Energy in 2017

POLICY BRIEF

Carlos Andrés Molina, Samir Jagdish, Paul-Etienne Pini

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Contents

Introduction

The fast shifting global trends in energy production, consumption and economic flows account for both the dynamism and the instability of energy transition pathways and temporalities. As a whole, energy transition remains predominantly framed as a linear process shaped by long-term structural forces such as increased climate awareness, carbon emissions reduction policies, energy efficiency gains, technological and digital breakthroughs—especially in the areas of energy storage, mobility and electricity grids—, but also lowering costs of variable renewable energies, and peak oil demand foreshadowing a yet unseen decline in global oil consumption.

However, the processes that undergird the energy transition are far from being seamless, homogeneous or synchronically paced (IEA 2017) Structural changes unfold differently depending on the world areas and geographical scales considered, on resource endowments, development levels and regional trade systems, as well as on institutional capability and policy efficiency (Pinho 2018). Furthermore, the energy transition often displays unexpected patterns generated by a combination of short-run cyclical factors and long-term structural forces that should be carefully distinguished (BP 2018).

This paper analyses the 2017 energy trends against the backdrop of the ongoing energy transition, in order to assess how consistent 2017 proved to be with long-run energy previsions. We argue for an

advancement in the inclusion of renewable and cleaner energy sources into the global energy pool, yet persisting inertias augur a troublesome transformation of the current fossil fuel dependent world energy system. As 2017 has shown, we are far from being able to assert that world energy consumption has shifted towards a "greener" energy paradigm.

1 | The Energy Transition: A Forecasting Conundrum

Having to face the many energy transition complexities and uncertainties, forecasting is bound to be a challenging exercise whose accuracy does, by definition, depend upon modeling assumptions and error margins. As the International Energy Forum's latest energy forecast comparison study remarks, energy outlooks remain one essential way to inform policy-making and market decisions by anticipating the longer-term unfolding of the energy transition—that is to say, 20 to 25 years ahead. However, a proven lack of methodological harmonization between the authoritative global energy outlooks—namely those by the OECD-IEA, the US-IEA, the OPEC, BP and ExxonMobil—produces differing long-term projections that are difficult to compare (IEF-RFF 2017). These forecasting issues do question the role of global energy outlooks in the explanation of energy trends: what do discrepancies between forecasts and present-day trends reveal of the energy transition's unfolding, and to what extent can the latter be modeled?

As we demonstrate in this paper, 2017 energy trends are a prime example of the back-and-forth nature of the energy transition, an empirically observed evolutionary pattern that diverges from certain outlooks' previsions. To prove this point, we will present two contrasting global forecasts, those by BP and McKinsey&Company, before confronting them to actual 2017 energy trends.

BP's Energy Outlook (BP 2017) models the 2015–2035 evolution of global energy markets. It forecasts a slowdown in the growth of global energy consumption to 1.3% per annum over the next 20 years (down from 2.2% p.a. over 1995–2015). This outcome derives from the assumption that energy consumption increases in the industrial and buildings sector will be balanced by large efficiency gains and structural shifts towards less energy-intensive activities in major economies such as China (BP 2017).

Overall, according to BP, fossil fuels remain the main source of energy globally, only receding from 85% of total energy supply in 2015 to about 75% in 2035. Fuel switching processes, transport efficiency and the penetration of EVs (6% of the global car fleet by 2035) cause growth in total oil demand to gradually slow with a 50% decrease throughout the next 20 years; the BP outlook only prudently locates a possible peak around the "mid-2040s". Annual growth of coal consumption is expected to fall dramatically—by 92% over 2015–2035—with a peak around the mid-2020s as China falls back on lower-carbon fuels, leading to a plateauing coal demand over the two decades. Supported by an expanding LNG sector, natural gas consumption grows steadily by 1.6% p.a. to 2035, especially in China and Europe. Renewable energy grows the fastest and reaches 10% of the primary energy mix and 20% of global power by 2035 (BP 2017).

The forecast proposed by McKinsey assumes a rather different starting point and follows a more systemic conceptualization: that of technological disruptions and macro-economic trends causing changes in the resource intensity of global production and consumption. Three main disruptive factors are assumed to be key leverages in this respect: technological innovation in automation, analytics and energy efficient devices; changing consumer behaviors; and a faster decline in the advanced economies' demand in fossil fuels (McKinsey 2017).

