PROFESSIONAL TECHNICAL PAPER
ONLINE PRESENTATION
24 - 25 OCTOBER 2020

Towards Green Energy Companies: Study on the Movement of International Oil Companies to Renewables

Abdurachman Ali Assegaf[1]
[1]Eni Muara Bakau B.V

* Email: abdurachman@eni.com

Abstract. In recent years, numerous International Oil Company (IOC) are reintroducing themselves as an energy company. It can indicate their movement to progressively positioning themselves for the proclaimed energy transition. This paper tries to designate the IOCs movement toward their new shape as an energy company. Results show that The IOCs is now taken a massive approach toward transformation into energy companies as revealed by their movement to diversify their asset, which formerly dominated by oil and gas, to renewables.

Keyword: IOC, Renewables

1 Introduction

The IOC, or sometimes referred to as The Majors, is a wholly private oil and gas company, shares owned by private entities. This term is used to distinguish it from the National Oil Company or NOC, whose shares are partly or wholly owned by the government. The distinction between IOCs and NOCs is not always clear-cut. Over time, some NOCs such as BP, Total S.A., and ENI S.p.A. has been privatized—or substantially privatized—so that they behave in ways that are similar to a company that has always been in the private sector. Furthermore, there are companies such as Equinor (named Statoil Hydro when privatized) and Petrobras that, although partially privatized, still seem to operate in some ways that reflect the interests of their national governments.

In the last decade, several IOCs have changed their upstream portfolios to reintroduce themselves as energy companies. The simplest observation to support the justification could obtain from the official company website. It is rarely hard to find the word "oil" or "gas" mentioned on the cover of the website. Some companies also proudly presented their projects that did not involve oil and gas. Comparing to several years ago, the number of barrels, discovery of oil and gas, and other oil and gas project still proudly mentioned. At that time, renewable energy or their movement on environmental issues only gets a small portion. Nowadays, many IOC's openly present its renewable projects on the cover page of its official website. Many covers now contain the words "green," "reduce CO2," "renewable," and more words that are related to renewables rather than oil and gas.

According to BP 2020 energy outlook, renewables energy consumption (which includes biofuels and all traded renewable electricity apart from hydro) continued to grow strongly, contributing its most significant increase in energy terms (3.2 EJ) on record. It accounted for over 40% of the global growth in primary energy from 2019, which is more significant than any other fuel. As a result, renewables increased its share in the energy mix from 4.5% in 2018 to 5% in 2019.

Table.1 Fuel shares of primary energy and contributions to growth in 2019 (BP Statistical Review of World Energy, 2020)

Energy source	Consumption (exajoules)	Annual change (exajoules)	Share of primary energy	Percentage point change in share from 2018
Oil	193.0	1.6	33.1%	-0.2%
Gas	141.5	2.8	24.2%	0.2%
Coal	157.9	-0.9	27.0%	-0.5%
Renewables*	29.0	3.2	5.0%	0.5%
Hydro	37.6	0.3	6.4%	-0.0%
Nuclear	24.9	0.8	4.3%	0.1%
Total	**583.9**	**7.7**		

*Renewable power (excluding hydro) plus biofuels

If it is divided by energy source, from the total increase 3.2 EJ, the immense contribution was from wind power at 1.4 EJ, followed by solar at 1.2 EJ, Other sources of renewable electricity (such as biomass and geothermal) 0.3 EJ, and biofuel consumption 0.2 EJ.

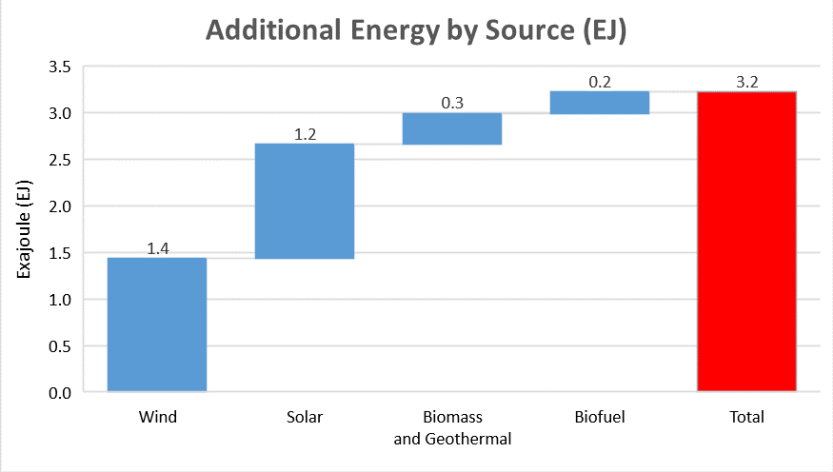

Figure.1 Additional energy by sources in EJ

If it converted to a familiar term in the oil and gas industry, Barrel Oil Equivalent (BOE), the total additional renewables energy consumption is up to 1.4 million BOE (MBOE). From that number, it can be divided to around 0.6 MBOE/day from wind and solar and around 0.1 MBOE/day from biomass, geothermal, and biofuel.

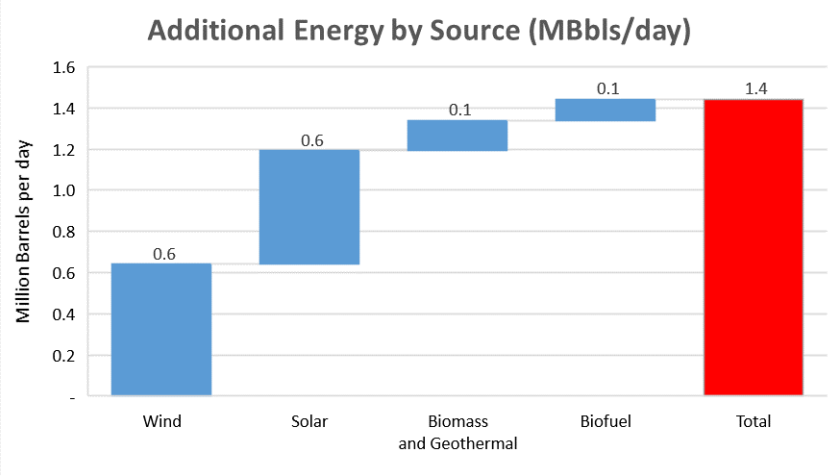

Figure.2 Additional energy by sources in a million barrel

In power generation itself, renewable energy provided the most significant increase of 340 TWh from 2018 to 2019 period. The incremental is followed by natural gas at 220 TWh. The share of renewables in a generation increased from 9.3% to 10.4%, surpassing nuclear generation for the first time. The sharp decline from coal generation by -270 TWh. It caused coal-fired power plants to drop by 1.5% to 36.4%. Nevertheless, in 2019 coal remains the largest source of electricity generation.

