The Global Energy Transition: Challenges and Opportunities

Presentation to the First International Petroleum Data Management Conference

Luanda, Angola

May 27 & 28, 2021

Tako Koning
Senior Petroleum Geologist/ Energy Consultant
Calgary, Canada

Presentation's Key "Take Away" Points

- The oil & gas industry is currently faced with unprecedented challenges due to the need for the world to transition to carbon-zero economies as soon as possible.
- Despite "*Covid-19 oil demand destruction*" the world still consumes oil at a current rate of 95 million BOPD.
- Unprecedented pressure is now on the oil & gas industry by the USA's Biden Administration and governments everywhere, and also the investment community including global pension funds, banks and sovereign funds for oil & gas companies to reduce their carbon footprint.
- As the world moves towards renewable energy and lower emissions fuels, natural gas has emerged as a "*compromise energy source*" since it is the cleanest burning of the hydrocarbons. It is also termed as a "*bridge fuel*" or a *"transition fuel".* Accordingly, oil & gas companies will need to transition from oil to natural gas.

May 18, 2021 "Landmark" Report of the International Energy Agency (IEA) presented by Fatih Birol, IEA Executive Director

International Energy Agency (IEA) Landmark Report May, 18, 2021

- "Bombshell" and "radical" report by Paris-based IEA stated there is no need for further investment in oil and gas developments if the world wants to effectively end global warming.
- Report states that "No exploration for oil and gas is necessary….other than oil and gas fields already developed….no new oil fields are necessary".
- IEA calls for a massive clean energy push to reach net zero by 2050.

International Energy Agency (IEA) Landmark Report May, 18, 2021

Reactions to the IEA May 18, 2021 Report include:

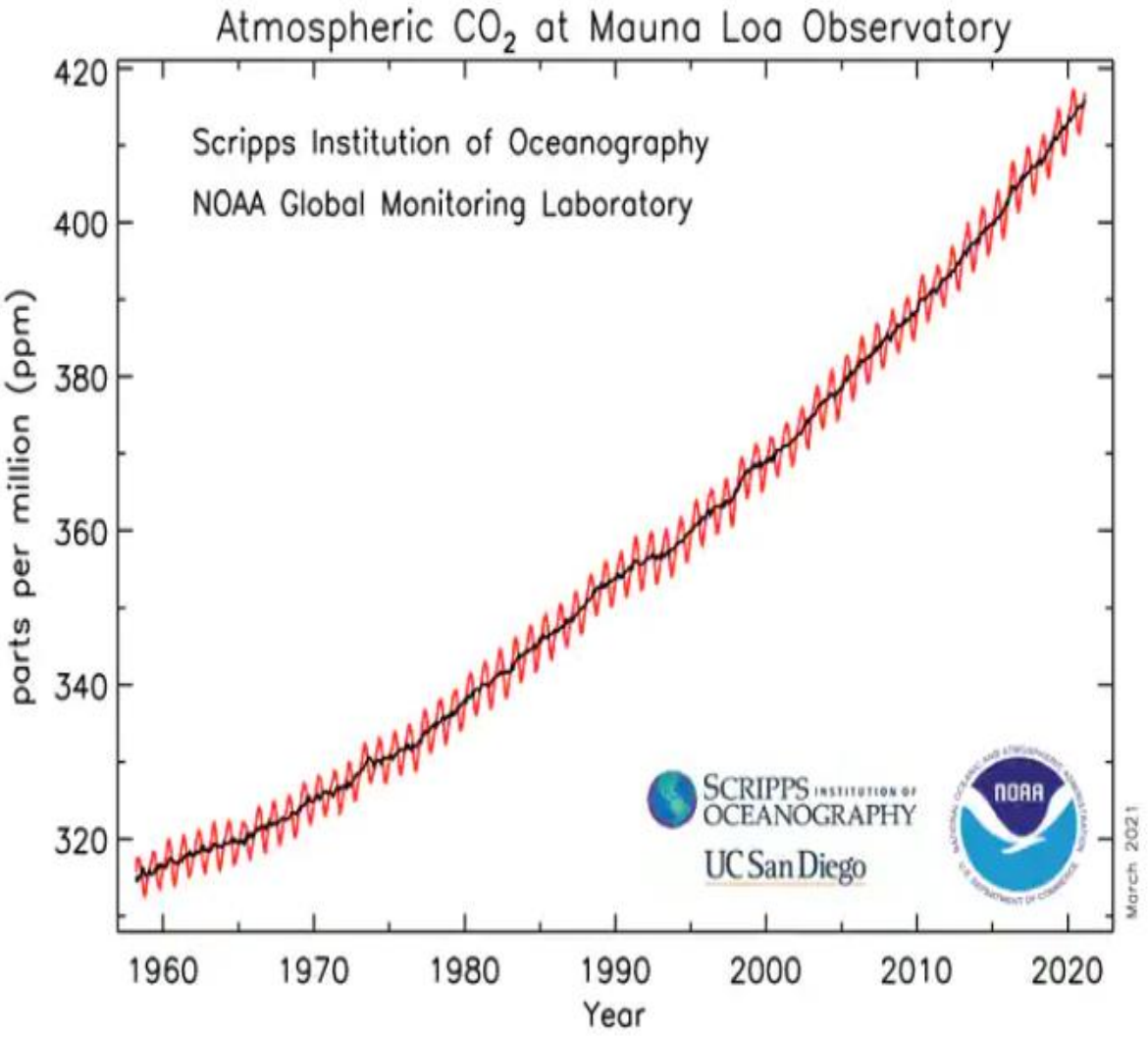
1.) **American Petroleum Institute (API)** stated: "Any pathway to net zero must include continued innovation and use of natural gas and oil which is displacing coal in developing nations and enabling renewable energy".

