

The renewable energy strategies of oil majors – From oil to energy?

Matthias J. Pickl

King Fahd University of Petroleum and Minerals, University Blvd, Dhahran, 31261, Kingdom of Saudi Arabia



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ABSTRACT

Renewables, especially wind and solar, are taking a role of increasing importance in the energy industry. Therefore, oil majors are progressively positioning themselves for the proclaimed energy transition. This indeed raises the question of whether sizeable capital allocation into renewable energy could indicate that oil majors are indeed transforming into energy companies. This paper helps to address this query by investigating the oil majors' renewable energy strategies and investments. Furthermore, a complete quantification and categorization of oil majors into renewable leaders or laggards is provided. Results show that of the eight oil majors, five have undertaken considerable investment into renewable energy. The analysis also demonstrates the strong linkage between the oil majors' proved oil reserves and their renewable energy strategies.

1. Introduction

According to BP's 2018 Energy Outlook, renewable energy will be the fastest-growing source of energy, increasing five-fold by 2040 thus providing around 14% of global primary energy at this future point in time [1]. Concurrently, oil majors are gradually facing potential prospects as a declining industry: while peak demand for oil has not yet occurred so far, it may be expected that this scenario is indeed approaching as oil demand growth slows and eventually peaks [2,3].

In light of this, the oil industry is confronted with the question of whether it should try and at least partially reinvent itself as renewables businesses [2] as in fact also the rising cost of hydrocarbon extraction creates an incentive to consider accelerating the energy transition away from hydrocarbons toward progressively more affordable renewable energy resources [4]. In other words, could renewables be the oil majors' next big business to which scarce capital will be diverted to from upstream oil [5]? As such, oil firms are essentially attempting to figure out how the best presently available cash cow in the world can be replaced [6] for the benefit of their own sustainable future. Furthermore, growing concerns about climate change following the Conference of the Parties 21 (COP21) Paris Agreement [7] may provide an additional drive for such strategy to hedge against hardening investor sentiment towards carbon emissions. Following COP21, more than 170 countries agreed to try limiting global warming to well below two degrees Celsius, an effort that will require major investments in low-carbon energy sources. In witness whereof, the chief executive officer of Royal Dutch Shell Mr. Ben van Beurden, for example, told investors recently that Royal Dutch Shell is no longer an oil and gas company, but an energy transition company [8].

However, the current business models of oil majors and renewable companies are distinctively different, and the oil industry is likely to have, for example, a different cost of capital to the renewables sector [2]. Most renewable ventures, like wind and solar projects, churn out cash flows akin to annuities for several decades after initial up-front capital expenditure generally with low price risk [5], quite different to the business models of oil majors that face oil price risk. However, one could argue that with an increasing share of intermittent renewables, the power business is becoming more akin to the oil industry requiring a trader's skillset to manage increasing volatility and provides a hedge in a future low carbon environment.

Therefore, this paper sets out to analyze the question of whether oil companies are transitioning to become energy companies in the broader sense (Fig. 1) and are making sizeable capital allocations to the renewable energy sector as part of their corporate strategies. Section 2 provides a literature overview. Section 3 presents the rise of renewable energy. Section 4 analyzes the strategic responses of the eight oil majors. Section 5 discusses the results, and Section 6 concludes and provides ideas for further research.

2. Literature review

In terms of international oil and gas companies investing in the renewable energy industry, four studies are of particular relevance to this paper. First [9], are exploring the range of strategies that international oil and gas companies are deploying to invest in renewable energy technologies and conclude, based on general descriptive analysis, that mixed success can be observed with investment models being still emerging. Next [10], analyze, on a country level, the reasons for

E-mail address: matthias@kfupm.edu.sa.

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Fig. 1. From oil companies to energy companies?.

Thailand's oil and gas companies to increasingly invest in renewable energy and conclude that justifications are most often based on complying with government policy, enhancing national energy security, and increasing the uptake in environmentally friendly energy. Third [5], explores in descriptive manner whether renewables could be the majors' next big venue of investment and evaluate that the transition to new energy will be the biggest shift in strategy in generations and predicts that particularly wind and solar will be increasingly important strategic growth elements that cannot afford to be ignored by oil majors. Finally [11], more dramatically put the old business model of oil majors in doubt as they see it as no longer fit for purpose. Decisively, a holistic analysis of the oil majors' renewable energy investment strategies and a full quantification and categorization of oil majors in renewable leaders or laggards has not been established in previous research and is the subject of this paper.