For the long run, BP predict renewables will lead transition to a lower carbon energy mix. BP Energy Outlook 2020 provides 3 strategy for its predictions. First is the Business-a-usual Scenario (BAU). It assumes that government policies, technologies and social preferences continue to evolve in a manner and speed seen over the recent past. A continuation of that progress, albeit relatively slow, means carbon emission peak in the mid-2020s. Despite this peaking, little headway is made in terms of reducing carbon emissions in 2050 less than 10% below 2018 levels.

The second scenario is the Rapid Transition Scenario (Rapid). It assumes a series of policy measures, led by a significant increase in carbon prices and supported by more targeted sector specific measures, which cause carbon emissions from energy use to fall by around 70% by 2050. This fall in emissions is in line with scenarios which are consistent with limiting the rise in global temperature by 2100 to well below 2 degrees Celsius above pre industrial levels.

The third is the Net Zero Scenario (Net Zero). It assumes that the policy measures embodied in Rapid are both added to and reinforced by significant shifts in societal behavior and preferences, which further accelerate the reduction in carbon emissions, Global carbon emissions from energy use fall by over 95% by 2050, broadly in line with range of scenarios which are consistent with limiting the temperature rises to 1.5-degrees Celsius.

From the three scenarios, renewable energy increases more than 10 fold in both Rapid and Net zero, with its share in primary energy rising from 5% in 2018 to over 40% by 2050 in Rapid and almost 60% in Net Zero. Although the growth of renewables is less pronounced in BAU, they still account for around 90% of the overall increase in primary energy.

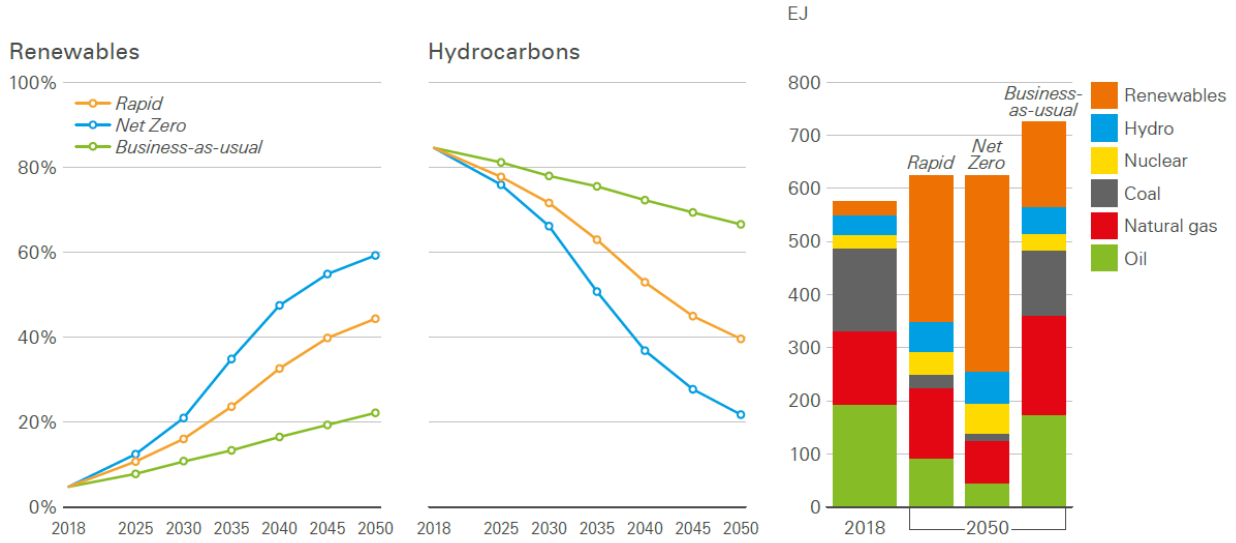

Figure.3 Shares of Primary Energy and Primary Energy Consumption by Source
(BP Energy Outlook, 2020)

The current energy transition in IOCs can roughly be observed to move towards a cleaner, low-carbon system. This movement has implications well beyond power markets and touches on liquids, heating and cooling industrial demands, and transportation.

If it foreshadowed a critical event that may contribute significantly to driving the IOC transformation into an energy company to enhance renewable energy assets, the Paris Agreement is probably the most impactful one. Since it was signed in 2016, the Paris Agreement, which officially became international law on November 4th, 2016, has made renewable energy more attractive. It is because renewable energy is relatively friendly to the environment when compared to oil and gas. It is in line with the primary goal of the Paris agreement, which protects the global response to the threat of climate change by keeping global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and seeking efforts to limit temperature increases further to 1.5 degrees Celsius.

On June 1st, 2017, the US announced that it would cease all participation in the 2015 Paris Agreement on climate change mitigation. Following Article 28 of the Paris Agreement, a country cannot give notice of withdrawal from the agreement before three years of its start date in the relevant country, which was on November 4th, 2016, in the case of the United States. On November 4th, 2019, the administration gave a formal notice of intention to withdraw, which takes 12 months to take effect. It makes the earliest possible effective withdrawal date by the United States cannot be before November 4th, 2020, four years after the agreement came into effect in the United States and one day after the 2020 US presidential election.

2 Methodology

The methodological approach used in this paper is qualitative. The study in this paper does not determine whether the IOC business model is compatible with renewable energy. Instead, it tried to observe the strategies applied by the IOC in the process of transforming into an environmentally friendly energy company. The study, including renewable energy portfolio possession. A paper focuses on its attention to their activities in transforming energy changes. It is required in order to observe how far each studied company transforms. This paper compiled a version of the framework provided by the one developed by Pickl (2019).

The initial hypothesis of this research is that the IOC is transforming from an oil and gas company to an energy company that focuses more on the environment. With this aim, portfolio reform on renewable energy can be said to be the primary strategy that will be implemented by the IOC.

The framework identifies the IOC sample for further review, considering company capacity, reserve size, transparency to collect data, and activities to transform into a company. Seven IOC samples were taken, namely BP, Chevron, Eni, Equinor / Statoil, ExxonMobil, Royal Dutch Shell, Total S.A. Geographically, the seven IOC samples already represent companies representing oil and gas from Europe and the US. Furthermore, a study was carried out for the seven IOCs with the background coverage, strategies developed, investments made, and long-term plans. The net-zero program for each company was also examined to obtain a complete picture.

The matrix system is also developed by scrutinizing several factors that are considered a vivid indication of IOC transformation.