2.) **National Offshore Industries Association (NOIA)** stated: "Climate and emissions solutions need to balance the environmental, social, economic and energy needs of society. These needs are correlated. Progress in one can not come at the expense of another need".

How Can Oil Industry Professional Workers (Geoscientists, Engineers and Petroleum Data Managers) Contribute to the Energy Transition?

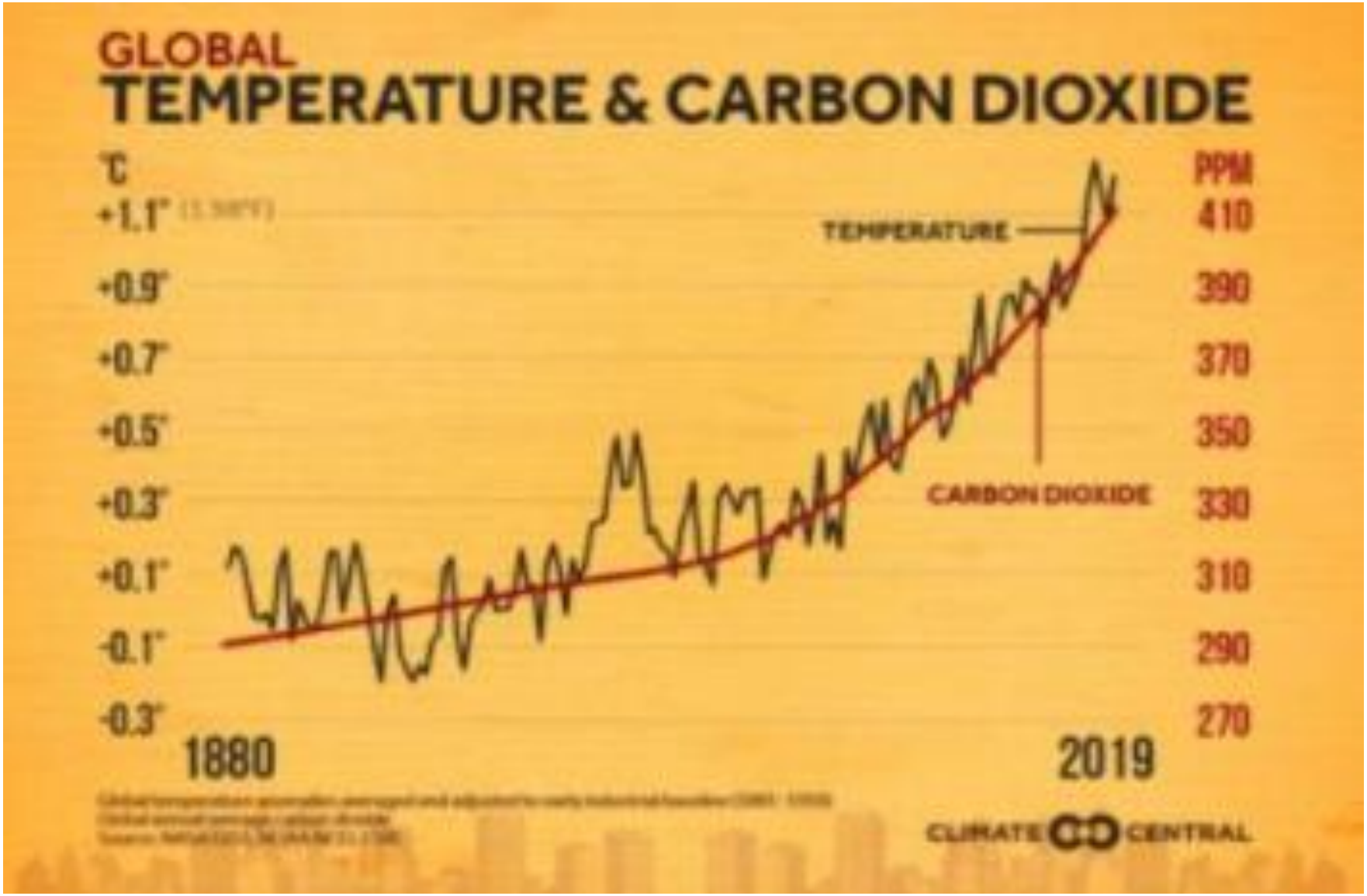
- **Gas** is the cleanest burning of the hydrocarbons and there will be much increased demand for gas as a substitute for oil and also to replace coal for electricity generation. Accordingly the need will remain for experienced and dedicated oil industry professionals for **gas** exploration & production.
- **Oil**: global oil consumption continues at 95 million BOPD. The need for oil will not drop overnight and the need remains for oil professionals to manage the world's oil resources.
- **CCUS-Carbon Capture, Utilization and Storage** will become hugely important. Oil industry professionals' input is critical for developing appropriate reservoirs to hold CO2.
- **Geothermal** energy investments worldwide are accelerating. Geological and geophysical input is critical for geothermal projects.