3. The rise of renewable energy

Renewables, especially wind and solar, are taking a role of increasing importance in the energy industry. Data from the International Energy Agency show that renewables accounted for close to two-thirds of net new power capacity around the world in the year 2016, with almost 165 GW (GW) coming on stream [12] (Fig. 2).

Also, over the next 20 years, it is expected that renewable energy will be the fastest-growing primary energy source globally, capturing around two-thirds of global investments in power plants to 2040 [13] (Fig. 3).

While such high shares in investments take time to translate into share of power output, and further into share of primary energy consumption [14], it is nevertheless expected that in the three major markets – European Union, Unites States of America, and China – the share of renewable power output will reach or exceed 20% before 2035 [15]. Indeed, the impressive growth in cumulative global wind and solar installations since 2000 (Fig. 4, left side), promise that the

renewable share of global primary energy consumption may approach 10% by 2040 [16], raising the question of whether sizeable capital allocation into renewable energy could be a future imperative for oil majors. In particular as increasing investments in renewable energy represents a hedge against the possibility of an even more rapid energy transition [17].

4. Analysis of the renewable energy strategies of global oil majors

As a strategic response to the growth potential in the renewable energy sector and the rising cost of hydrocarbon extraction [4], oil companies are getting increasingly active in the electricity and renewable energy sector [18], albeit at quite different levels of engagement. Oil majors are leading the way in shaping new strategies to capture a portion in the fast-growing renewable market and while they are arguably still getting to grips with the value proposition of renewables, carefully weighing up renewables against oil and gas developments, and the exact timing of such transition, they have already made first capital allocation choices [5]. These deals come as oil majors come under pressure from shareholders and climate activists to reduce their carbon emissions from their hydrocarbon businesses to limit global warming [20]. In this section, it is analyzed in detail how the oil majors – Royal Dutch Shell, ExxonMobil, Chevron, Total, BP, Eni, Petrobras, and Statoil/Equinor – have started their journey from big oil towards big energy.

Royal Dutch Shell has communicated to travel in step with society and to already have created a strategic framework for resilience whatever the outcome in terms of future oil price and renewable energy transition will be. At the same time, the company has clarified that it will not single-handedly lead the energy transition [21,22]. Still, its chief executive officer told investors recently that Royal Dutch Shell is no longer merely an oil and gas company, but an energy transition company [8].

The formation of Royal Dutch Shell's New Energies division was announced in May 2016, combining its existing low carbon and renewables interests (hydrogen, electric vehicle charging, biofuels, and renewable power) to jointly focus on long-term energy transition themes as part of its diversification strategy [23]. Recently, Royal Dutch Shell capital allocation to the renewable and low carbon sector is increasing as well. While in 2016, Shell mentioned a new energy investment budget of US\$ 200 million per year, this was revised to up to US\$ 1 billion per year at the Cambridge Energy Research Associates (CERA) week in March 2017 and further hiked to US\$ 1–2 billion per

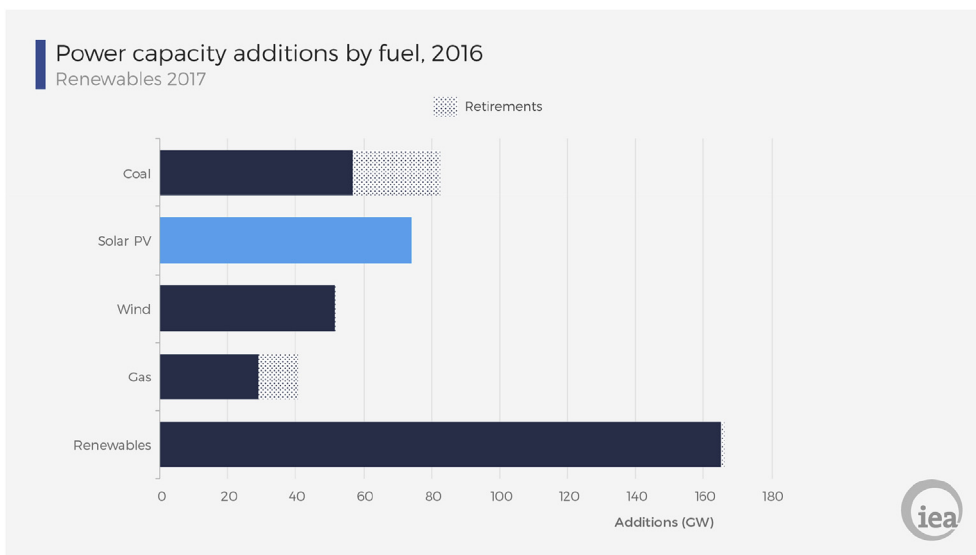


Fig. 2. Power capacity additions by fuel in the year 2016 [12].

