

Oil, Natural Gas & LNG Will Keep Renewables Stranded Throughout the 21st Century

BY MAMDOUH G SALAMEH

Introduction

Big Oil is increasingly listening to investors and building alternative energy portfolios, but oil and gas will remain their core business well into the future or at least until returns on clean energy start making commercial sense.

Big Oil's investments in renewables will be guided by three pivotal principles. The first is that there will be no post-oil era throughout the 21st century and probably far beyond. Oil will continue to reign supreme all through.¹

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.² While an increasing number of electric vehicles (EVs) on the roads coupled with government environmental legislations could decelerate the demand for oil, EVs could never replace oil in global transport throughout the 21st century and far beyond.

The third principle is business opportunities. While Big Oil 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, they all say that 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.³ While renewables accounted in 2018 for 4% of global primary energy demand, oil and natural gas accounted for 58%.⁴

Still, Big Oil does invest in clean energy solutions and has accelerated such investments in recent years partly to be genuinely involved in the clean energy solutions and partly to burnish their environmental credentials but the general mood, at least for now, is as Shell put it last year—we'll 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.⁵

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 market 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.⁶

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%.⁷

The Myth of an Imminent Energy Transition

With global oil consumption exceeding 100 million barrels a day (mbd), the notion of imminent energy transition looks like 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. In fact hydrocarbons accounted

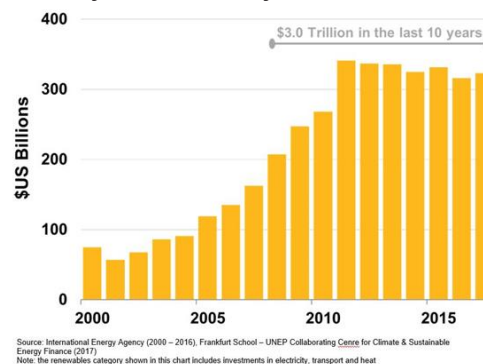


Chart 1 Global Investment in Renewable Energy Supply

Source: Courtesy of the International Energy Agency (IEA)

for 84.7% of global primary energy consumption in 2018.⁸ 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.

And whilst wind and solar are being deployed quickly at an exponential rate, renewable energy

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See footnotes at end of text.

installations are far too slow to catch the still-voracious appetite for fossil fuels. It is a fact needing acknowledgement in a world of over seven billion people, each of whom is wanting for more light, heat, mobility and gadgetry.

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.

Most oil companies are also investing heavily in chemicals and petrochemicals. Environmental groups would correctly note that this is hardly a strategy for a clean energy transition, but oil companies see global demand for plastics, fertilizers and other petrochemical products contributing more to the growth in global oil demand than the transportation sector. Petrochemicals currently account for 13% or 13 mbd of global oil demand and this is projected to rise to 16% by 2030 compared with 73% for transport.

Impact of Electric Vehicles (EVs) on Global Oil Demand

A few experts have been projecting the advent of the post-oil era within the next fifty years.

Hardly a day goes by without another media report about the impending demise of the Internal Combustion Engine (ICE) as petroleum-powered cars and trucks are replaced by super-clean EVs.

Some experts are now saying that widespread EV use could spell the end of oil. The tipping point, they reckon, is 50 million EVs on the roads. This they believe could be reached by 2024.⁹ However, 50 million EVs could hardly make a dent on the global demand for oil let alone replace it.

Currently, electric and hybrid cars combined number under 4 million cars out of 1.477 bn ICES on the roads worldwide in 2015, or a negligible 0.27%. The total number of ICES is projected to reach 2.0 bn by 2025 rising to 2.79 bn by 2040 according to U.S. Research.¹⁰

In 2018 the world used 36.4 bn barrels of oil (bb) of which 73% or 26.6 bb were used to power 1.477 billion conventional cars around the world.¹¹ Bringing 50 million EVs on the roads will reduce the global oil demand by only 0.9 bb, or 3.4%. This will neither be the end of oil as some experts are suggesting nor a tipping point.