Atmospheric CO2 at Mauna Loa Observatory, Hawaii, 1960 - 2020

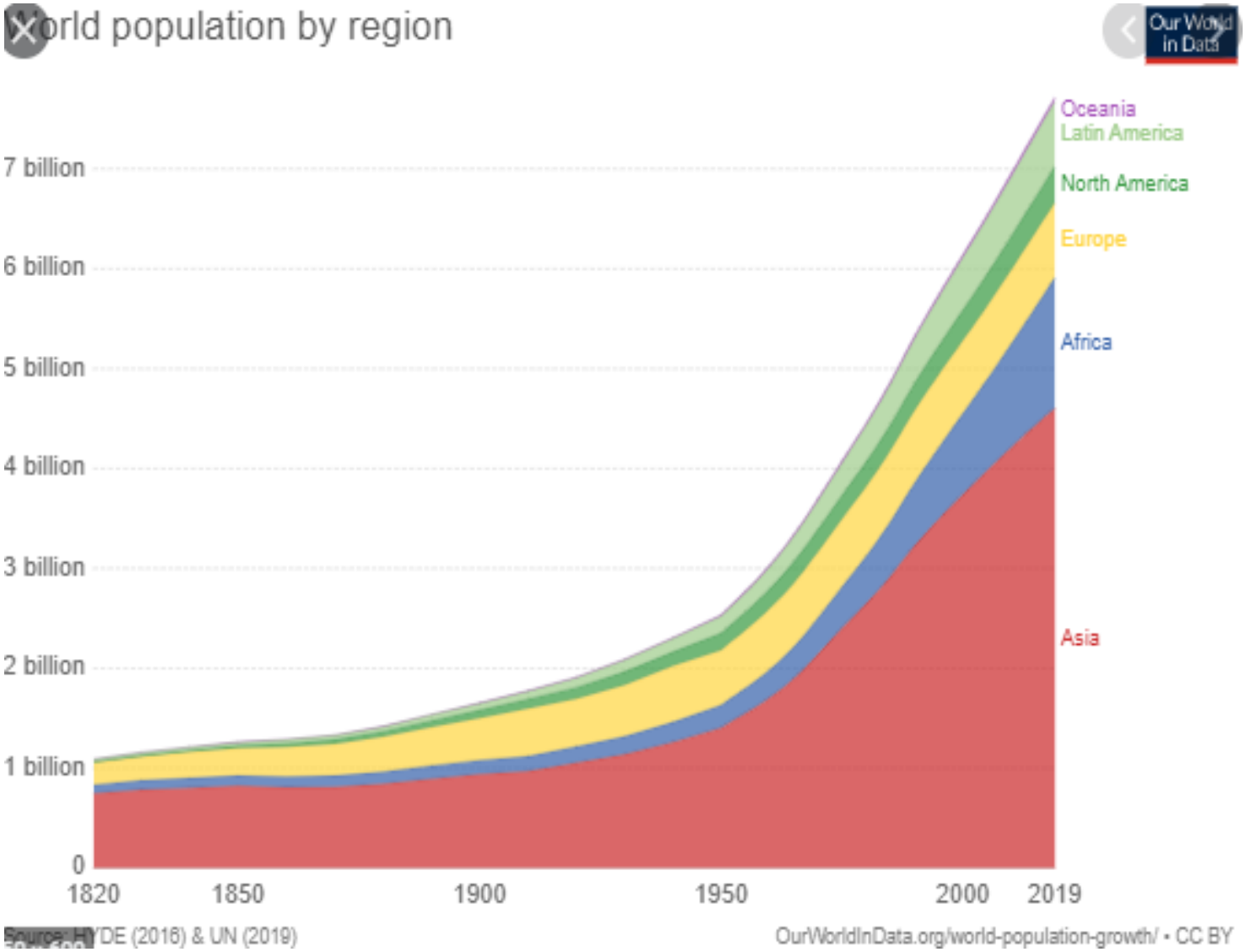


Global Temperature & Carbon Dioxide From 1880 To 2019

Source: Climate Central



Human population growth: In 1950 the world had 2 billion people, in 2021 the world has almost 8 billion people. *This is not sustainable*.



Energy transition requires critical thinking

- Global poverty issues can not be addressed without adequate energy.
- One billion people are without electricity and one third of the world is impacted by *energy poverty.*
- According to Scott Tinker, most of the world's ills including hunger, clothing, shelter, immigration and migration, population growth, healthcare and even empowerment of women cannot be addressed without access to affordable energy.

From: Scott Tinker, geologist, academic public educator, former president of the American Association of Petroleum Geologists (AAPG) and documentary film maker with latest film *Switch-on*

The Energy Transition

- The world needs ever more energy and at the same time we must reduce our CO2 emissions. This is not easy. This is complicated!

- Maybe a cooperative global roadmap is needed to reach the objective?

Governments Worldwide are Forcing the Energy Transition

Next slides review select examples of the determination of world governments to have economies which are carbon-zero.

- **USA**
- **China**
- **France**
- **Canada**

USA's Biden Administration Position on Climate Change

- In January, 2021 the **USA** rejoined the Paris Climate Agreement whose objective is to limit global warming to well below 2°C above pre-industrial levels and preferably below 1.5°C.

- January 28, 2021 John Kerry, **USA** Special Presidential Envoy for Climate said that "The United Nations Glasgow Climate Summit to be held November 1 – 12, 2021 *is the world's "last best chance" to avert the worst environmental consequences for the world*".