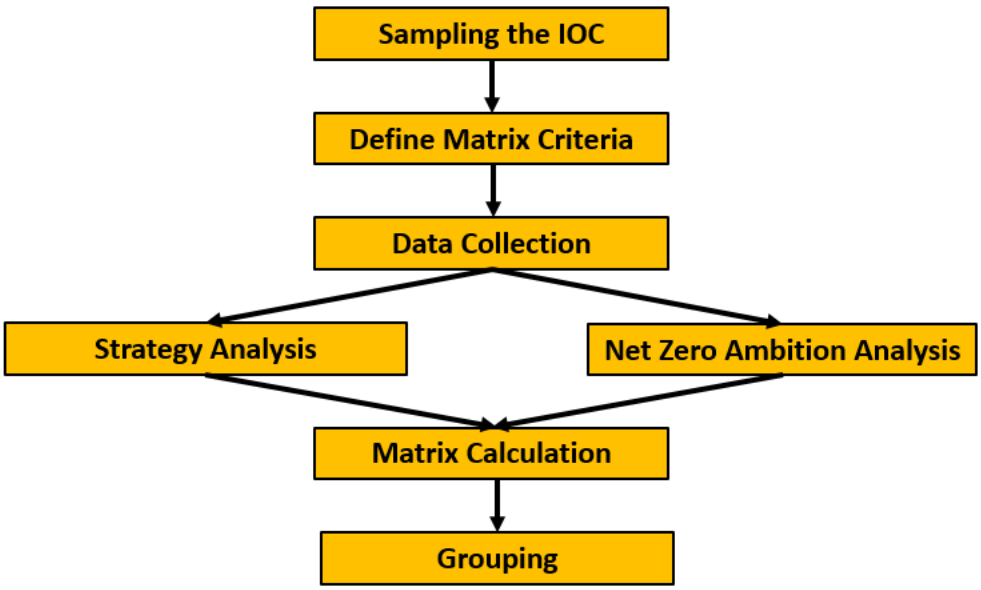

Figure.4 Research Methodology

Afterward, an assessment is made in the form of a percentage to compare the transformations of each IOC. The assessment criteria are shown in Table 2 below.

Table.2 Matrix Criteria

Criteria		Rules	Weight
Strategy	Official Statement / Declaration	Strong statement=1, Medium statement=0.5, Weak statement/Never mentioned=0	10%
	The dedicated energy transformation team	Have a dedicated team=1, No dedicated team=0	20%
	Net-zero ambition	Have Net-zero plan=1, Doesn't have net zero plan=0	10%
Investment	Capital investment into renewables	0-0.1 billion p.a= 0; 0.1-0.5 billion p.a = 0.25; 0.5-1 = 0.5; 1-2 = 0.75; >2 =1	25%
	Renewables Investment %	Refer to % for each company	20%
Portfolio	Hydro	Yes =1, No=0	2.5%
	Solar	Yes =1, No=0	2.5%
	Wind	Yes =1, No=0	2.5%
	Biofuels	Yes =1, No=0	2.5%
	CCS	Yes =1, No=0	2.5%
	Geothermal	Yes =1, No=0	2.5%

The most considerable portion, namely 45%, is given to the capital investment made, including its percentage. The portion is allocated because capital investment is considered as the most significant proof of seriousness to carry out the plans that have been presented. Furthermore, the second largest portion is on the dedicated team. It is because a dedicated team is the main engine that can drive the transformation going well. The official statement and net-zero ambition receive the same portion, namely 10%, because both are in the form of plans, not actions such as capital investment and team building. However, plans are still necessary because they provide direction and targets for the transformation to take place. This type of investment receives a share of 2.5% for each investment made for the company. It is useful to see the extent to which energy diversification has been carried out. The more types, the greater the value obtained.

a. IOC Strategy Analysis

How the oil majors – BP, Chevron, Eni, Equinor/ Statoil, ExxonMobil, Royal Dutch Shell, Total S.A.– have started their journey from big oil towards significant energy be analyzed in this section.

BP is arguably the first IOC to initiate the transformation into an energy company focusing on diversifying towards more environmentally friendly energy sources. It was declared long before other IOCs had a similar strategy. BP started its campaign in 2000. At that time, BP declared its vision to be an energy company that would pay more attention to the environment and becomes the first oil company to commit to significant capital in renewable energy. Back then, despite changing its logo from a seventy years old shield-style logo to a cheerful green and yellow sunburst, BP also used its acronym from "British Petroleum" to "Beyond Petroleum." The chairman at that time also stated that BP had started its transformation into an energy company by mentioning that BP is not an oil company, and 40% of its hydrocarbon production comes from natural gas. BP also conveyed that they realize the world wants

additional carbon-efficient fuels. The statement was quite visionary for the size of the time. It was as if BP had created a new arena of competition with other IOCs, and they become the first to enter that arena.

However, after several years since BP's vision was announced, BP is still far from transforming itself from an oil company to an environmentally conscious energy company. In 2008, Eight years after BP's vision was announced, BP move to Canada's highly polluted tar sands. After that, in 2011, BP sold its solar energy business. In that same year, BP quietly announced that it was releasing its wind power assets, part of what the company calls "BP's continuing efforts to become a more focused oil and gas company." It also repositions the sustainable company. Future growth in 2014, BP has dumped much of its wind energy, abandoned its investment plans ten years earlier, and announced that the only significant alternative energy investment at biofuels, which has its severe problems.

It is rather difficult to monitor the BP movement towards energy companies after the Deepwater Horizon disaster occurred in 2010. The disaster effects may cause a deviation in BP's long term strategy, as stated in the 2000 mission. It could be comprehended that overcoming disasters was BP's top priority at that time**.**

In 2017, BP revived its plans to become an environmentally conscious energy company as dreamed of seventeen years earlier by buying a US $ 200 million stakes in the European solar power company Lightsource. The oil giant exclaimed it was eager to return to solar. Still, the purchase only represented 1% of BP's 2017 capital expenditure of US $ 16 billion, with the remaining 99% going to be very much used for oil and gas. Continues In 2018, BP made three investments to prepare for a low carbon future. First, the company invested the US $ 20 million into StoreDot, Israel's fast-charging battery developer. Second, BP is investing US $ 5 million in FreeWire, a US company developing a fast-charging infrastructure for electric vehicles. Third, BP bought Chargemaster, the leading points filling network in the UK, for more than US$ 160 million to combine around 6500 points charging Chargemaster network with around 1200 gas stations and hedging technology that could challenge the dominance of oil as a transportation fuel.