Based on this, McKinsey's outlook construes that the end of the 2003–2015 supercycle—an above-trend movement in commodity prices—will be give way to structural shift in resource supply and demand patterns, such as increased energy consumption efficiency, lower-cost renewables owing to technological innovation and enhanced extractive technologies. Relatedly, the outlook concludes, "the combination of increased efficiency in energy use and a shift to renewable energies could mean that primary energy demand peaks in 2025 in a tech acceleration scenario" (McKinsey 2017). Indeed, even McKinsey's moderate scenario foresees that oil demand will increase by 11% (2013–2035), while coal would undergo a long-term decline as cleaner and cheaper energy substitutes are preferred. Natural gas' growth would be locked by the renewables' expansion, leading gas demand to peak around 2025 and reach 2013 levels by 2035. In the meantime, Renewables could grow from □4% of global power generation in 2017 to as much as 36% by 2035 (McKinsey 2017). Hence, McKinsey proposes an alternative global energy prospect that diverges from BP's on a number of key scenario aspects which 2017 energy trends may help shed additional light on.

2 | 2017 Energy Demand: Two Steps Forward, One Step Back

Global demand in energy grew significantly in 2017, growing 2.2% in 2017 (BP 2018) and peaking at an energy demand of 14,050 mtoe (IEA 2017). Compared to a 10 year average of 1.7%, 2017 marks the year with the highest primary energy growth since 2013 (BP 2018) with gains across all sources of energy. In relative terms, renewables led the group with consumption increasing by 17% in 2017 followed by natural gas at 3%. This voracious uptick in demand can be traced to China and India as these two countries contributed more than 40% of the growth in 2017 (BP 2018). Comparable growth was recorded in South East Asia (8% of global energy demand growth) and Africa (6% of global energy demand growth) but it should be noted that the per capita levels of energy use in these regions are still below average (IEA 2017).

China especially drove this demand through a rebound in many of its energy intensive sectors, such as iron and steel, which was fueled through a 15% increase in natural gas consumption (BP 2018). China's natural gas growth occurred as an outcome of its 2013 Environmental Action Plan, which created targets for air quality in the next five years. In achieving these targets, China incentivized coal to gas substitution through a variety of tariffs and regulations targeted at both residential and industrial scales. Overall the effect of natural gas consumption increases have been felt through the

increase in imports of liquified natural gas from the introduction of new supply lines in Australia and the US (BP 2018).

However, China's coal consumption still accounts for over half of its energy consumption even with no year on year growth. Coal in 2017 experienced an increase in global consumption of 1% following declines in the past years (BP 2018), much to the dismay of global leaders experiencing the negative externalities of coal's high CO_2 emissions. Coal's growth was lead by India, who increased their coal usage increasing by 4.8%, spurred by imports from China along with slow generation in other sources.

Oil demand has followed these trends by showing the strongest demand since its height in 2006/2007 with an increase of 1.4% (BP 2018). This was concentrated in USA and the EU, both benefiting from US tight oil following OPEC production cuts. This, combined with oil prices rising, indicates that oil demand is steadily increasing since the low during the 2008 economic crisis.

Where coal throws carbon equilibrium off, renewables step in to bring homeostasis. Biggest gains growth per annum are captured by renewables at 17% with solar being the leader (BP 2018, IEA 2017). This has been, again, driven by China and India who have been ramping up policies to tackle climate change through incentivizing demand to renewables. Increasingly these are being executed through competitive auctions rather than feed-in tariffs of the past as cost per unit of renewables, especially solar photovoltaics, has fallen precipitously (EIA 2018). New energy scenarios predict this trend continuing with renewable demand trajectories disrupting energy mixes globally.

Taking these demand trends into a different light we see that there has been backwards steps in terms of carbon emissions, which increased by 1.6% following three consecutive years of decline (BP 2018). This coincides with decreases in energy intensity (the amount of energy needed to produce a unit of output) but also reveals the institutionalized inertias that causes energy consumers to choose one source over the other. Given the recent IPCC report (IPCC 2018) which indicated that threats from climate change will materialize sooner rather than later, it is imperative when taking demand trends that these be reflected in a policy environment that regulates these sources of emissions as well.