CHINA – The World's Second Largest Economy: President Xi Jinping

CHINA

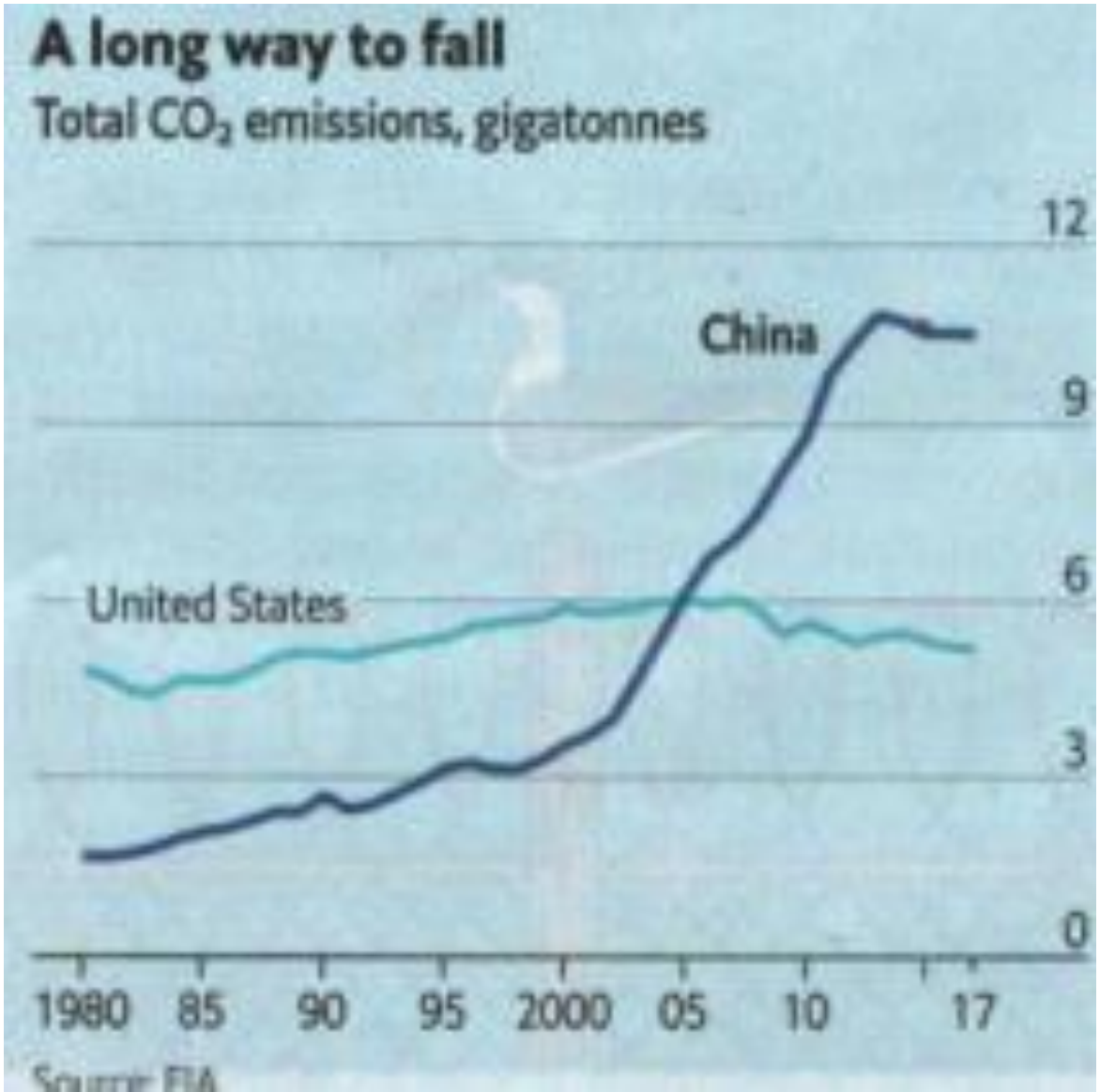
- **CHINA** is the world's second largest consumer of oil at 14.0 MMbls per day (USA is 19.1 MMbls per day and India is 5.3 MMbls per day).
- **CHINA** is driving LNG price hike: Asia's liquified natural gas prices have reached more than $38 per million BTU's for January deliveries.
- **CHINA** is expected to overtake the UK with the world's largest offshore wind operations, 50GW of total capacity by 2029.

  From: March 20, 2021, Wood Mackenzie & Upstream
- **CHINA's** *President Xi Jinping vows China will reach peak emissions by 2030 and be carbon zero before 2060.*

  From: Feb 8, 2021, Globe & Mail

China & USA CO2 Emissions 1980 – 2019

From: EIA, The Economist, Sept 26, 2020



FRANCE

- **France** announced April 12, 2021 that French lawmakers plan to reduce carbon emissions have moved to ban short-haul internal flights where train alternatives exist.
- It was stated that planes emit 77 times more CO2 per passenger than do train passengers.

From: BBC, April 13, 2021

CANADA

- **Government of Canada** has set a goal of achieving "net zero" greenhouse gas (GHG) emissions economy wide by 2050
- **Canada's** government will raise carbon taxes to $170 per tonne by 2030
- Environmental policy groups and the **Government of Canada** believe that the toll of continued climate change consisting of adverse weather effects like floods and fires far outweigh the near-term downsides with carbon taxes which is significant losses of employment and GDP

What's Currently Happening with Global Oil Production?

- Next 2 slides will show Top 20 Global Oil Producers
- Subsequent 2 slides will review historic oil prices

Top 20 Global Oil Producers in 2020

Million barrels of crude oil per day

1.)	USA	11.0 MMbopd
2.)	Russia	10.8
3.)	Saudi Arabia	10.4
4.)	Canada	4.7
5.)	Iraq	4.6
6.)	China	4.0
7.)	Brazil	3.0
8.)	UAE	2.6
9.)	Iran	2.4
10.)	Kuwait	2.3

Top 20 Global Oil Producers in 2020

Million barrels of crude oil per day

11.)	Norway	2.1 MMbopd
12.)	Nigeria	1.9
13.)	Kazakhstan	1.8
14.)	Mexico	1.7
15.)	Angola	1.4
16.)	UK	0.9
17.)	Algeria	0.9
18.)	Indonesia	0.7
19.)	India	0.6
20.)	Egypt	0.5

Oil Prices (*Inflation Adjusted*) 1940 to Present Day

From: MacroTrends – Crude Oil Prices

Oil Prices vs Renewables

- The current oil price of US$64.00 per barrel is the same on an inflation adjusted basis to oil prices in the mid 1970's despite the passage of 45 years of time.
- Thus the current oil price is very low compared to the other costs in society over the last 45 years including the costs of housing, vehicles, groceries, etc which have risen sharply.
- Therefore "cheap oil" has discouraged the transition to renewable sources of energy; *however the costs of renewables keeps declining and is now increasingly economically competitive with cheap oil.*

USA's Oil & Gas Industry:
An Oil & Gas Powerhouse

- The **USA** is the world's biggest producer of oil.
- The **USA** is also one of the world's biggest producers of natural gas.
- The **USA's** position as a top oil and gas producer is due to:

1.) Geology - extensive sedimentary basins with thick shale sections like the Permian Basin of West Texas and New Mexico which are ideal for hydraulic fracturing. **USA** is producing 7.5 Mmbopd from fracking of shales.
2.) Previous administrations were very supportive of domestic oil and gas exploration and production. *The Biden Administration is opposed to the oil industry due to climate change.*

USA Wind
-Biden Administration targets 30 GW of offshore wind by 2030

Global Investors and Fossil Fuels

- Increasing numbers of pension funds worldwide, banks and sovereign funds are reducing their investments in companies active in producing fossil fuels.
- BlackRock – the world's largest assets manager – announced that greener stocks enjoy a "sustainability premium" and they may divest from firms such as ExxonMobil for failing to appreciate the "tectonic shift" taking place with renewables.