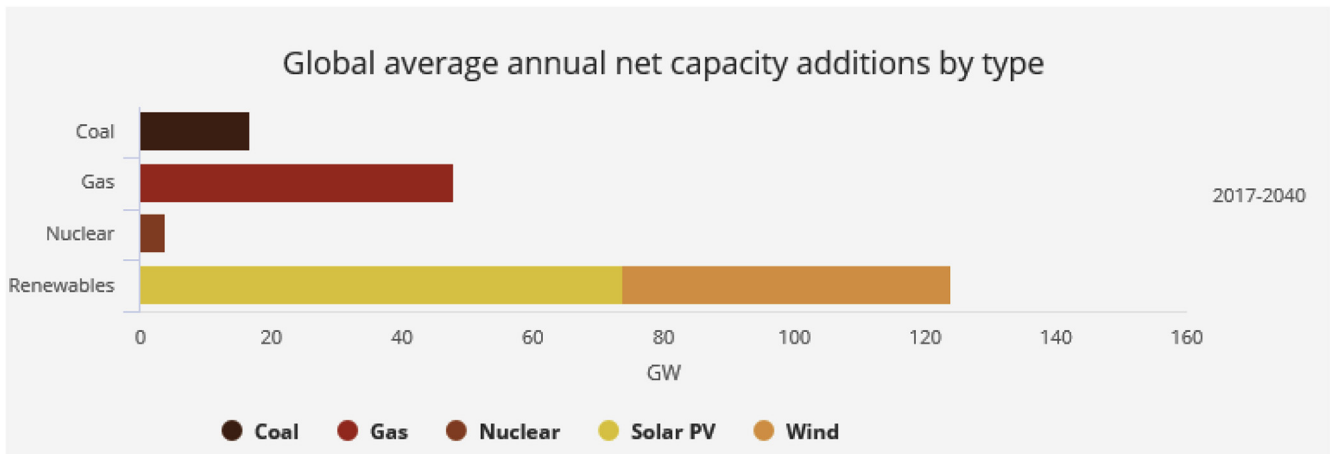


Fig. 3. Power capacity additions by fuel from 2017 to 2040 [13].

year in December 2017 [23], of which about 80% will go into the power sector [17] to prepare for the world's gradual shift beyond fossil fuels.

A few Royal Dutch Shell investments particularly stand out. In 2017, Royal Dutch Shell moved into the consumer power market by acquiring First Utility, a UK-based electricity and gas supplier, and NewMotion, Europe's largest electric vehicle charging company [17]. At the beginning of 2018, the company invested in the US-based solar developer Silicon Ranch, by taking a 44% stake in a deal valued at more than US \$200 million [23]. The agreement also stipulates that Shell can further increase its stake after 2021. Furthermore, in 2018, Royal Dutch Shell has agreed to a long-term power purchase agreement with British Solar Renewables for electricity from Bradenstoke, the largest solar farm in England [24]. These two deals are particularly noteworthy as Shell pulled out of the solar sector in 2009. Additionally, Royal Dutch Shell has led a US\$20 million equity investment in Husk Power Systems, an India-based company that provides renewable power to rural communities and businesses through distributed off-grid installations, to help Husk Power Systems expand in the African and Asian markets with mini-grids [25]. Royal Dutch Shell has also made a move in June 2018 to further strengthen its position in the power industry with the deal to buy Texas electricity group MP2 [26]. Finally, Royal Dutch Shell is investing in grid edge and energy storage companies such as GI Energy, Axiom Energy, and Sonnen - either outright or with equity stakes [23].