A tipping point for oil could only be reached once 739 million EVs (50% of the current global ICES number) are on the roads worldwide. This is impossible to achieve within that time frame. One then can only guess how many decades will have to pass before the entire global car fleet of ICES is replaced by EVs.

Moreover, growth in EV sales thus far has been supported by significant government subsidies. Sales would crash once the subsidies are withdrawn

according to a report in April 2017 by U.S. auto research firm, Edmunds.

Furthermore, there will be a need for trillions of dollars of investment to expand the global electricity generation capacity in order to accommodate the extra electricity needed to recharge 50 million EVs. How could such expansion be sourced: nuclear, hydrocarbons or solar?

Other alternatives to ICES include hydrogen fuel cells (FCVs).¹² However, experts estimate it will take at least 40 years or more before FCVs could have any meaningful impact on the demand for oil.

World Oil Outlook

Oil will maintain its dominance during the 21st century and beyond. According to ExxonMobil's 2017 "Outlook for Energy: A View to 2040", oil is projected to account for 33% of the global primary energy consumption in 2040 as it did in 2017 (see Chart 2).

In the medium-period 2018-2022, oil demand is projected to increase by 2.5 mbd from 99.8 mbd in 2018 to 102.3 mbd. The outlook for long-term oil

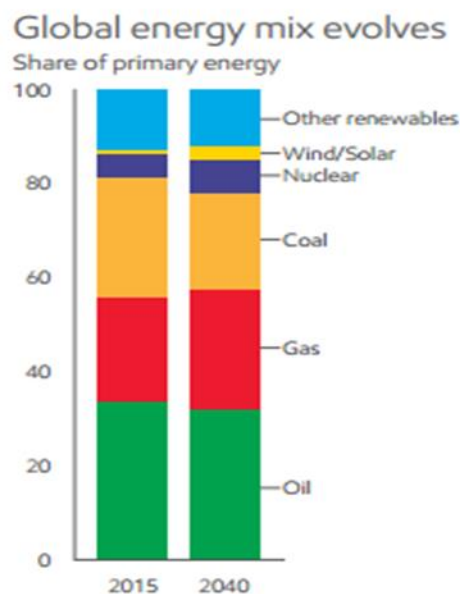


Chart 2

Source: Courtesy of Exxon Mobil 2017 Outlook for Energy

Table 1
Sectoral Oil Demand Growth, 2018-2040 (mbd)

	2018	2020	2022	2025	2030	2035	2040
Transportation	73.0	73.7	74.4	76.1	78.4	80.1	81.1
Industry	17.4	17.6	18.2	18.3	18.9	19.2	19.5
Other uses	9.4	9.5	9.7	9.9	10.1	10.4	10.5
World	99.8	100.8	102.3	104.3	107.4	109.7	111.1

Source: OPEC 2017 World Oil Outlook 2040 / BP Statistical Review of World Energy, June 2019.

demand growth is more optimistic reaching 111.1 mbd by 2040 (see Table 1).

Most of the demand for oil is used for transportation. It is a sector where oil continues to face the weakest competition from alternative fuels. Between 2018 and 2040, the transportation sector will account for 77% of all oil consumed. Nevertheless, demand growth is projected to decelerate on the back of efficiency improvements driven by technological developments, a tightening of energy policies and a wider penetration of EVs.

The Potential for Hydrogen

Some supermajors are looking into hydrogen and its various possible uses as a clean fuel--not only for cars but also for heavy industries and home heating. Still, a meaningful large-scale hydrogen use with low or zero emissions in heavy industries where emissions are the most and the hardest to cut, is years if not decades away. Producing hydrogen from something other than fossil fuels is currently cost prohibitive.¹³

Hydrogen is already used widely, but it is almost entirely produced from natural gas and coal, and its production is responsible for annual carbon dioxide (CO₂) emissions equivalent to those of Indonesia and the United Kingdom combined according to a report last month by the International Energy Agency (IEA).¹⁴

Still, Japan is boosting the search for new non-fossil fuel sources of energy. It is one of the pioneers in hydrogen technology, with Toyota for example expanding mass production of fuel cell stacks and high-pressure hydrogen tanks as it aims to boost sales of FCEVs.¹⁵

However, hydrogen on its own can't solve Japan's energy problem. Japan needs nuclear energy, LNG and also solar power for generating electricity. Without them the Japanese economy will come to a standstill. Moreover, Japan's demand for oil for transport could be decelerated with a wider use of both EVs and FCVs. Still, the most significant challenge facing FCVs is the cost and durability of the fuel cell system.