Stock market investing: Green Energy vs Traditional Energy

Note: ETF is an exchange traded fund which is a type of security that tracks an index, sector, commodity, or other asset, but which can be purchased or sold on a stock exchange the same as a regular stock.

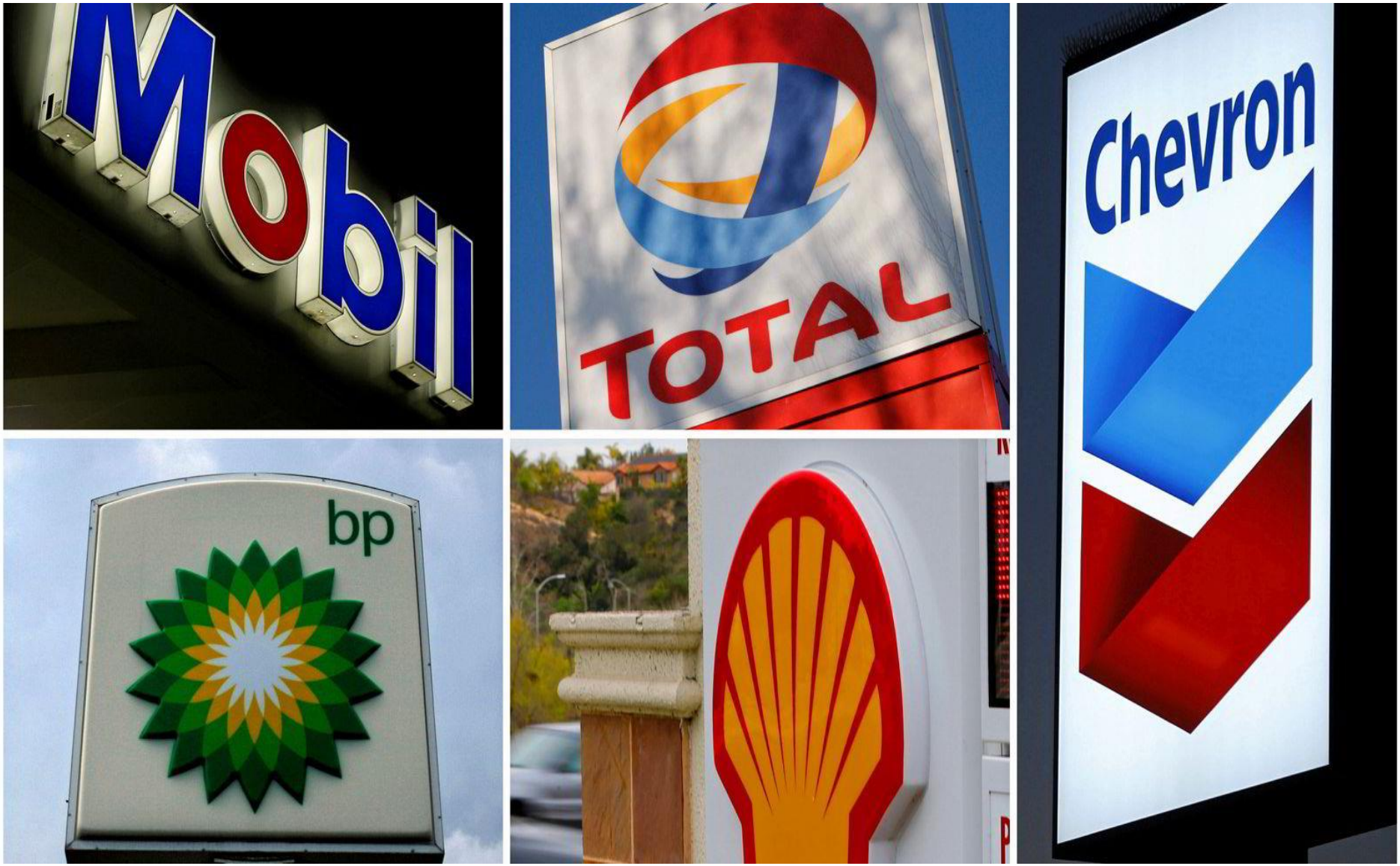
Recent Headlines on Cars & Planes

- "**GENERAL MOTORS** will end by 2035 manufacture of all gasoline and diesel engines".

- "**VOLKSWAGEN's** all-out electric push to displace Tesla is less risky than it appears". VW intends to spend $50 billon in the next decade on EV's. VW's market value has increased 100% in the past year as its strategy captures the imaginations of investors.
  From: March 27, 2021, Globe & Mail

- "**BOEING** vows 100% biofuel planes by 2030".
  From: Jan 23, 2021, Globe & Mail

What's Happening with Big Oil?