ExxonMobil, the US supermajor, has largely avoided following its European oil peers and has shown no interest in renewables into renewable energy, resulting in criticism from climate activists [17]. Engagement in green energy is generally low and rather confined to legacy projects with no vision, investment plan, budget or ambition for future renewable energy activities communicated. In terms of developing new technologies, ExxonMobil's strategy is limited to reducing greenhouse

gas emissions, advancing biofuels, and carbon capture and storage (CCS) technologies [23]. Notably, ExxonMobil holds interests in roughly one-third of the world's CCS capacity and captured 6.9 million metric tons of carbon dioxide for sequestration in 2015 [23]. It announced an agreement to pursue development of a carbon capture fuel cell technology that could considerably reduce costs. With regards to advanced biofuels research, the company funds and conducts research in a broad portfolio approach including algae, non-food based biomass feedstock, and agricultural waste [23]. In July 2017, ExxonMobil announced a breakthrough in algae biofuels research involving the modification of an algae strain that more than doubled its oil content without significantly inhibiting the strain's growth [27]. Furthermore, ExxonMobil invests and participates in a variety of research programs at leading US universities (e.g., MIT and Stanford) and governmental research programs (e.g., US Department of Energy and International Energy Agency).

Similar to ExxonMobil, **Chevron**, the second US supermajor, has largely not followed the recent moves of its European peers into renewable energy [17]. In contrast, Chevron established a dedicated renewable energy presence with a focus on solar, wind, and geothermal projects in 2000 and, in 2014 and 2016, largely exited the same, stating lower returns compared to core activities as the prime reason to re-focus on its oil and gas business [23]. Currently, the company maintains a rather small renewable portfolio consisting mostly of legacy wind and solar projects in the United States. Chevron continues to be committed to managing emissions by improving energy efficiency, reducing flaring, and fixing methane leaks [28]. The company is also investing in 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 [23]. Notably, Chevron launched a Future Energy Fund, with an initial commitment of \$100 million, to invest in breakthrough

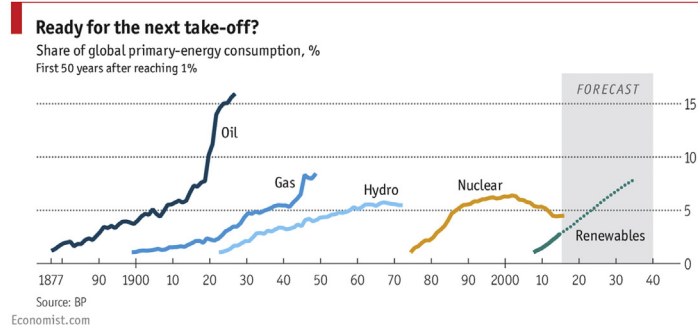
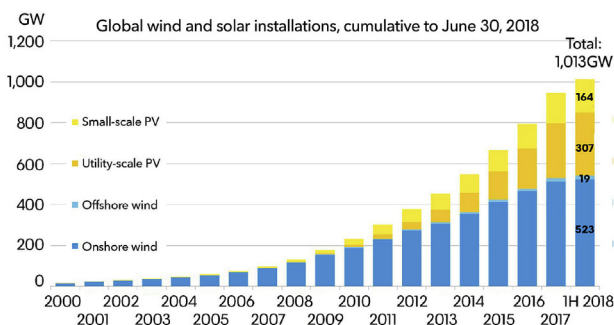


Fig. 4. Left Side: Cumulative global wind and solar installations [18]. Right Side: Share of global primary energy consumption, first 50 years after reaching 1% [16,19].

technologies that enable the ongoing energy transition to a greater diversity of sources to lower carbon emissions while supplying reliable, affordable, and cleaner energy [29]. In general, Chevron's overall engagement with renewable energy is rather low, and no target, vision, or roadmap for renewable energy has been communicated.

Similar to Equinor and Shell, the French oil major **Total**, seems to emerge as one of the front-runners among the oil majors to transform from a traditional oil and gas producer to a full range energy company [5]. The company is increasingly active across the energy value chain from oil and gas exploration and production to refining, chemicals, trading, shipping, and marketing as well as in power generation and the renewable sector. This follows the strategic rationale of diversifying revenues away from volatile oil prices towards establishing a robust position in future energy growth markets.

Total's initial organic investment plan for renewables includes investing \$500 million per year, roughly 3% of total capital expenditure [23], to over time grow the low carbon business, which is a bid broader defined to encompass downstream gas, renewable energies, energy storage, energy efficiency, clean fuels and carbon capture, utilization, and storage technology, to 20% of its asset base over the next 20 years [30]. Historically, Total's renewable energy activities were rather focused on solar photovoltaics and biofuels. However, more lately the push towards becoming a full range energy and renewable player has included strategic investments in energy storage, energy efficiency, wind, and electricity retail.