The concept of Japan building a 'hydrogen society' is not new. Icelandic professor Bragi Arnason of Reykjavik University whom Newsweek magazine nicknamed as 'Professor Hydrogen' has had the aspiration of converting Iceland into a 'hydrogen economy' years before Japan.¹⁶

The Outlook for Gas & Liquefied Natural Gas (LNG)

Global demand for natural gas is growing faster than other hydrocarbons and also faster than global overall energy demand. It grew by 5.3% from 3141.9 million tons of oil equivalent (mtoe) in 2017 to 3309.4 mtoe in 2018.¹⁷

A movement to de-commission nuclear power and coal in electricity generation particularly in Japan and Germany and a huge demand from China in addition to environmental concerns are accelerating the global demand for gas.

There are three huge natural gas and LNG markets

in the world, namely, the European Union (EU), the Asia-Pacific region and China.

Russia's position in the EU gas market is unassailable with almost 40% market share and growing. Moreover, Russia's share will be enhanced further to 45%-50% with the completion of both the Nord Stream 2 and the Turk Stream which will bring Russian gas supplies under the Baltic Sea and the Black Sea, respectively, to the EU when completed by the end of this year.

The EU demand for gas and LNG is growing fast at a time when European gas production is projected to decline significantly particularly with the planned shutdown of the Groningen gas field in the Netherlands by 2030.

The world's biggest LNG market with the highest prices is the Asia-Pacific region to which the thrust of U.S. LNG exports is directed. In 2018 the U.S. exported 28.4 billion cubic metres (bcm).¹⁸ Still, U.S. LNG will face formidable competition on price from Qatar and Australia which will continue to dominate this market well into the future.

The third biggest market is China. China's gas demand is projected to grow by 33% in the next six years from 283 bcm in 2018 to 376 bcm by 2023 with LNG imports rising by 26.5% from 73.5 bcm in 2018 bcm in 2017 to 93 bcm in 2023.¹⁹

China became the world's top natural gas importer-including LNG and pipeline - in October last year, overtaking Japan which imports all its gas as LNG.²⁰ It is set to overtake Japan as the top global LNG importer by 2022.²¹

Solar Energy

China is now the largest investor in solar energy. According to BloombergNEF, nearly half of the world's new renewable energy investment of \$279.8 billion in 2017 came from China (see Table2).

China has recently come up with a very innovative way to enhance global electricity generation and reduce demand for oil: solar highways. The solar highways are the next gambit because they take the

Countries	Investment
China	\$126.6
U.S.	40.5
Japan	13.4
India	10.9
Germany	10.4
Australia	8.5
UK	7.6
Brazil	6.0
Mexico	6.0
Sweden	3.7

Table 2 New Renewables Energy Investments Made by Top 10 Countries in 2017. U.S. Billions
Source: Courtesy of Bloomberg New Energy Finance

‘farm’ out of solar and free up the land for agricultural use.²²

The plastic-covered solar panels cover a portion of highway that is two-thirds of a mile long and is designed to absorb the pressure of some 45,000 cars and trucks that traverse it daily.²³ And this patch of highway is close to an electricity substation, so it can be hooked up to the grid easily (see Chart 3).

There are also new solar markets opening up: Saudi Arabia is one very ambitious new addition to the industry. The Saudi solar market is projected to expand at a compound annual rate of 30% between 2018 and

a peak oil demand throughout the 21st century and probably far beyond. Oil and natural gas will continue to be the core business of oil majors well into the foreseeable future.

And despite a global expenditure of \$3 trillion on renewable energy during the last decade, there is not much to show for it. This is a hefty price to pay just to gain only a percentage point of market share from coal.