3 | 2017 Energy Supply: A Matching Trend

Mirroring demand, energy supply increased for almost every source from 2016 to 2017. Despite production curtailments from major OPEC and Non-OPEC producers, such as Saudi Arabia, the United Arab Emirates and Russia, USA's flexible shale oil production—along with ending sanctions for major producers like Iran—sufficed to offset the oil production decrease, allowing oil supply to expand by 0.7% (BP 2018). Shale oil producers' flexibility allowed them to quickly respond to recent oil price increases through the expansion of their supply; allowing them not only to increase their revenue but also their relative market share (BP 2018).[1]

[1] See Appendix 2

In line with growth in natural gas consumption, production increased by a considerable amount from 2016 to 2017, near 4% (BP 2018). Seven out of the top eight natural gas producers worldwide—concentrating 63.5% of the global market in 2017—increased their production from 2016 to 2017 (BP 2018). Most notably, five of the top eight natural gas producers expanded their supply by more than 6% (BP 2018). Natural gas growth production is driven by consumption expansion in Asia, where countries like China aim to substitute coal use for less CO2-emitting sources like natural gas.

Part of the natural gas supply expansion is also linked to increasing natural gas-powered electricity generation.[2] In this regard, some of the sequels of Japan's Fukushima event continue to have an impact on natural gas markets as natural gas-powered electric generation continues to grow in this country, a trend that is also observable in several Middle-East countries such as Iran and Saudi Arabia. Increasing global climate change concerns and natural gas powered electricity generation may continue to drive production growth in the coming years.

Tailing natural gas, global coal production increased by 3.4% from 2016 to 2017 (BP 2018). Considering coal is mostly employed for power generation[3], we can unambiguously attribute this growth to the hegemonic role coal continues to play in global electricity generation. From 2016 to 2017, coal-powered generation not only grew in absolute terms but also increased its share of global electricity generation; concentrating 38.1% of global generation in 2017 against 37.9% during the previous year. Three of the four top coal-power generating countries in the world increased their coal power generation in 2017 (BP 2018). Despite efforts to increase renewable power capacity in China, coal power generators constitute the base of China's electric sector. Coal power capacity, which is already in place and ready for dispatch, will continue to play an important role in China's power sector in the coming years, particularly considering coal power assets' long useful lives. A similar situation is present in India, where coal is plentiful, and in Japan, where coal is used as a base load power substitute for nuclear energy.

Renewable based power generation—excluding nuclear and hydro—increased both in relative and absolute terms. Renewables had the greatest percentage growth in electricity generation from 2016 to 2017. Moreover, renewables increased their share of global electricity generation by 1%, by going from 7.4% of global generation in 2016 to 8.4% in 2017. This increase in renewable generation was mainly driven by China, the US, Germany, Japan and India, where 60% of global renewable generation is concentrated and renewable electricity generation grew above 14%, from 2016 to 2017. Nuclear and hydro, on the other hand, remained at a fairly constant level in terms of electricity generation by growing below 1%, at 0.9% at 0.6% respectively, from 2016 to 2017 (BP 2018).

Despite renewables' current modest contribution to global electricity generation[4] future growth is expected for these energy sources. In 2017, over 61% of the world's new power generation capacity was

[2] See Appendix 3.
[3] Around 91.5% of coal production is destined for electricity generation (Travis 2018).
[4] Renewables remain behind coal, natural gas, hydro and nuclear generation in 2017.

renewable based.[5] During the past ten years prior to 2017, this percentage has oscillated between 57% and 20% (Frankfurt School et al. 2018). Most of the current fossil fuel-based power generation capacity is being replaced by cleaner and renewable power generation assets that will certainly play a greater role in future global electricity generation.

Energy supply in 2017 can be considered as a reflection of the underlying tensions in the global energy market. On the one hand, renewables are certainly increasing in importance, both in absolute and relative terms, in the global energy pool. However, most economies around the globe still largely depend on long-lived fossil fuel assets, such as coal or natural gas generators or traditional fossil fuels. transportation. Oil, coal and natural gas 2017 supply expansions can be thought of as expressions of this underlying resistance for change within the global energy market.

Conclusions and Recommendations

Forecasting the global energy transition seems nearly unattainable. Modelling to a sufficiently extensive manner the diverse technological, economic and institutional processes that affect the different global energy markets, as to provide unambiguously accurate insights, is more than enigmatic. Nonetheless, through careful analysis, it is possible to depict the underlying tensions within the global energy system.

On the one hand, throughout 2017, we have witnessed how primary energy consumption, electricity generation and installed power capacity have increased substantially for renewable and clean energy sources. Thus, indicating a transformation within the global energy sector, particularly in terms of electricity where fossil fuel power generation is being replaced by a new array of cleaner assets.

