metalworking, namely, smelting of Bronze and Iron. The same logic applies to oil. There could never be a post-oil era throughout the 21st century and far beyond because it is very doubtful that an alternative as versatile and practicable as oil, particularly in transport, could totally replace oil in the next 100 years and beyond. What will change is some aspects of the multi-uses of oil in electricity generation and water desalination which will eventually be mostly powered by solar energy. However, oil will continue to be used extensively in global transport, the petrochemical industry and other industries and outlets from pharmaceuticals to aviation and computers to agriculture without which it will never be able to feed 7.5 billion of the world population.

The second principle is that there will be no peak oil demand either. Peak oil demand has become one of the most contentious and fascinating debates in the oil industry over the past few years with forecasts for the pending peak seemingly creeping closer to the present with every new publication. The precise dates vary. Royal Dutch Shell, for instance, has said that the peak could come within 5-15 years. BP, for its part, says demand could plateau in the 2030s or 2040's.[12] While an increasing number of electric vehicles (EVs) on the roads coupled with government environmental legislations could slightly decelerate the demand for oil, EVs could never replace oil in global transport throughout the 21st century and far beyond.

Range, charging time and price are only temporary teething problems for electric vehicles (EV).Technology will sooner or later resolve them. However, the real challenge facing a deeper penetration of EVs into the global transport system is the realization that oil is irreplaceable now or ever.

And whilst EVs are benefiting from evolving technologies, ICEs are equally benefiting from the evolving motor technology. As a result, ICEs are not only getting more environmentally-friendlier but they are also able to outperform EVs in range, price, reliability and efficiency.

Therefore, one shouldn't get fooled by the rush of carmakers towards investing in EVs. This is being forced upon them by government regulations and also by wanting to burnish their environmental credentials rather than by business sense.

The third principle is that the notion of imminent energy transition is an illusion. In fact, the percentage of fossil fuels in the world's energy mix—coal, oil and natural gas—is still lingering well above 80%, a figure that has changed little in 30 years. That remains so despite being challenged by serious environmental policies and despite a global expenditure of $ 3.0 trillion on renewable energy during the last decade (see Chart 1). This is a hefty price to pay just to gain only a percentage point of market share from coal.

The fourth principle is that oil and gas will continue to be the core business of the global oil and gas

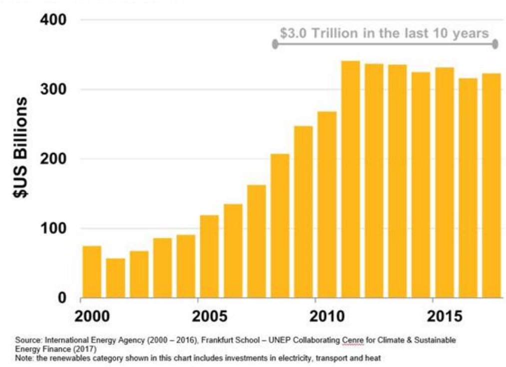

Chart 1: Global Investment in Renewable Engergy Supply Annual 2000 to 2017

Source: Courtesy of the International Energy Agency.

industry well into the foreseeable future.

Still, the oil industry does invest in clean energy solutions and has accelerated such investments in recent years partly to be genuinely involved in the clean energy solutions but the general mood, at least for now, is that it will only move away from oil when this makes commercial sense. Shell's spending on new energy solutions may be huge by some standards at $1-$2 bn. But this is less than 8% of the supermajor's total annual capital spending of around $25 bn.[13]

In recent years, Big Oil has faced increased investor pressure to start addressing climate change risks and set emission reduction targets if the world is ever to achieve the Paris Agreement targets.