BP assets in renewables are including offshore wind with a capacity of 470 MW (Flat-Ridge 2), solar with a capacity of 70 MW in Ireland (Country Meath). BP also owned and operated ethanol mills, farming around 127,000 hectares, producing over 700 million liters per year of ethanol equivalent. Since 2006, BP has invested about $3 billion in biofuels research, development, and operations. BP has Carbon Capture Storage (CCS) project in Algeria (In Salah project). Salah is one of the largest and first full-scale carbon dioxide capture and storage schemes in the world. It turns around over 1 million tonnes of CO2, re-injecting it into large underground aquifers in the In Salah reservoirs each year, at depths of 1,800 meters. Between 2004 and 2012, almost 4 million tonnes of CO2 were re-injected. Nevertheless, the project was suspended in 2012.

BP’s strategy in low carbon energy has, over recent years, been relatively measured, centered around the screening of new technologies, partnerships, and opportunities. The company has been investing around US$500 million per year in low carbon activities (around 3% of pre-slump group capital investment of US$15 billion -US$17 billion).

Chevron mentioned they committed to improving energy efficiency, reducing combustion and ventilation systems, and repairing methane leaks. Chevron is also driving two of the world's largest

carbon dioxide injection projects, the Quest CCS project in the Canadian oil sands and the Gorgon Project in Australia. In 2014, Chevron sold the Renewable Power Group; Its geothermal assets in Asia followed in 2017. However, Chevron is committed to understanding and jeopardizing the economies of renewable energy investments, including solar, advanced biofuels, and energy efficiency technologies. The initial investment was made in electric charging companies and "direct CO2" capture specialists in 2018 and 2019.

Currently, the company has a relatively small renewable energy portfolio consisting mostly of legacy wind and solar power projects in America.

Chevron launched the Future Energy Fund, with an initial commitment of $ 100 million to develop breakthrough technologies that enable the transfer of sustainable energy to a broader variety of sources to reduce carbon emissions while providing reliable, affordable, cleaner energy. With capital expenditure is expected to range between US$19 - 22 billion over the period 2021 to 2023, Chevron expenditure in renewables is around 0.5% of its total capital expenditure. In general, Chevron's total interactions with renewables are relatively low, and no targets, visions, or roadmaps for renewables have been communicated.

Chevron assets in renewables, including a joint venture in solar, all in the USA, onshore winds with capacity 16.5 MW, geothermal, and CCS project in Canada, namely Quest Project. This project is designed to capture and safely store more than a million metric tons of carbon dioxide each year. Commercial operations at the Quest CCS project began in November 2015.

Eni, the Italian multinational Oil and Gas Company, has delivered a concrete vision for investing in long-term renewable energy activities and ensuring the ability of companies to adapt to a low-carbon future. Eni's seriousness in transforming into an environmentally friendly energy company is clearly stated in the first three sentences of their introduction, namely (1) we are an energy company, (2) we concretely support an equitable energy transition, and (3) to preserve our energy planet.

Eni's commitment to tackling climate change is shown by the achievement of all commitment targets in 2019, namely (1) -27% Greenhouse Gas (GHG) emission intensity index (upstream) vs. 2014, (2) -29% volume of hydrocarbons sent for the flaring process vs. 2014, and (3) -81% methane emissions upstream vs. 2014.

Regarding the focus on decarbonization and renewable energy, Eni has conveyed that the primary medium / long term strategic guidelines have the following objectives (1) progressive expansion of global installed capacity to more than 55 GW by 2050, (2) expansion to new areas based on where we have an existing or targeted customer base to maximize the value of the integrated model and (3) further development in areas where Eni already operates.

In line with the medium and long term strategy, the 2020-2023 Action Plan provides for 3GW installed capacity by 2023 and 5GW by 2025 with € 2.6 billion over the plan period. It is equal to US$ 3 billion or around US$ 600 million per year. Eni plans to spend 5% of its 2019 budget toward its Decarbonisation, Circular & Renewables' business unit, which will subsequently increase to an average 9% over the 2019 to 2022 timeframe.

Eni introduced a new business unit to ensure a low emission future in 2015. The unit's head reports directly to the CEO. It is responsible for developing the company's renewable energy business and overseeing the creation and management of energy plants and sales worldwide. In late 2017, Eni signed

MoUs in Algeria and Angola to evaluate renewable energy opportunities, particularly in PV. Besides, Eni has also signed an MoU with the United Nations Development Program (UNDP) to improve access to sustainable energy in Africa. Eni is also developing biofuels, especially those obtained from urban waste. Eni's CEO mentioned in an interview with La Repubblica newspaper in 2019 that Eni's history and profile are related to hydrocarbons, but Eni has come a long way. In 2014, Eni produced 65 million tonnes of CO_2 with oil and gas; in 2019, Eni reduced it to 38 million.

Eni assets in renewables including solar with capacity around 50 MW in Egypt, winds in Kazakhstan with a capacity around 48 MW, biofuels in Venice Green Refinery, a world's first conversion of a traditional refinery to a bio-refinery producing green diesel, green naphtha, LPG and potentially also jet fuel. The second phase of development is underway, which will increase the capacity to 0.56 Mt/yr, and CCS.

Statoil, one of the largest oil companies in Europe from Norway, had made a breakthrough by released "oil" from its name in 2018. After that, Statoil reintroduced themselves as **Equinor**, an Energy company – as they mentioned on their website. Changing the name is a prerequisite for Statoil to be unrestrained from the branding of oil companies. In the corporate structure, Equinor has established a business unit that reflects the company's long term goal to complement its oil and gas portfolio with sufficient renewable energy and other low-carbon energy solutions, namely NES or New Energy Solutions. The main aim of this business unit is to combining Equinor's oil and gas competence, project delivery capacities, and the ability to integrate technological solutions.

Equinor assets in renewables can be categorized into production and potential developments. The assets in production among are The Sheringham Shoal offshore wind farm, located in the UK, has been operation since September 2012 with annual production approximately 1.1 TWh. The other is The Dudgeon offshore wind farm, located in the UK, operating since November 2017 with an annual production of approximately 1.7 TWh. While the potential development assets are The Dodger Bank wind farms located in the UK are three proposed 1200 MW offshore wind farms. The wind farm will be the world,s most significant offshore wind farm development with a total installed capacity of 3600 MW and Guanizul 2A solar project, located in Argentina. The plant is expected to be in operation in the first half of 2020 and will have an installed capacity of 117 MW. Equinor upgraded its targets in renewables and carbon in 2020. The company now aims to invest US$2-3 billion a year (gross before project financing) in renewables by 2022/23. It advances a previous ambition to invest 15-20% of its capital budget in renewables by 2030. The renewables strategy is focused on offshore wind, including floating wind power. Among oil majors, Equinor will lead the way in renewable investments

ExxonMobil seems still in its heyday as one of the biggest oil companies in the world. On its official website, ExxonMobil introduced itself as "the largest publicly traded international oil and gas companies in the world." They presented the discovery of 8 million barrels of oil in Guyana as the main story on its official website. Refer to Pickl (2019), ExxonMobil's involvement in green energy is generally low and somewhat limited to legacy projects without vision, investment plans, budgets, or ambitions for future renewable energy activities. ExxonMobil's strategy is developing new technologies to reduce greenhouse gas emissions, advancing biofuels, and CCS technologies.