Recent Headlines on EUROPEAN Oil & Gas Companies

- "The **EUROPEAN** oil industry is quickly transitioning to a future dominated by cleaner energy".
- "**BP, SHELL, TOTAL, EQUINOR** and other European companies are investing considerable resources in offshore wind and solar energy while cutting back on oil".
  @Feb 3, 2021, *New York Times News Service*

Recent Headlines on SHELL

- "**SHELL** is to oversee a gradual and managed decline of its oil output. We won't play the commodity green power game – why **SHELL** is going its own way on renewables; CEO Ben Van Beurden".
  From: Feb 11, 2021, *Upstream*
- "**SHELL** has vowed to accelerate cuts in the carbon intensity of its business".
  From: Feb 11, 2021*, Upstream*
- "The world is changing, we will change too: **SHELL** accelerates drive to net zero emissions".
  From: Feb 11, 2021, *Upstream*

Recent Headlines on BP

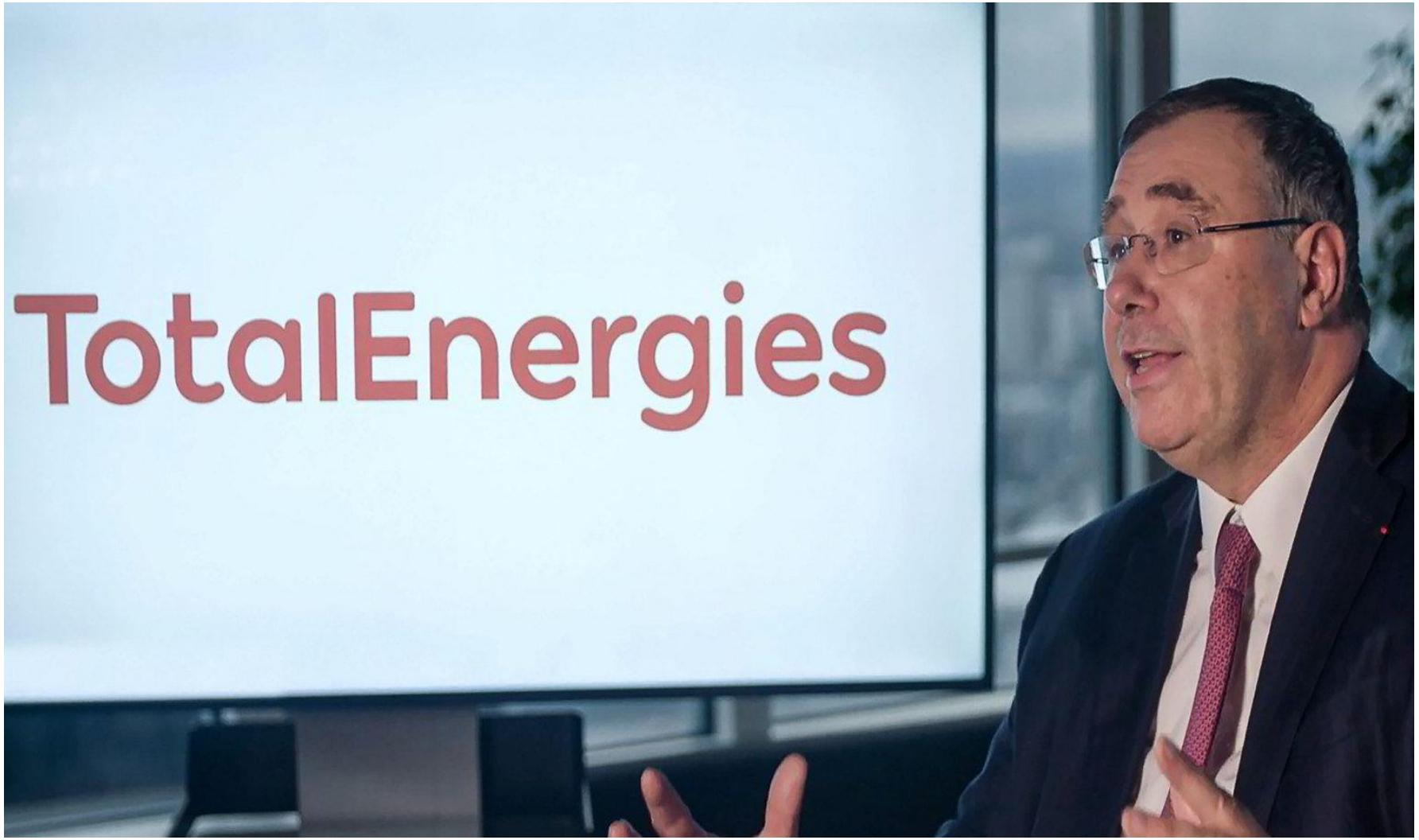
- "Fossil fuel demand has likely peaked, says energy giant **BP** and might never recover to pre-Covid levels"
  From: Sept 15, 2020, Globe & Mail, Nov 2020, EAGE First Break

- "**BP** is cutting at least 10,000 jobs from a work force of 70,000 and in the first 3 months of 2021 achieved debt reduction of $35 billion by sale of noncore assets".
  From: Feb 3, 2021, New York Times News Service, April 8, 2021, Upstream

- **BP** CEO Bernard Looney aims to cut BP's oil output by 1 million BOPD, or over 40% over the next decade while growing renewable output 20-fold.
  From: March 24, 2021, Upstream

Total to TotalEnergies

-with CEO Patrick Pouyanne



Recent Headlines on TOTAL

- "**TOTAL** is an emerging leader of the energy transition. Demonstrates how to pivot from an oil company to an energy company".
  From: January, 2021, Gerard Kreeft, Africa Oil + Gas Report
- Patrick Pouyanne, CEO, **TOTAL** said that by 2030 the company "will grow by one-third, roughly from 3 million BOE/D to 4 million BOE/D, half from LNG, half from electricity, mainly from renewables. This is the first time that any major oil company has translated its portfolio into Barrels-of-Oil-Equivalent. So, at the same time **TOTAL** has slashed "proved" oil & and gas from its books, it has added renewable power as a new form of reserves".
  From: January 20, 2021, Gerard Kreeft, as above

Recent Headlines on EXXONMOBIL

- "**EXXONMOBIL** announced it is investing $3 billion in a new business called Lower Carbon Service Solutions which will initially focus on carbon capture and sequestration projects".