For the first time ever, Shell has just signed a $10-billion revolving credit facility, and the interest and fees paid on it will be linked to the company's targets to reduce its carbon footprint. This is an innovative deal which also demonstrates Shell's broad-based commitment to reducing the Net Carbon Footprint of the energy products it sells by 20% in 2035 and 50% by 2050.[14]

Yet, there has been a marked decline in spending on renewable energy projects during the first half of this year with spending totalling $117.6 bn, a 14% less than a year ago and the lowest amount for a comparable period since 2013 according to Bloomberg New Energy Finance (BloombergNEF). The decline was evident in all key renewables markets particularly so in China. The reason: Beijing is cutting subsidies for solar and wind and trying to make them stand on their own two feet without government support.[15]

Interestingly enough, spending on solar and wind also fell by 4% in Europe where governments and environmentalist groups are particularly vocal about their clean energy plans. In the United States, new renewables spending fell by 6%.[16]

Tackling Global Warming Problem

Solving the global warming problem is regarded as the most important challenge facing humankind in the 21st century. The capacity of the earth system to absorb greenhouse emissions is already exhausted, and under the Paris Climate Agreement, emissions must cease by 2040 or 2050. Barring a breakthrough in carbon sequestration technologies, this requires an energy transition away from fossil fuels such as oil, natural gas and coal.

Despite the widespread understanding that a transition to renewable energy is necessary, there are a number of risks and barriers to making renewable energy more appealing than conventional energy. Overall, the transition to renewable energy requires a shift among governments, business, and the public.

An energy transition designates a significant change for an energy system that could be related to one or a combination of system structure, scale, economics, and energy policy. A prime example is the change from a pre-industrial system relying on traditional biomass and other renewable power sources (wind, water, and muscle power) to an industrial system characterized by pervasive mechanization (steam power) and the use of coal.

Many lessons can be learned from history. The need for large amounts of firewood in early industrial processes in combination with prohibitive costs for overland transportation led to a scarcity of accessible (e.g. affordable) wood. When Britain had to resort to coal after largely having run out of wood, the resulting fuel crisis triggered a chain of events that culminated in the Industrial Revolution.

Another example where resource depletion triggered a technological innovation is how whale oil was eventually replaced by kerosene and other petroleum-derived products.

Energy transitions have occurred in the past, and still occur worldwide. Contemporary energy transitions differ in terms of motivation and objectives, drivers and governance.

For now, we're in an era of "energy diversification" where alternative sources to fossil fuels, notably renewables, are growing alongside—not at the expense of—the incumbents.

Still, any mandatory transition to renewable energy and EVs will not achieve the desired outcome without individuals, businesses and governments getting on board about the benefits of transition.

Challenges facing the EU in the field of energy include issues such as the growing threats of climate change, slow progress in energy efficiency and the need for further integration and interconnection in energy markets. A variety of measures aiming to achieve an integrated energy market, security of energy supply and a sustainable energy sector are at the core of the EU's energy policy.

The current policy agenda is driven by the comprehensive integrated climate and energy policy adopted by the European Council on 24 October 2014, which sets out to achieve the following by 2030:[17]

- A reduction of at least 40% in greenhouse gas emissions compared to 1990 levels;
- An increase to 27% of the share of renewable energies in energy consumption;
- An improvement of 20% in energy efficiency, with a view to achieving 30%;
- The interconnection of at least 15% of the EU's electricity systems.

The European Union unveiled recently its 2050 net-zero emissions target, a proposal that calls for 100 billion euros invested in the transition.

However, for energy transition to accelerate, it should have three realistic objectives: benefit to users, practicability and lucrative financial returns from renewables to match those from oil and gas. Mandatory transition will only achieve limited success.

While the global oil industry is investing huge amounts in renewables, such investment pales in size when compared with that in oil and gas exploration and production, refining and petrochemicals. The slower pace of oil majors toward alternative energies is due to two key reasons. First, oil and gas will continue to be needed well into the foreseeable future. And second, and probably much more important, is that financial returns from renewables are nothing compared to the huge bonanzas oil firms are accustomed to rake in when oil prices rise.[18]

Conclusions

It is very probable that oil and natural gas will continue to be the fulcrum of the global economy well into the foreseeable future.

For energy transition to accelerate, it should have three realistic objectives: benefit to users, practicability and lucrative financial returns from renewables at least comparable to those from oil and gas.