ExxonMobil does not make any investment in existing renewable energy sources like wind. The company explained although they aware wind and solar will play an essential role in the transition to

lower-carbon energy sources, ExxonMobil conveys that new energy breakthroughs will be required to reduce emissions to levels outlined in 1.5^{o}C and 2^{o}C scenarios. ExxonMobil also mentioned they focused on areas where it can make a unique and significant contribution, and where it has deep scientific competencies.

In transforming into an environmentally sound energy company, ExxonMobil is involved in taking less drastic steps. The company pledges to reduce 15 percent of methane emissions - another potent greenhouse gas - between 2016 and 2020, and stop 25 percent in natural gas combustion systems.

Although it appears to be on the right track to achieving this goal, Exxon's total annual greenhouse gas emissions have remained stable at around 124 million tonnes on a CO2-equivalent basis between 2009 and 2018, according to company data.

ExxonMobil holds a working interest in roughly one-third of the world on stream CCS capacity. In 2015, ExxonMobil captured 6.9 million metric tons of carbon dioxide for sequestration. It is also involved in CO2 injection projects in the North Sea. ExxonMobil to pursue the development of carbon capture, fuel cell technology that could substantially reduce costs with Fuel Cell Energy by Announced an agreement.

ExxonMobil assets in renewables, including solar in the USA, namely Sage Draw Wind and Permian Solar projects, and biofuels. It also holds a CCS project in the USA, namely the LaBarge project. ExxonMobil holds a working interest in roughly one-third of the world's CCS capacity. In 2015, it captured 6.9 million metric tons of carbon dioxide for sequestration.

Royal Dutch Shell (Shell) 'New Energies' division was announced in May 2016, bringing together some of Shell's existing lower carbon and renewables interests (such as hydrogen, EV charging, biofuels, renewable power), and backing a renewed push into wind. Shell mentioned that the division would focus on long-term "energy transition themes." Shell told investors in 2017 it would spend between US$ 1 billion to US$2 billion a year developing a clean energy business up to the end of 2020, up from a previous plan to spend up to $1 billion a year in the same period. Under the plans, Shell would spend up to US$ 6 billion on green investment, but instead, it is on track to meet a third of this, with only a year left for the company to meet its guidance. The current phase of investment in Power – ramping to US$2-3 billion pa from 2021 to 2025. With Annual cash Capex will average approximately US$30 billion from 2021 to 2025, with a ceiling of US$32 billion in any one year, total Shell spending in renewables is around 8% from its total capital investment.

Shell assets in renewables, including solar and onshore wind (USANedPower Mount Storm with capacity 264 MW), offshore wind in the Netherlands, namely NordZee Wind with capacity 108 MW, biofuels in Brazil, namely Reizen, which are the world's largest producer of ethanol from Sugar Cane. Production, distribution, and marketing. Massive company. Raizen produces more than 2 billion liters of ethanol, 4 million tons of sugar and sells 2.2m MWh of electricity annually, and CCS in the Gorgon Field. The Gorgon field has a high carbon dioxide content, which will be disposed of via the largest CO2 sequestration project in the world.

Total S.A, The Other Majors from France, has just entered the Spanish solar power market through two agreements with Powers and Solarbay Renewable Energy and is developing nearly 2 GW of solar projects. In the same month, Total S.A. also expanded its partnership with Adani Group, the most significant private energy and infrastructure conglomerate in India, to contribute to the growth of solar

power plants in India. These two decisions align with Total's main strategic priorities to prepare for a low carbon future. They mentioned that although the oil and gas business is still, and will be the core of the future, the focus has shifted towards 'sustainability.' In parallel, the company is also investing in new energy throughout the electricity value chain. Changes in the global energy market, intensification of carbon policies, and investor pressure have pushed Total S.A. to adopt ambitious long-term targets in low-carbon energy. The company's strategic mission is to grow a profitable electricity business, with around 20% of total assets in renewable energy by 2035. Total S.A. has guided investments of US $ 1-2 billion in new energy per year. So far, the company has invested 3.7 billion US dollars in the acquisition of clean technology throughout the electricity value chain. However, a significant increase in investment is still needed to achieve its goals by 2035.

Total S.A. plans to invest around US$ 1.5 to 2 billion per year in low carbon electricity. With an investment of around US$ 14 billion per year, Total S.A. is spending around 13% of its expenditure on renewables.

Total S.A. assets in renewables including hydro in Italy and Greece, solar and winds (which spread in France, Italy, Oman, and several other countries). Total S.A. asset in biofuels t(he La Mede project) in France, Total's first biorefinery in France - used oils and vegetable oils are processed to make biofuels. The CCS pilot was located in the Lacq basin approximately 800 kilometers from Paris. The last injection of CO2 took place on March 15th, 2013. More than 51,000 tonnes of CO2 were injected during those 39 months. The Lacq pilot is part of the broader Total S.A. CCS technological roadmap. CCS is a valuable contributor to greenhouse gas (GHG) emissions reduction, and the Lacq pilot demonstration project contributes to the deployment of CCS technology by 2030.

The summary of IOC strategies is provided in the table below:

Table.3 IOC Strategy Summary

IOC	Strategy	Investment in Renewables	Portfolio
BP	○ BP has a history of renewables. The company was an early mover. However, it seems too early. (Investing US$8 to 10 billion to go "beyond petroleum" in the 2000s. around US$8 billion of that initial investment was subsequently written off.) ○ Strengthen its vision start in 2017. ○ Create a dedicated energy transformation team.	Around US$ 500 million per year (3% from Total Capital Expenditure)	Solar, Wind, Biofuels, and CCS
Chevron	○ Chevron has stepped up. It is messaging around the actions it is taking to tackle climate change-related risks. ○ Recent seed investments in electric vehicle charging and direct carbon capture companies perhaps signal the start of greater engagement in the low-carbon sector.	Create future energy funds with an initial commitment of US$ 100 million. (0.5% from Total Capital Expenditure)	Solar, Wind, CCS, and Geothermal