However, this "green" revolutionary impetus should be confronted to the enduring resistance of the current global economic system. Hydrocarbons remain the fundamental source of primary energy consumption world-wide. The fuels and electricity that sustain today's economies around the globe are refined or generated employing—mostly—hydrocarbons. As proof of this continuous hegemony, in 2017, coal, oil and natural gas consumption and production increased, further complicating the global climate policy scenario. As eloquently stated by the BP Energy Outlook, the energy transition has thereby taken the waltz-inspired pattern of "two steps forward, one step back".

More importantly, the fact that it might be daunting to forecast the global energy transition does not mean that we cannot determine where we *should* be standing in this process. With rising CO2 emissions and pressing climate concerns, global policies should start to consider ways to effectively tackle the gargantuan challenges that lie in front us. Strategies should be designed considering the enduring inertias within the global economic fossil fuel-dependent system. Bridges should be built between what we have now and the energy systems of the future.

[5] See Appendix 4.

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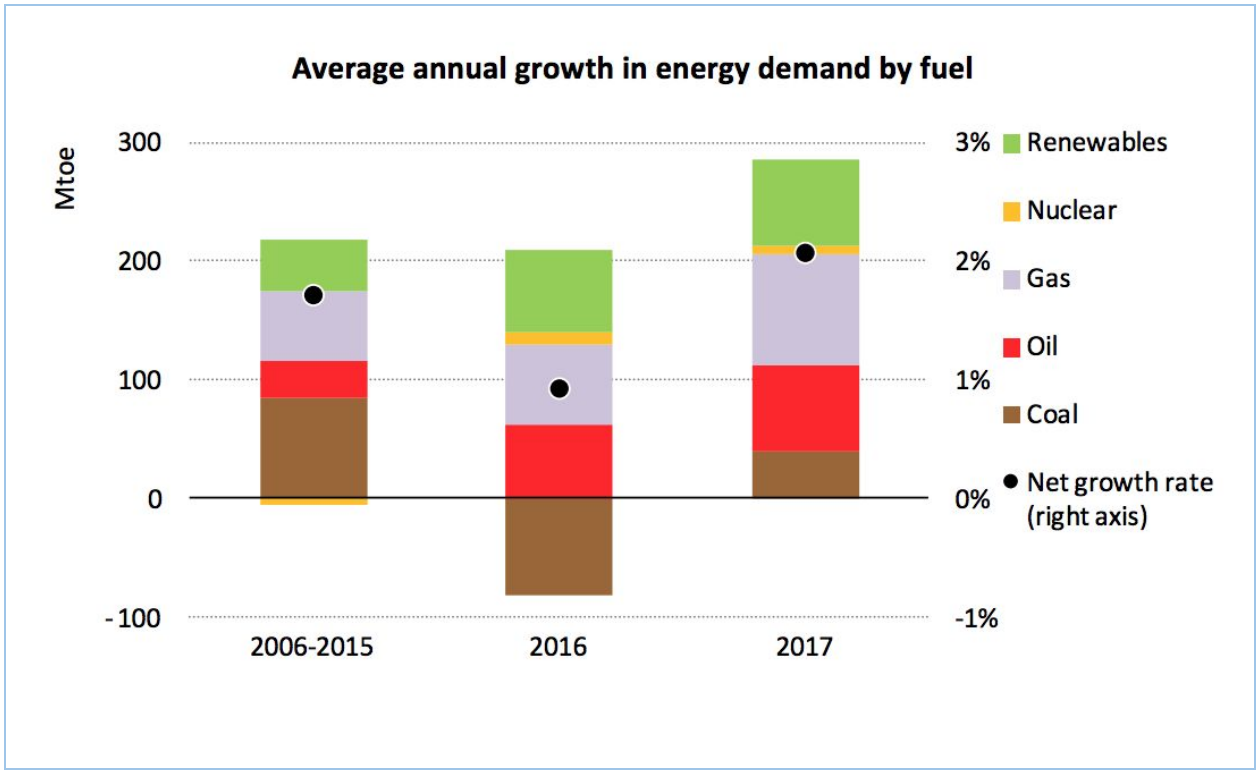
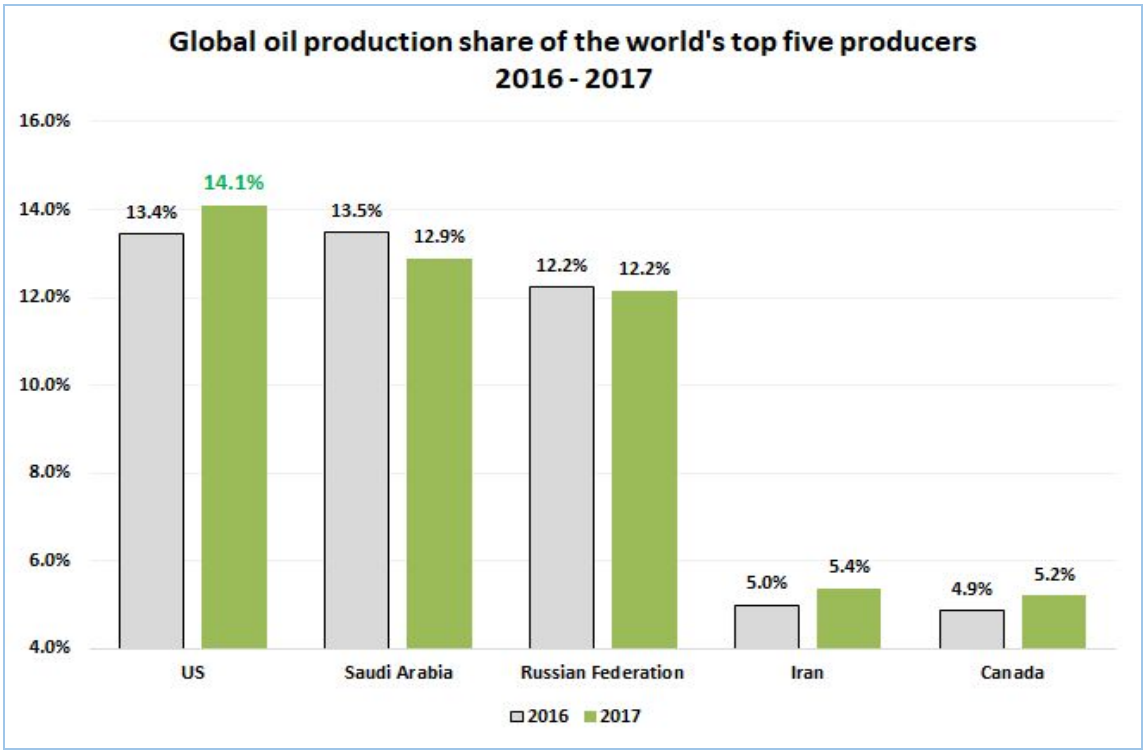
Appendixes