In recent years, Total has engaged in inorganic investments by acquiring equity stakes in various companies. In 2011, \$1.4 billion was spent for a 60% majority stake in U.S. solar specialist SunPower [31]. This acquisition grants Total full access to photovoltaics expertise along the entire value chain, from panel manufacturing to project development, in line with the company's strategic mission to become a global integrated leader in solar. Currently, Total has stakes in solar plants with a capacity of 1.6 GW and plans to develop up to 5 GW renewable capacity over the next five years [30]. In 2016, Total purchased the French battery manufacturer Saft for \$1.1 billion, providing the oil and gas group with access to some of the most advanced technology for storing energy [17], which in turn will support further development of renewables. In the same year, Total acquired the Belgian green power utility Lampiris in a deal valued at \$224 million [32]. In September 2017, a 23% stake in the French renewable company Eren, which holds a diversified asset base of more than 650 MW in wind, solar, and hydro, was acquired for \$286 million with an option to buy it outright after 2021 [33]. Simultaneously, Total fully acquired the French energy efficiency leader GreenFlex [34]. Also, in the same year, Total made an investment of more than \$200 million to transform its La Mède refinery into the first biorefinery in France to produce 500,000 metric tons of biofuels per year from various types of oils, including vegetable oils [23]. In 2018, Total purchased a 74% stake in the French electricity retailer Direct Energie for \$1.7 billion [23] thus becoming one of the top utility providers in France building up its retail energy business to challenge incumbents EDF and Engie [17]. Finally, in 2018, Total took a 25% stake in Clean Energy Fuels Corp for \$83 million to drive deployment of natural gas heavy-duty trucks and to support the launch of an innovative leasing program to place thousands of natural gas heavy-duty trucks on the road [35].

In addition, Total has established the venture capital arm Total Energy Ventures in 2008 and has invested almost \$200 million in over 20 innovative start-ups since its inception [23]. Total Energy Ventures takes minority stakes in promising start-ups that have the potential to become long-term growth drivers or enable operational improvements. The overall portfolio includes solar, wind, marine energy, energy storage, distributed energy tech, hydrogen, biofuels, and chemicals. In 2016, the fund acquired an interest in United Wind, a company leasing small wind turbines (10–100 kW) to rural businesses and homes [36].

The British multinational oil company **BP**, headquartered in London, has to take a rather careful approach in terms of renewable

investments, having lost several billion dollars in premature bets in the 2000s [17]. Notably, BP was the first oil major to commit significant capital to renewable energy, showing high dedication towards renewables from 1980 to 2010 with activities in component manufacturing (solar) as well as project development (solar and wind). The company launched a \$200 million campaign in 2001 to re-brand BP into Beyond Petroleum, highlighting its early envisioned transition to new sources of energy. In 2005, BP established BP Alternative Energy to consolidate its low-carbon business activities [37]. However, by now, most of its \$8 to \$10 billion of green energy investments during that era has been written off, while the company still has major onshore wind legacy assets in the US, a biofuels business (sugar cane processing, ethanol production, research, and development) in Brazil, and a carbon capture and storage joint venture with Chevron, Petrobras, and Suncor [23,38]. Following the 2010 Deep Water Horizon oil spill incident [39], BP gradually exited the renewables business and closed the BP solar business in 2011 to exit a low margin commodity business [40]. Also, BP's wind business was offered for sale in 2013, but no suitable buyer could be identified at this time; still as of today, BP retains a gross generating wind capacity of more than 2200 MW in the U.S. alone and claims to have the largest operated renewable energy business among oil and gas peers [17,41].

Following the divestment from renewables, BP has not formulated a clear new renewable energy vision, but, as per chief executive officer Bob Dudley, is scanning and screening for renewable energy opportunities to plan for a life beyond oil [42]. Hence, BP is prepared to spend around \$500 million per year (organic and inorganic investments) to have some skin in the game and enable growth options for a low carbon future [23]. In this spirit, BP acquired a 43% stake in Lightsource, Europe's largest solar power project developer, for \$200 million in 2017, essentially marking the company's re-entry into solar power following the closure of its previous solar business in 2011 [38]. In 2018, BP made three investments to prepare for a low carbon future. First, the company invested \$20 million into StoreDot, the Israeli developer of rapid-charging batteries [6] in a move following Royal Dutch Shell's NewMotion purchase (see above). Second, BP made a \$5 million investment in FreeWire, a US company developing fast-charging infrastructure for electric vehicles [23]. Thirdly, BP bought Chargemaster, the UK's leading network of charging points, for more than \$160 million to combine Chargemaster's 6500 charging points network with its 1200 petrol stations and to hedge against technologies that could challenge the dominance of oil as a transport fuel [43].