	○ Chevron is also well positioned in Carbon Capture and Storage (CCS).		
Eni	○ Create a dedicated energy—transformation team. ○ The progressive expansion of global. It has installed capacity to more than 55 GW by 2050. ○ Eni's new-energy model will also be integrated, building on synergies with existing oil and gas assets and activities. ○ Solar and wind power will replace fuel gas, reducing energy costs and making more molecules available for sale. ○ Support the decarbonization effort.	Around US$ 600 million per year. (9% from Total Capital Expenditure)	Solar, Wind, Biofuels, and CCS
Equinor	○ Define itself as an energy company (Obviously by changing its name). ○ Create a dedicated energy—transformation team (NES).	Around US$ 2 billion per year (15% from Total Capital Expenditure)	Solar, Wind, and CCS
ExxonMobil	○ Considered new energy breakthroughs will be required to reduce emissions. ○ 15% reduction in methane emissions by 2020, a 25% reduction in flaring by 2020, 10% greenhouse gas emissions intensity reduction at Imperial-operated oil sands projects by 2023	Not mentioned	Solar, Biofuels, and CCS
Shell	○ Create a dedicated energy—transformation team (New Energies Division). ○ Bringing together existing lower carbon and renewables interest and backing renewed push into wind.	Around US$ 1-2 billion per year (8% from Total Capital Expenditure)	Solar, Wind, Biofuels, and CCS
Total S.A.	○ Create a dedicated energy—transformation team (New Energies Division). ○ Strengthen its solar portfolio	Around US$ 500 million per year (13% from Total Capital Expenditure)	Hydro, Solar, Wind, Biofuels, and CCS

b. Net Zero Ambition Analysis

Net-zero means that any emissions are balanced by absorbing an equivalent amount from the atmosphere. The Paris Agreement commits to making the net-zero transition, and long-term strategic planning shows that many of the decisions and actions needed to get back on track must be taken imminently. To meet the 1.5°C global warming target, as stated in the Paris Agreement, global carbon emissions should reach net-zero around mid-century. For developed nations, the date may need to be earlier.

Many countries have already set targets, or committed to do so, for reaching net-zero emissions on timescales compatible with the Paris Agreement temperature goals. They include the UK, Germany, France, Spain, Norway, Denmark, Switzerland, Portugal, New Zealand, Chile, Costa Rica (2050), Sweden (2045), Iceland, Austria (2040), and Finland (2035). A more precise image for net zero-emission

can be taken from the Himalayan Kingdom of Bhutan, and Suriname, the most forested country on earth, is already carbon-negative. It means they absorb more CO2 than they emit. The European Union recently agreed to enshrine its political commitment to be climate neutral by 2050 in its European Climate Law.

In line with the net-zero ambition, BP has launched the campaign in February 2020. BP's ambition is to become a net-zero company by 2050 or sooner. It means they must handle around 415 million tons of emissions and 360 million tons of carbon content in BP's upstream oil and gas production. With this campaign, BP mentioned it is an effort to positioning itself for a low carbon future. BP's strategy is centered on filtering new technologies, partnerships, and new opportunities. In early August 2020, BP introduces a new strategy that they mentioned "will reshape its business as it pivots from being an international oil company focused on producing resources to an integrated energy company focused on delivering solutions for customers." BP movement is like representing what is going on beneath the industry.

Within ten years, BP aims to have increased its annual low carbon investment to around $5 billion a year, building out an integrated portfolio of low carbon technologies, including renewables, bioenergy, and early positions in hydrogen and CCS. BP aims to have developed around 50GW of net renewable generating capacity by 2030. Over the same period, BP's oil and gas production is expected to reduce by at least one million BOE a day, or 40%, from 2019 levels. Its remaining hydrocarbon portfolio is expected to be more cost and carbon resilient.

Eni has defined strategies and operational targets concerning achieve the net-zero ambitions for 2035 and 2050. Eni presented the Long-Term Business Plan in February 2020. The strategies outline the evolutionary and integrated path of the individual businesses, including obtaining an 80% reduction in net emissions from the entire life cycle of sold energy products by 2050. It includes over the 70% threshold indicated by the International Energy Agency (IEA) in the Sustainable Development Scenario (SDS). It is compatible with the objectives of the Paris Agreement and 55% of the emission intensity. Besides, Eni has confirmed and further extended the intermediate decarbonization targets: net-zero carbon footprint for 2030 from upstream activities and net-zero carbon footprint for all Group activities by 2040.

In February 2020, Equinor launches a new climate roadmap to ensure a competitive and resilient business model in the energy transition, fit for long term value creation and in line with the Paris Agreement. The aim is to reduce the net carbon intensity, from initial production to final consumption, of energy produced by at least 50% by 2050, growing renewable energy capacity tenfold by 2026, developing as a global offshore wind major, and strengthen its industry-leading position on carbon-efficient production. Equinor is aiming to reach carbon neutral global operations by 2030.

Shell announced its plans to become a net-zero carbon company in April 2020. Shell mentioned it would work with its customers, such as major airlines, to share the burden of offsetting any carbon emitted from fossil fuels that may still be present. Shell plans to offset its emissions with as much carbon as its business operations generate through new carbon capture technologies or natural solutions such as planting trees. Shell said that they have plans in three ways to achieve their ambition. First, by striving to achieve net-zero for all emissions from the manufacture of all our products by 2050. The second is to reduce the Net Carbon Footprint of energy products. Its long-term ambition is to reduce the Net Carbon

Footprint of energy products sold by Shell by 65% by 2050. Shell's provisional and medium-term ambition is to reduce it by 30% by 2035.

In May 2020, Total announced its ambition to achieve net-zero emissions by 2050. The company stated that it would collaborate with the community and its customers for all energy production in its global business around the world. The steps to achieve Net Zero are (1) Net Zero across Total operations worldwide in 2050 or sooner; then followed by (2) Net Zero in all production and energy products used by its European customers by 2050 or sooner, and (3) 60% or more reduction in the average carbon intensity of energy products used worldwide by Total customers by 2050. The target for the medium term is 15% by 2030 and 35% by 2040. Total also mentioned they would continue to grow the business to become a leading international player in renewable energy. Total also stated in a joint statement with investors that they are currently allocating more than 10% of its Capex to low-carbon electricity. As well as total flows will contribute to the energy transition, Total will increase its Capex allocation for low electricity to 20% by 2030 or sooner.

ExxonMobil has yet to make any material move into zero-carbon energy. The Supermajor is targeting Research and Development to prove up new technology solutions to reduce emissions. The strategy includes striking research partnerships with niche players and universities.