  @Feb 3, 2021, New York Times

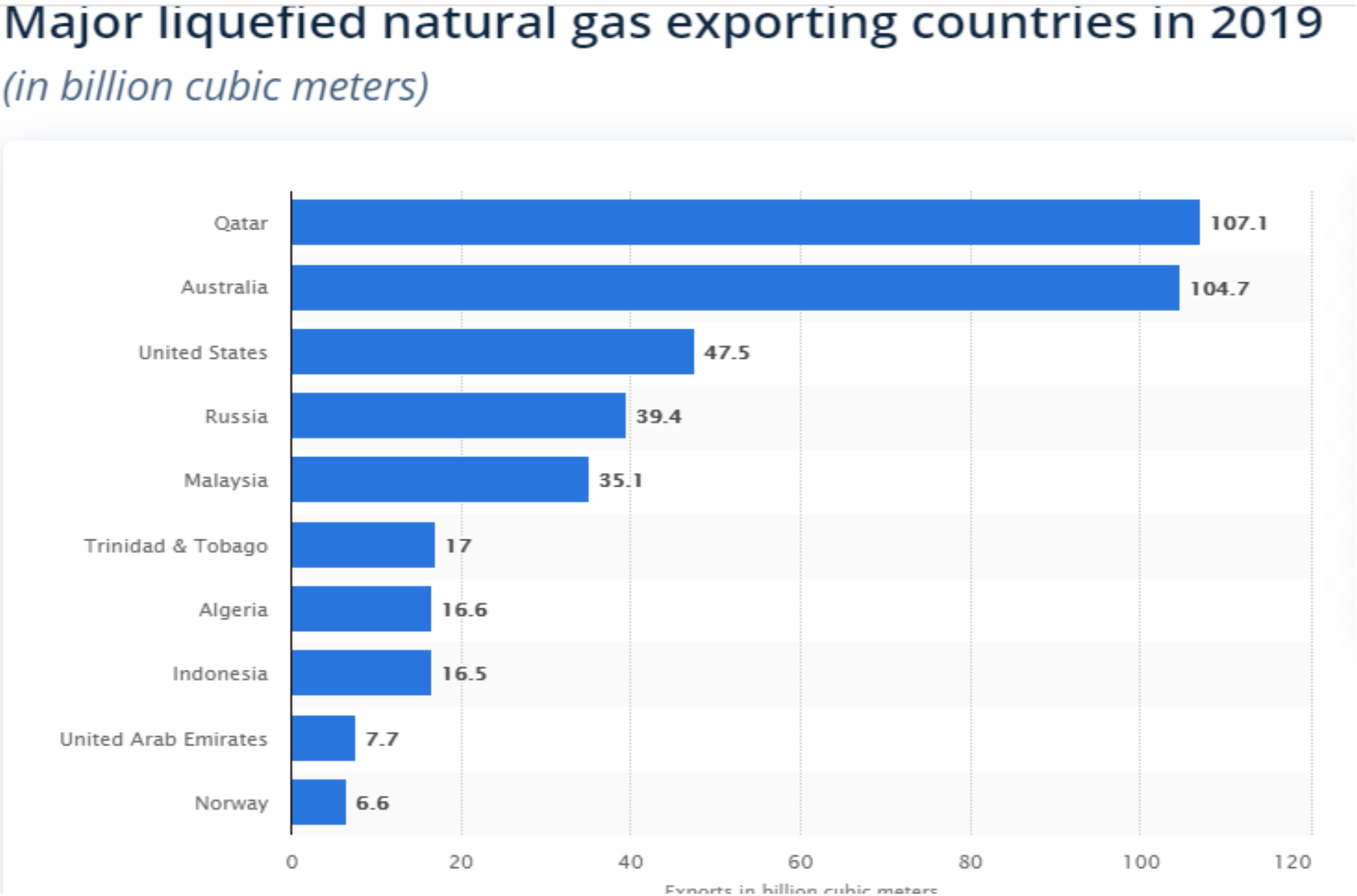
- Nevertheless, **ExxonMobil** remains the most traditional of the International Oil Companies and is almost entirely focused on oil and gas production.

What's Happening with Global Gas – LNG Production and Prices?