Furthermore, BP has established a venture capital arm with the name BP Ventures in 2006 and has invested over \$300 million into an active portfolio of more than 40 entities comprising emerging and disruptive technologies across upstream, downstream, and green energy [23].

Eni, the Italian multinational oil and gas company, has communicated a concrete vision to invest in order to grow its renewable energy activities in the long-term and ensure the company's ability to adapt to a low carbon future [44]. In 2014, the company started up the world's first conversion of a traditional refinery to a biorefinery producing green diesel, green naphtha, liquid petroleum gas, and jet fuel [23]. In 2015, Eni established a dedicated energy solutions department to identify and implement renewable growth opportunities. In the same year, Eni established a venture capital fund and since then engages in joint research with a number of universities to conduct research and development of promising renewable technologies and applications. The company recently formed partnerships with GE (in 2016) and with Statoil (2017) emphasizing its growing interest in renewable energy, including offshore and onshore wind [45,46]. Eni's three-pillar corporate strategy includes renewable energy as an integral part and targets to deliver 1 GW (175 MW by 2018, 320 MW by 2019, 463 MW by 2020, and 1 GW by 2021) of installed renewable power capacity over the 2018 to 2021 business plan period by investing EUR 1.2 billion [47]. Renewable energy projects (photovoltaics, wind, concentrated solar

Assessment Criteria	Weigh	Shell	ExxonMobil	Chevron	Total	BP	Eni	Petrobras	Equinor
Hydro	5%	0	0	0	1	0	0	1	0
Solar	5%	1	0	1	1	1	1	1	1
Wind	5%	1	0	1	1	1	1	1	1
Biofuels	5%	1	1	0	1	1	1	0	0
Carbon Capture	5%	1	1	1	1	1	1	0	1
Geothermal	5%	0	0	0	0	0	0	0	0
Energy Storage/ EV Charging	5%	1	0	0	1	1	0	0	1
Explicit Renewable Strategy/ Renewable Capital Allocation	5%	1	0	0	1	1	1	0	1
Capital Investment into Renewables (billion \$ per year)	50%	1	0	0	0.5	0.5	0.3	0	0.5
Dedicated Renewable Team	5%	1	0	0	1	1	1	0	1
Renewable Venture Capital Arm	5%	1	0	1	1	1	1	0	1
Total Score		9	2	4	9.5	8.5	7.3	3	7.5
Total Weighed Score	100%	90%	10%	20%	70%	65%	50%	15%	60%

Fig. 5. Renewable Leaders and Laggards among Oil Majors. (qualitative evaluation: 0 ... no activity, 1 ... activity; quantitative evaluation in billion \$ for capital investments).

power, biofuels, and green chemicals) will be developed where the company can leverage technological and geographical synergies with its main core business [23]. Eni targets a project internal rate of returns of between 8 and 12% after financing and synergies with upstream operations [23] with a long-term goal of 5 GW installed renewable power capacity by 2025 [48].

Petróleo Brasileiro, the semi-public Brazilian multinational oil and gas major that is more commonly known as **Petrobras**, currently places low emphasis on renewable energy given its strategic plan to refocus on the upstream oil and gas business to reduce corporate debt and improve its financial position following the recent Lava Jato scandal [49]. The company's renewable energy activities are largely confined to its electricity generation portfolio of 6.8 GW, with mostly thermal generation (6.1 GW) and a small share of renewable generation (0.7 GW) including wind, small hydro, and solar assets [50]. Petrobras exited the biofuels production activities in 2017, as part of its divestment program to reduce corporate debt and aim at optimizing its business portfolio [51]. Overall, renewable energy plays a marginal role in the Petrobras 2018 to 2022 business plan solely stating that the company wants to be prepared for a future based on a low carbon economy [52]. Remarkably, Petrobras recently signed a nonbinding agreement with Total to jointly assess future potential business opportunities in onshore solar and wind power in Brazil [53].