The summary of Net Zero ambitions for each IOC is provided in the table below:

Table.4 IOC Net Zero Ambitions Summary

IOC	Released	Medium-Term Target	Long Term target
BP	Feb 2020	In 2030, BP aims to : ○ have increased its annual low carbon investment to around $5 billion a year ○ Building out an integrated portfolio of low carbon technologies, including renewables, bioenergy, and early positions in hydrogen and CCS. ○ It was developed around 50GW of net renewable generating capacity. ○ Reduce by at least 40% of its oil and gas production.	Become a net-zero company by 2050 or sooner
Chevron	No Net Zero Ambition		
Eni	February 2020	○ Net-zero carbon footprint for 2030 from upstream activities ○ Net-zero carbon footprint for all Group activities by 2040.	Obtaining an 80% reduction in net emissions from the entire life cycle of sold energy products by 2050
Equinor	February 2020	Plan to Reach carbon-neutral global operations by 2030	Reduce the net carbon intensity, from initial production to final consumption, of energy produced by at least 50% by 2050
ExxonMobil	No Net Zero Ambition		
Shell	April 2020	Reduce 30% by 2035	○ Striving to achieve net-zero for all emissions from the manufacture of all our products by 2050. ○ Reduce the Net Carbon Footprint of energy products ○ Reduce the Net Carbon Footprint of energy

			products sold by Shell by 65% by 2050
Total S.A.	May 2020	Reduce 15% by 2030 and 35% by 2040	○ Net Zero across Total S.A. operations worldwide in 2050 or sooner. ○ Net Zero in all production and energy products used by its European customers by 2050 or sooner. ○ 60% or more reduction in the average carbon intensity of energy products used worldwide by Total S.A. customers by 2050.

C. Matrix Calculation

From the data above, a system of quantification is made to provide a value for the actions taken by each IOC.

The assessment was carried out to obtain the results of the assessment in the form of a percentage for each IOC. It should be noted here that the percentage quantity is used to compare one IOC with another, not as a scale indicating that the transformation is successful if it reaches 100% and fails if it does not reach a particular value. Refer to Table below for the scoring result.

Table.5 Matrix Calculation

Criteria	Weight	BP		Chevron		Eni		Equinor		ExxonMobil		Shell		Total S.A.	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight	Score	Weight	Score	Weight	Score	Weight
Official statement to become the Energi company	10%	1	10%	0.5	5%	1	10%	1	10%	0.5	5%	1	10%	1	10%
Dedicated energy transformation team	20%	1	20%	0	0%	1	20%	1	20%	0	0%	1	20%	1	20%
Net zero ambition	10%	1	10%	0	0%	1	10%	1	10%	0	0%	1	10%	1	10%
Capital investment into renewables	25%	0.5	13%	0	0%	0.5	13%	1	25%	0	0%	0.75	19%	0.75	19%
Renewables Investment %	20%	0.03	1%	0.005	0%	0.09	2%	0.15	3%	0	0%	0.08	2%	0.13	3%
Hydro	2.50%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Solar	2.50%	1	3%	1	3%	1	3%	1	3%	1	3%	1	3%	1	3%
Wind	2.50%	1	3%	1	3%	1	3%	1	3%	0	0%	1	3%	1	3%
Biofuels	2.50%	1	3%	0	0%	1	3%	0	0%	1	3%	1	3%	1	3%
CCS	2.50%	1	3%	1	3%	1	3%	1	3%	1	3%	1	3%	1	3%
Geothermal	2.50%	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%
SCORE	100%		63%		15%		64%		76%		13%		70%		74%

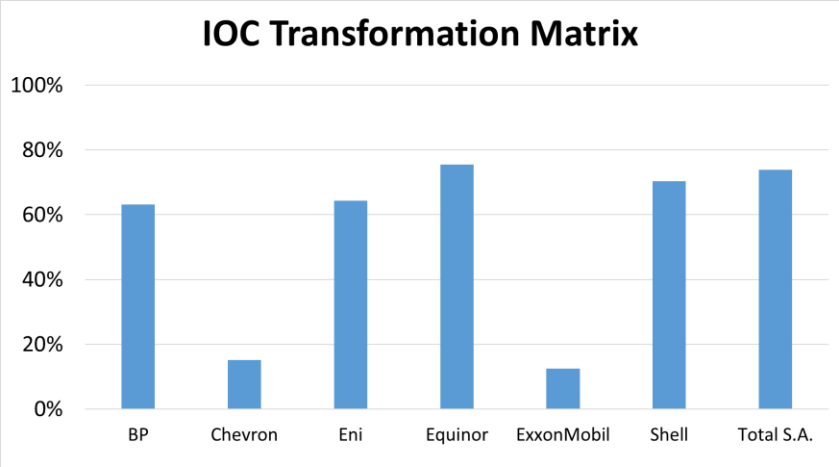

Figure.5 Additional energy by sources in a million barrel

Results and Discussion

It can be seen that renewable energy already plays a significant role and continues to increase in the world's energy mix. From table.1, it can be seen that the increase in renewable energy, which amounted to 3.2 EJ, was twice the increase in oil, which was only around 1.6 EJ. Although if compared from the consumption side, renewables are still far below oil and gas. Besides, if a comparison is made between oil and renewables, renewables consumption increases around equivalent are 1.4 million barrels per day. In comparison, oil consumption is increased by 0.9 million barrels per day from 2018 to 2019.

It can be said that the net-zero plans will start to show results in 2030 and 2050. The net-zero plans itself will play a vital role in the future energy mix.

All the IOCs studied already have investments in renewables. Solar is owned by all the IOCs in the study, followed by wind. It shows that the official statements delivered by each IOC are not just jargon, but are realized by making real investments outside of oil and gas. All companies also own CCS technology. It shows that even though Chevron and ExxonMobil do not have zero plans like their European counterparts, they still have and carry out their commitment to reducing GHG by investing in CCS.

The matrix assessment of the renewable energy strategy of the company resulted in the categorization into two groups. The first group with a score above 50%, such as Equinor, Shell, Total, BP, and Eni - all from Europe - can be said to have made drastic steps to transition from oil companies to energy companies. In comparison, the second group with scores below 50% are Chevron and ExxonMobil seems to be still focusing its activities on oil and gas. However, it cannot be denied that the two IOCs from the US have started to transition to become energy companies. Based on observations, the steps taken have not been as radical as those taken by the European IOCs.

Since many companies have just begun the process of reintroducing themselves with new faces as an environmentally friendly energy company in the middle of the decade, it still cannot assess how profound the transformations are. It still required further observations in the future, especially in the years 2030 and 2050.

Conclusion and further research

It can be concluded that Renewables, especially wind and solar, are increasing importance in the energy industry. Therefore, oil majors are progressively positioning themselves for the proclaimed energy transition. From the analysis, it can be seen that most of the IOCs have already started their transformation into energy companies. It can be seen from official announcements, team formation, and real investment in energy sources other than oil and gas, and asset diversification.