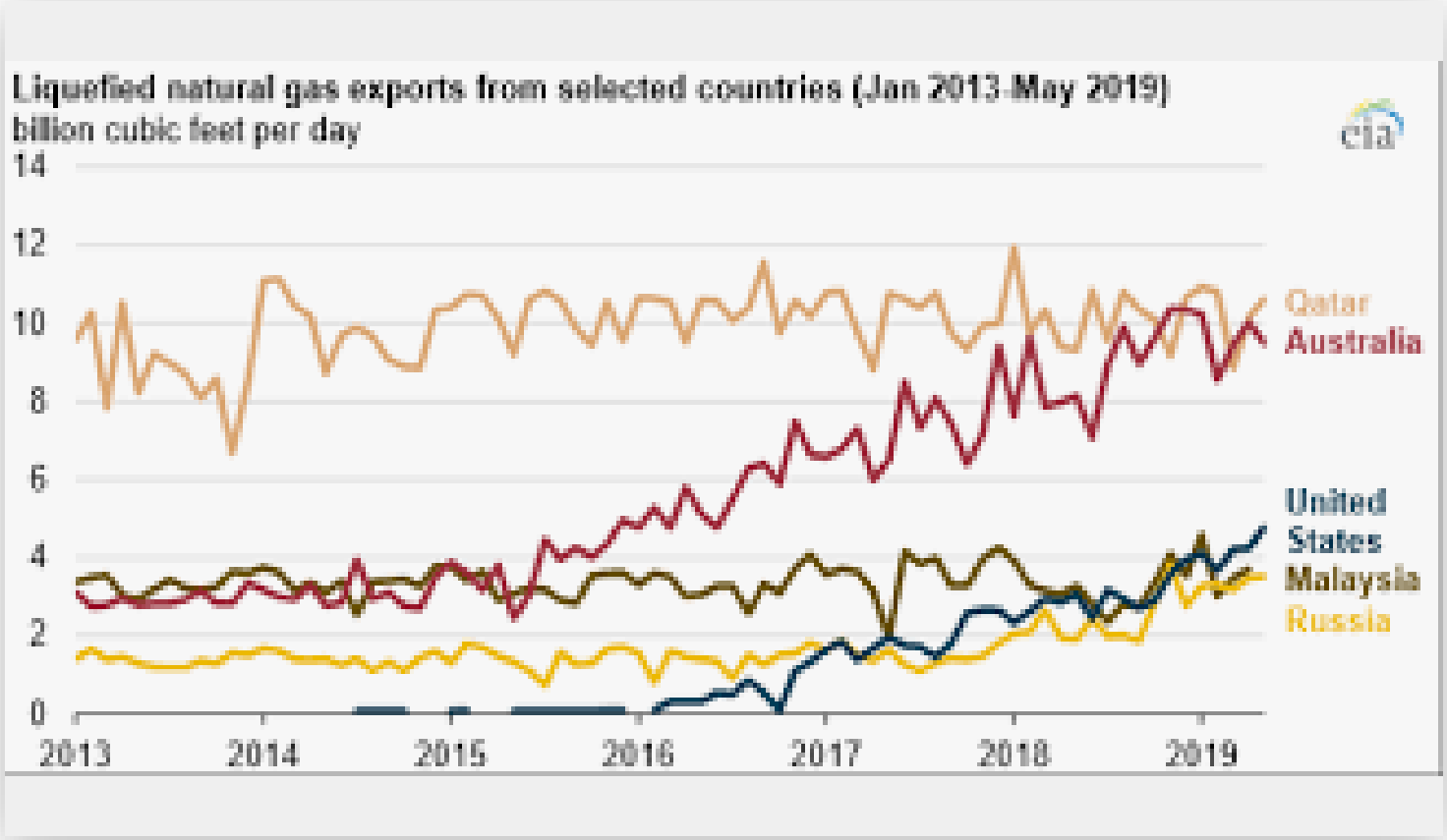
- Next 3 slides review the world's top LNG producers, historic levels of LNG production and prices

Major LNG Exporting Countries in 2019 – Note USA is Now #3 Due to Extensive Fracking of Shales

@2020 statistica.com



Global LNG (Liquified Natural Gas) Exports – *Constantly Increasing*, Especially Australia



Largest LNG Exporter ...

instituteforenergyresearch.org

Global Natural Gas Prices - Note Current Huge Surge in Prices

Henry Hub – USA; TTF – Europe; JMK - Asia

The Transition to Gas

- According to the world-reknown international consultancy of Wood Mackenzie, this year of 2021 is to be the defining year for the gas and Liquified Natural Gas (LNG) industry as *decarbonizing* natural gas will become a strategic priority in the oil industry.
- Shell recently announced they expect global demand for LNG to double by 2040.
- According to A. Sewell, Society of Petroleum Engineers (SPE): "*A rapid pivot to gas is essential. There is no alternative that can provide cleaner energy at the volume required to sustain a growing world population with an increasing per capita energy demand*".

@May, 2020, A. Sewell, SPE Journal of Petroleum Technology

My Recommended Near-Term Strategies for National Oil Companies (NOCs) and International Oil & Gas Companies (IOCs)

- Plan to transition your exploration from oil to gas.
- You need to exercise cost control, modernize and be innovative to stay ahead in this very competitive oil and gas industry.
- You need to leverage your technical capacity to develop renewable energy resources (wind, solar, geothermal) *to transition from being an oil company to an energy company.*

Opportunities for Oil Industry Professional Workers

- We are in 2022, the world must be carbon-zero by 2050. Only 28 years from now. Will **oil** consumption have gone to zero by then? Is this realistic?
- **Oil** will still be needed for plastics, petrochemicals and aviation (airplanes can not fly on solar energy) so the need will remain for petroleum professional workers
- **Gas** as a energy "bridging fuel" will need in the short to medium term professionals to explore for and produce gas

Opportunities for Angola's Oil Industry Professionals in the Energy Transition

1.) **Natural gas** as the energy "bridging fuel" will be greatly in demand worldwide. Angola is still much underexplored for gas. Increased gas exploration will be needed in the deep and shallow water offshore, onshore coastal basins and the totally unexplored onshore basins such as the Permian-age Karoo interior basins.

2.) The world's oil consumption of **oil** will not drop overnight. Oil industry professionals will still be needed to effectively manage Angola's oil resources.

3.) Geoscientists and reservoir engineers will be needed to study possible sites in Angola for **CCUS** - Carbon Capture, Utilization and Storage.

4.) The skill sets of Angola's oil professionals will be needed to discover and develop **geothermal energy projects** in Angola.

- For oil industry professionals, it is not all gloom & doom and the energy transition also creates opportunities.

Obrigado!

I would like to express my sincere gratitude to:

1.) The National Agency of Petroleum, Gas and Biofuels (ANPG) for holding this important first-ever conference.

2.) Thank you to Sra Nancy Pereira, Coordinator and the team members of the Organizing Committee for their efforts to hold a successful conference.

3.) Thanks to an old friend, Gerard Kreeft, Energy Transition Advisor, EnergyWise, Amsterdam, The Netherlands for his good advice on this presentation.

4.) Thank you to Dilo Sa and Charles Thomas, Striped Horse Atlantico for general discussions on the energy transition and on its potential impact Africa-wide and on Angola.