Appendix 1.



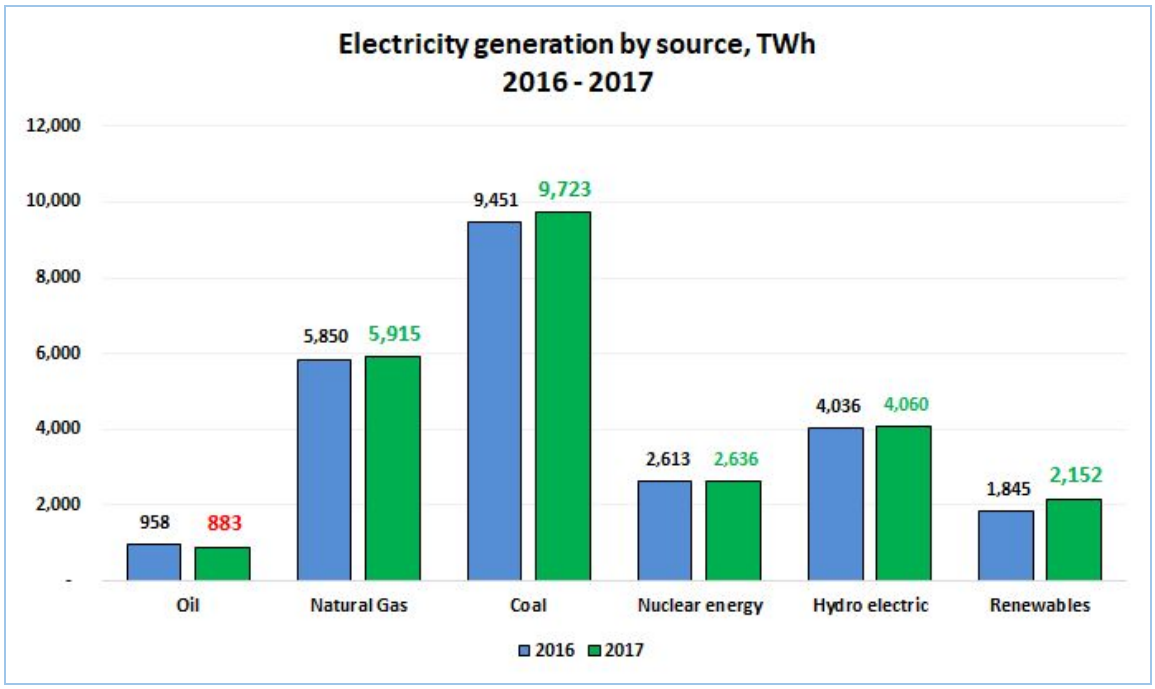
Source: International Energy Agency (2017).