Statoil, the Norwegian oil major, recently changed its name to **Equinor** to reflect the company's shift in strategy from a focused oil

company to a broad energy company in future [54]. Chief executive officer Mr. Eldar Sætre clarified that while oil is by no means a dirty word, the company will grow its renewables business and the name change was part of a clear strategic direction [55]. As a whole, Equinor perhaps provides a realistic lens into the future as to how portfolios of oil majors might evolve, from their traditional role as oil and gas producers to suppliers of energy in the broader sense [5]. Historically, the company's strategy was primarily focused on offshore wind, leveraging its operational expertise in the North Sea, and on carbon capture and storage [23]. Wind projects included large-scale conventional offshore developments such as the world's first floating offshore wind turbine installed in Norway in 2009, with an overall portfolio size of 750 MW.

In future Equinor's investments into the renewable space will increase: While the greater part of annual capital expenditure remains in oil and gas - over the previous two years 3–5% of annual capital expenditure was spent on renewables [55] – the capital expenditure share attributed to low-carbon energies and renewables could rise to between 15 and 20% of the total capital expenditure by 2030 [56]. Already in 2015, the New Energy Solutions unit was established as a dedicated business unit to support the company's renewable energy expansion as one of three cornerstones to help manage the long-term climate roadmap. The strategic rationale is to diversify the company's revenues with more predictable returns as cheaper alternatives to capex-intensive unconventional oil and gas projects and to establish a strong foothold in this future growth market. In line with this in 2017, Equinor

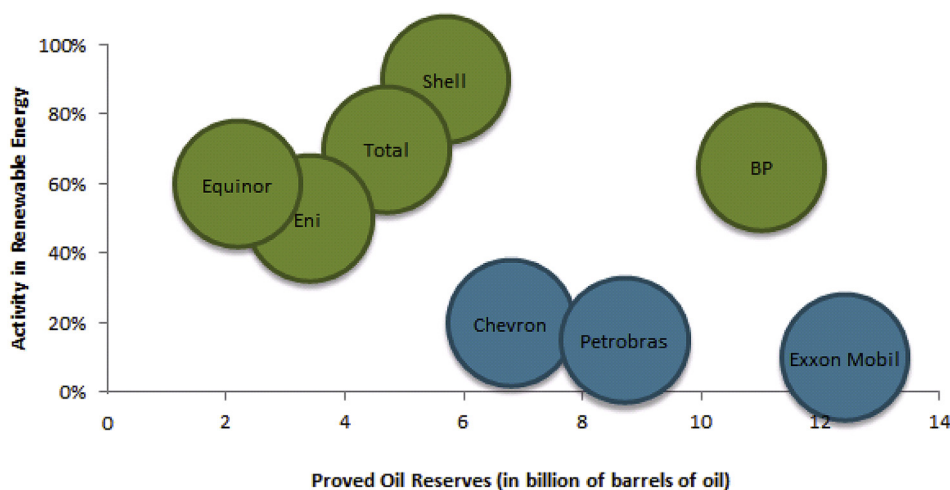


Fig. 6. Linkage of Renewable Energy Activity of Oil Majors with their Proved Oil Reserves [59].

acquired a 40% stake in Scatec Solar's 162 MW Brazilian Apodi solar assets as well as 50% interest in the project execution company for \$25 million [23], enabling the company to develop and operate large-scale PV plants in the future. In 2018, Equinor has agreed to buy the Danish power and gas trading firm Danske Commodities for EUR 400 million to secure its future in a global transition towards cleaner fuels. Irene Rummelhoff, executive vice president for New Energy Solutions at Equinor, indicated that the deal would strengthen the company's position in power generation from renewable energy, particularly the ability to capture value from future equity production of renewable electricity [56]. Furthermore, in 2018, Equinor acquired a 50% stake in two offshore wind developments in Poland [23]. Finally, \$200 million are committed as renewable venture capital to invest in innovative renewables start-ups, low-carbon technologies, and associated business models. Four major investments have been completed to date in wind energy leasing (United Wind), electric vehicle charging infrastructure (ChargePoint), solar technology (Oxford PV), and energy storage (Convergent) [57].