BP, Eni, Equinor, Shell, and Total S.A. appear to have firm net-zero plans compare to Chevron and ExxonMobil. However, they have their plans for environmental sustainability related to climate change, do not appear to have a net-zero plan. Since the Net Zero plan is part of the Paris Agreement, It can be related to the withdrawal of the US from the Paris Agreement may have an impact. It could be the weak pressure from the US government on its IOC compared to the IOC from Europe, where the countries of origin of each IOC are still committed to the Paris Agreement. If it is observed further at the plans of each company.

The evaluation results over and done with scoring methodology result categorize into two groups: Group for IOC that has embarked on their transition from oil companies to energy companies and for IOC that remains relatively pure hydrocarbon focused companies. Further conclusions can draw if we observe the IOC origin. The first group is consists of IOC from Europe, while the second group consists of IOC from the US. Further research needs to be conducted to observe the relation between IOC strategies in renewables with the Paris Agreement and the US decision to withdraw from its agreement.

Units

1 barrel of oil equivalent (BOE)	= 5.8 million Btu
1 British thermal unit (Btu)	= 1.055 kJ
1 kilojoule (kJ)	= 1,000 joules
	= 0.948 Btu
1 exajoule (EJ)	= 1 quintilion joules (1 x 10^{18})
	= 948 trillion Btu
	= 278 TWh
1 kilowatt-hour (kWh)	= 860 kcal
	= 3600kJ
	= 3412 Btu
1 Terawatt-hour (TWh)	= 1,000,000,000 KWH
1 Megawatt-hour (MWh)	= 1000 KWH

References

[1] BP, BP Statistical Review of World Energy 2020. BP (2020) June 2020.
[2] BP, BP Energy Outlook 2020. BP (2020) September 2020.
[3] EIA, The Oil and Gas Industry in Energy Transitions. IEA, (2020)

[4] MJ Pickl, The Renewable Energy Strategies of Oil Majors – From Oil to Energy, Energy Strategy Reviews 26 (2019) 100370.
[5] M. Zhong, MD Bazilian, Contours of the energy transition: investment by international oil and gas companies in renewable energy, Electr. J. 31 (2018) 82–91.
[6] From International Oil Company to Integrated Energy Company BP Sets Out Strategy for Decade of Delivery Towards Net Zero Ambition, bp.com, 4 August 2020, 7 August 2020, available from https://www.bp.com/en/global/corporate/news-and-insights/press-releases/from-international-oil-company-to-integrated-energy-company-bp-sets-out-strategy-for-decade-of-delivery-towards-net-zero-ambition.html.
[7] One of Europe's biggest oil companies is taking 'oil' out of its name , cnn.com, 15 March 2018, 1 August 2020, available from https://money.cnn.com/2018/03/15/news/statoil-equinor-oil-norway-name-change/index.html
[8] Chevron 2019 Annual report, chevron.com, available from https://www.chevron.com/-/media/chevron/annual-report/2019/documents/2019-Annual-Report.pdf
[9] Spain: Total to Enter Into The Solar Market with a Pipeline of 2 GW of the Project, total.com, 11 February 2020, 8 August 2020, available from https://www.total.com/en/media/news/press-releases/spain-total-enter-solar-market-pipeline-2-gw-projects
[10] Total Expands Its Strategic Partnership with Adani to Supply and Market Natural Gas in India, total.com, 14 October 2019, 8 July 2020, available from https://www.total.com/en/media/news/press-releases/total-expands-its-strategic-partnership-adani-supply-and-market-natural-gas-india.
[11] Eni Renewable Energy, available from https://www.eni.com/en-IT/operations/renewable-energy.html
[12] BP rebrands on a global scale, theguardian.com, 25 July 2000, 7 July 2020, available from https://www.theguardian.com/business/2000/jul/25/bp.
[13] How BP Never Went Beyond Petroleum, behindthelogos.org, https://www.behindthelogos.org/how-bp-never-went-beyond-petroleum/
[14] 'Beyond Petroleum' No More? BP Goes Back to Basics, 22 April 2013, 7 July 2020, available from https://www.cnbc.com/id/100647034 'Beyond Petroleum' No More? BP Goes Back to Basics
[15] https://www.bp.com/en/global/corporate/who-we-are/reimagining-energy.html
[16] On the U.S. Withdrawal from the Paris Agreement, 4 November 2019, 7 Kuly 2020, available from https://www.state.gov/on-the-u-s-withdrawal-from-the-paris-agreement/
[17] Shell unveils plans to become net-zero carbon company by 2050, 16 April 2020, 7 July 2020, available from https://www.theguardian.com/business/2020/apr/16/shell-unveils-plans-to-become-net-zero-carbon-company-by-2050
[18] Shells Ambition to be A Net-Zero Emissions Energy Business, available from https://www.shell.com/energy-and-innovation/the-energy-future/shells-ambition-to-be-a-net-zero-emissions-energy-business.html
[19] Equinor sets ambition to reduce net carbon intensity by at least 50% by 2050, 6 February 2020, 7 July 2020, available from https://www.equinor.com/en/news/2020-02-06-climate-roadmap.html

[20] Net zero: why is it necessary?, available from https://eciu.net/analysis/briefings/net-zero/net-zero-why
[21] ExxonMobil 2020 Energy and Carbon Summary, available from https://corporate.exxonmobil.com/-/media/Global/Files/energy-and-carbon-summary/Energy-and-carbon-summary.pdf
[22] ExxonMobil dismisses carbon targets as a 'beauty' match, available from https://www.ft.com/content/6b785d00-5f23-11ea-b0ab-339c2307bcd4
[23] Paris Climate Agreement Becomes International Law, 4 November 2016, 7 July 2020, available from http://web.archive.org/web/20161104205748/https://abcnews.go.com/US/wireStory/paris-climate-agreement-international-law-43293508
[24] Chapter XXVII Paris Agreement , available from https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en
[25] What is the Paris Agreement?, available from https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement
[26] Royal Dutch Shell may fail to reach green energy targets, 3 January 2020, 7 July 2020, https://www.theguardian.com/business/2020/jan/03/royal-dutch-shell-may-fail-to-reach-green-energy-targets
[27] Rystad oil industry analysis shows only Norway's Equinor is backing up renewable talk with real dollars, 2 June 2020, 7 July 2020, available from https://ieefa.org/rystad-oil-industry-analysis-shows-only-norways-equinor-is-backing-up-renewable-talk-with-real-dollars/
[28] Why invest in Total, available from https://www.total.com/investors/why-invest-in-total
[29] BP Sets Ambition for Net Zero by 2050, Fundamentally Changing Organization to Deliver, 12 February 2020, 7 July 2020, available from https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/12-feb-2020/bp-sets-ambition-for-net-zero-by-2050-fundamentally-changing-organisation-to-deliver.pdf