Appendix 2.



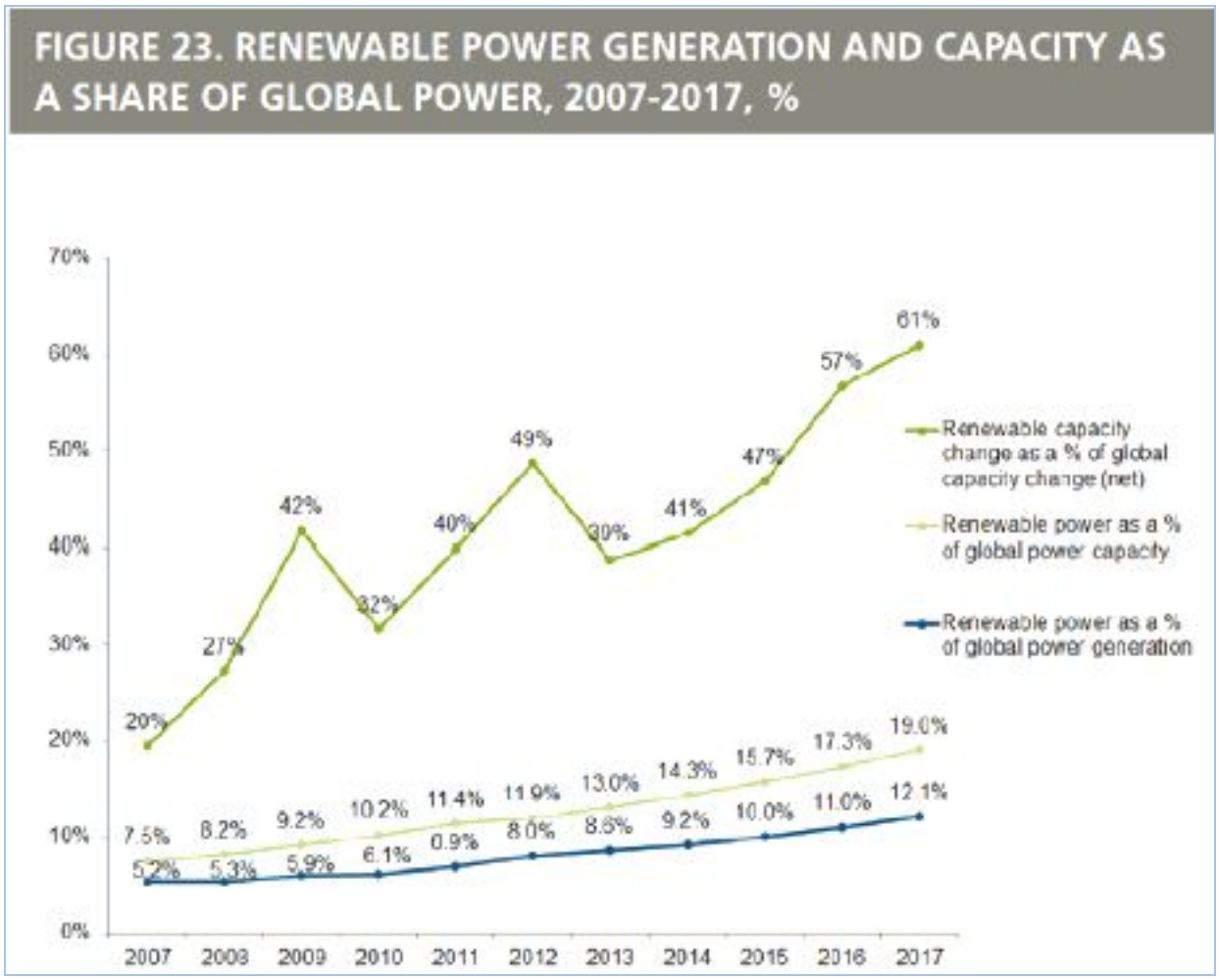
Source: Own production, based on data from BP (2018).

Appendix 3.



Source: Own production, based on data from BP (2018).

Appendix 4.



Source: Frankfurt School et al. (2018: 32).