This could be enhanced by accurate down-to-earth information rather than bombastic claims about the destructive impact of climate change on the globe. Any mandatory transition measures would only achieve limited success.

Still, decision-makers, environmentalists and futurists may have to accept the notion that there will neither be a post-oil era nor an imminent energy transition or a peak oil demand throughout the 21st century and probably far beyond.

Footnotes

1 Sourced from the Wikipedia.

2-Ibid.,

3-Ibid.,

4- Global Energy Transformation: A Road Map to 2050 (2019 edition), the International Renewable Energy Agency (IRENA), April 2019.

5- Ibid.,

6- Nick Cunnigham,"Emissions Sore as Permian Burning Frenzy Breaks New Records", posted on December 14, 2019 and accessed on December 15, 2019.

7- Global Energy Transformation: A Road Map to 2050.

8- Ibid.,

9- My comments on an article titled:" Solar Storms Can Devastate Entire Civilizations" posted by Irina Slav on October 12, 2019 on oilprice.com.

10-Ibid.,

11-Mamdouh G Salameh, "A Post-oil Era Is a Myth" (A USAEE Working Paper Series No. 16-290 published on 8 December 2016).

12-Ibid.,

13-Mamdouh G Salameh, "Oil, Natural Gas & LNG Will Keep Renewables Stranded throughout the 21st Century", the IAEE Energy Forum, Fourth Quarter 2019.

14-Tsvetana Paraskova,"For the First Time Ever, Shell Signs $10 bn Emissions Linked Financing", posted on December 14, 2019 and accessed on December15, 2019

15- Mamdouh G Salameh, "Oil, Natural Gas & LNG Will Keep Renewables Stranded Throughout the 21st Century".

16- Irina Slav, "What's Behind the Drop in Renewable Spending?" posted on Oilprice.com on July 16, 2019 and accessed on July 17, 2019.

17- Fact Sheets on the European Union (EU) accessed on 14 December, 2019.

18- Mamdouh G Salameh, "Oil, Natural Gas & LNG Will Keep Renewables Stranded Throughout the 21st Century".

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Many jurisdictions are trying to couple EV market share targets with build out of charging infrastructure. Given that charging infrastructure would almost always be integrated with disco businesses, a fair number of proposals and pilot programs entail the discos and their utility parents.

In the U.S., while a number of programs have been proposed or are being implemented, most of the effort is at the state level. While some state legislatures, like California's, have been actively legislating to transform and electrify transportation much of the responsibility lies with public utility commissions. PUCs have oversight of electric utilities and utility discos and, in most cases, other disco businesses such as cooperatives or municipals. Several states are in the process of implementing pilot programs for charging infrastructure, including residential charging, that include implications for discos. Issues such as disco capacity and network capability, cost recovery and retail customer pricing including time of use (TOU) are being vetted. Few of the programs we surveyed incorporate investment in distribution networks themselves; the number of EVs and thus demand for charging infrastructure is very low. There are clear indications that utilities and discos see EVs as good business.

In none of these instances can the jurisdictions do much about EV development and deployment, or challenges in battery science and supply chains. EVs are attractive because of perceptions that batteries are cheap. Falling costs of batteries have much to do with the location of some 60-70 percent of capacity in China and the prevailing, commercial lithium-based chemistry. Attempts to locate battery production elsewhere will have implications for labor costs and materials supply chains; changes in battery chemistry to improve performance will have implications for materials inputs and supply chains; and all will become subject to ever more environmental scrutiny. These considerations must be addressed well ahead of distribution networks.

Footnotes

1 Comment and information provided by Michael Maten, Manager, Energy, Environment and Electrification, General Motors Public Policy.

2 Input for this section from Clare Grey, Geoffrey Moorhouse Gibson professor in chemistry and Royal Society fellow, Cambridge University. Rice University/Imperial College Workshop on Energy & Minerals, Framing Integration Futures, September 18-19, 2018, Center for Energy Studies, Rice University's Baker Institute for Public Policy.