That is why oil, natural gas and LNG will keep renewables stranded throughout the 21st century.

Chart 3
Solar Highways



2024. The UAE is also very ambitious in the solar power department, planning to source a quarter of its energy from solar installations by 2030. It recently launched the largest single solar power farm in the world, the 1.18-GW Noor Abu Dhabi.

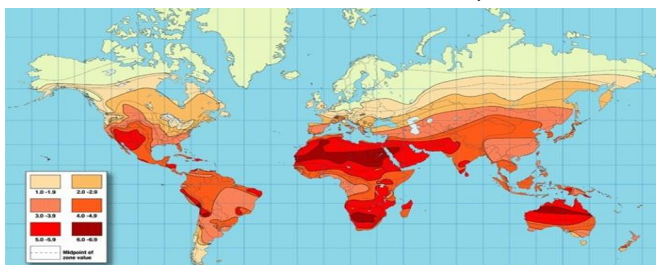
It has been calculated that all of the world’s energy needs could be met with solar panels on just 1.2% of the Sahara Desert.²⁴ A map depicting global solar power resources shows the reason. There is no greater solar resource on the planet than a broad swath extending from the Sahara Desert of North Africa and into north western Saudi Arabia (see Map 1).

Conclusions

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

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

Map 1
World solar insolation map



Footnotes

- ¹ Mamdouh G Salameh, “A Post-oil Era Is a Myth” (A USAEE Working Paper Series No. 16-290 published on 8 December 2016).
- ² Nick Cunningham, “5 Key Takeaways from CER-AWeek” posted on Oilprice.com on May 11, 2018, and accessed on July 19, 2019.
- ³ Tsvetana Paraskova, “Two Reasons Why Big Oil Isn’t Rushing into Renewables” posted on Oilprice.com on February 14, 2019 and accessed on July 17, 2018.
- ⁴ BP Statistical Review of World Energy, June 2019, p.9.
- ⁵ Tsvetana Paraskova, “Two Reasons Why Big Oil Isn’t Rushing into Renewables”.
- ⁶ Irina Slav, “What’s Behind the Drop in Renewable Spending?” posted on Oilprice.com on July 16, 2019 and accessed on July 17, 2019.
- ⁷ Ibid.,
- ⁸ BP Statistical Review of World Energy, p.9.
- ⁹ Mamdouh G Salameh, “A Post-oil Era Is a Myth”.
- ¹⁰ Green Car Reports, 7th of July 2014.
- ¹¹ BP Statistical Review of World Energy, June 2019.
- ¹² Mamdouh G Salameh, “How Viable is the Hydrogen Economy: The Case of Iceland” (A paper given at the 28th USAEE/IAEE North American Conference, 3-5 December 2008, New Orleans, USA).
- ¹³ Tsvetana Paraskova, “Is This Big Oil’s Next Secret Weapon?” posted on Oilprice.com on July 16, 2018 and accessed on July 17, 2019.
- ¹⁴ Ibid.
- ¹⁵ Tsvetana Paraskova, “Can Hydrogen Solve Japan’s Energy Problem? Posted on Oilprice.com on August 7, 2018 and accessed on July 18, 2019.
- ¹⁶ Mamdouh G Salameh, “How Viable is the Hydrogen Economy: The Case of Iceland”.
- ¹⁷ BP Statistical review of world Energy, June 2019, p 9.
- ¹⁸ Ibid, p. 40
- ¹⁹ Ibid., p34 & p.39.
- ²⁰ Tsvetana Paraskova, “Breakneck LNG Demand Surge in China Is History” posted on February 2, 2019 and accessed on 19 July 2019.
- ²¹ Ibid.,
- ²² Mamdouh G Salameh, “An Innovative Way to Expand Global Electricity Generation & Reduce Demand for Oil: Solar Highways” (an article published by the IAEE Energy Forum in the fourth Quarter of 2018).
- ²³ Ibid.
- ²⁴ Robert Papier, “Saudi Arabia to Fund Giant Solar Project with Oil Riches”, posted by Oilprice.com on 7 April 2018 and accessed on 20 July 2019.