5. Results and discussion

Based on the analysis in Section 4, it is now possible to quantifiably assess the renewable energy strategies of the oil majors, and subsequently categorize them as renewable leaders/energy transition companies, i.e. oil majors that have embarked on their transition from oil companies to energy companies, and renewable laggards, i.e. oil majors remaining rather pure hydrocarbon focused companies. Fig. 5 presents the results of assessing the oil majors based on their activities in the core renewable energy industries (hydro, solar, wind, biofuels, carbon capture, geothermal, and energy storage), their renewable energy strategy and capital investments, and their organization structure in terms of whether they have formed a dedicated renewable team and/or a renewable venture capital arm. The assessment criteria are weighed in terms of importance.

Notably, all oil majors except ExxonMobil have developed or are developing solar and wind assets, whereas none of the oil majors is investing in geothermal energy. Hydro activities are rather limited with only Total and Petrobras having exposure. Biofuels and carbon capture are well represented. Energy storage is an increasingly active sector in line with the expected rise in the penetration of electric vehicles [58]. Five out of eight oil majors have formulated an explicit renewable energy strategy, earmarked capital spending for renewables and have built dedicated renewable energy teams in their organizations. Lastly, six out of ten oil majors have created a renewable venture capital fund to invest in emerging renewable technologies and innovative

renewables start-ups.

Representing the oil majors based on the metrics *proved oil reserves* (x-axis) and *activity in renewable energy* (y-axis), demonstrates the strong linkage between the oil majors' proved reserves and their renewable energy activities. Fig. 6 illustrates that oil majors with smaller levels of proved oil reserves are moving into the renewable space faster, whereas those companies with large pools of oil reserves are rather choosing the strategy to progress at a more limited speed. Notably, BP is somewhat of an outlier to this overall trend as it is becoming increasingly active in renewable energy (Section 4) despite having large proved oil reserves.

Overall as graphically displayed in Fig. 6, oil majors can be grouped into two main categories - renewable leaders/energy transition companies (green) and renewable energy laggards/hydrocarbon focused companies (blue). Five of the oil majors can be categorized as renewable leaders/energy transition companies: Royal Dutch Shell, Total, BP, Eni, and Equinor; whereas, three of the oil majors remain renewable energy laggards with rather pure hydrocarbon focus and low activity in terms of renewable strategy: ExxonMobil, Chevron, and Petrobras.

6. Conclusion and further research

As per BP's 2018 Energy Outlook, more than 40% of the overall increase in energy demand will be met by renewable energy over the coming years, making renewable energy the fastest-growing source of energy [1]. Currently, more than 50% of the world's demand for oil is attributed to the transportation sector with over 25% coming from passenger cars alone. Most of the oil majors have acknowledged by now that this demand may peak in the next one to two decades, followed by a slow decline in demand for oil thereafter [6]. Consequently, oil majors have to position their strategy for this proclaimed new energy transition.

This paper analyzed the oil majors' renewable energy strategies and investments in response to this anticipation of renewables assuming a bigger share of the global energy mix at the expense of hydrocarbons, specifically investigating whether oil majors are transforming into energy companies in the broader sense. The quantitative assessment of the renewable energy strategies of the oil majors yields a categorization into two main differentiated peer groups: 1) Royal Dutch Shell, Total, BP, Eni, and Equinor as oil majors that have embarked on their transition from oil companies to energy companies and 2) ExxonMobil, Chevron, and Petrobras as oil majors that remain rather pure hydrocarbon focused companies. Thus, remarkably five out of eight oil majors have framed a renewable energy strategy and have commenced considerable investment into renewable energy.

The analysis also reveals the strong linkage between the oil majors'

proved reserves and their renewable energy strategies. Oil majors with less proved oil reserves to tap into seem to be moving into the renewable space faster with the aim of developing more diverse and less volatile portfolios sooner. Those companies with large pools of oil reserves, remarkably including US majors with especially low breakeven oil assets, are rather selecting the strategy to embrace the renewable industry at slower pace.

In any event, the transition to renewable may be considered the biggest shift in strategic direction of oil majors in a generation opening up avenues for further research. Firstly, a model from a portfolio perspective may be created to evaluate how oil majors may best strike the balance between sustaining their core hydrocarbon business while increasingly investing in renewable energy. Secondly, the value proposition of renewable energy promising stable long-term cash flows versus upstream investments that are subject to commodity price risk deserves further research in terms of assessing the cost of capital and risk-adjusted returns. Thirdly, the question of scale of renewables needs to be investigated as currently only offshore wind fully offers scale on the same level as upstream oil investments.

Disclaimer

The views expressed herein are those of the author solely.

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