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Brazil would seem to be in a comfortable situation in achieving its Paris agreement commitments since renewables accounted for 44% of the country's energy matrix as of 2016. In its Nationally Determined Contribution, the country has committed to increasing renewables participation in the energy matrix to just 45%. This indicates that to reach its global emission target in 2030, a major effort must be made by other sectors in the economy, such as Agriculture, Land Use and Forestry.

It is expected, however, that the share of fossil fuel in the Brazilian energy matrix will increase in the future due to the development of oil and gas reserves in the pre-salt area. Therefore, although it seems that Brazil is close to reaching its emissions target in the energy sector, a major effort will be necessary to increase the share of renewables if pre-salt production gives way to an increase in fossil fuel consumption in Brazil. Accordingly, how will the country balance its fossil fuel exploration with the need to increase renewables participation in its energy matrix?

Russia's energy policy, on the one hand, is based on economically sound energy strategies. On the other hand, the Russian government, reacting to the current political situation in the world and trying to impose its agenda, neglects the efficiency criteria in its energy geopolitics. As a result, there is a conflict of interest which leads to delays in Russia's sustainable energy development and promotion of inefficient international energy projects.

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CANADIAN ENERGY RESEARCH INSTITUTE

Brazil: Climate Change Goals and Energy Choices

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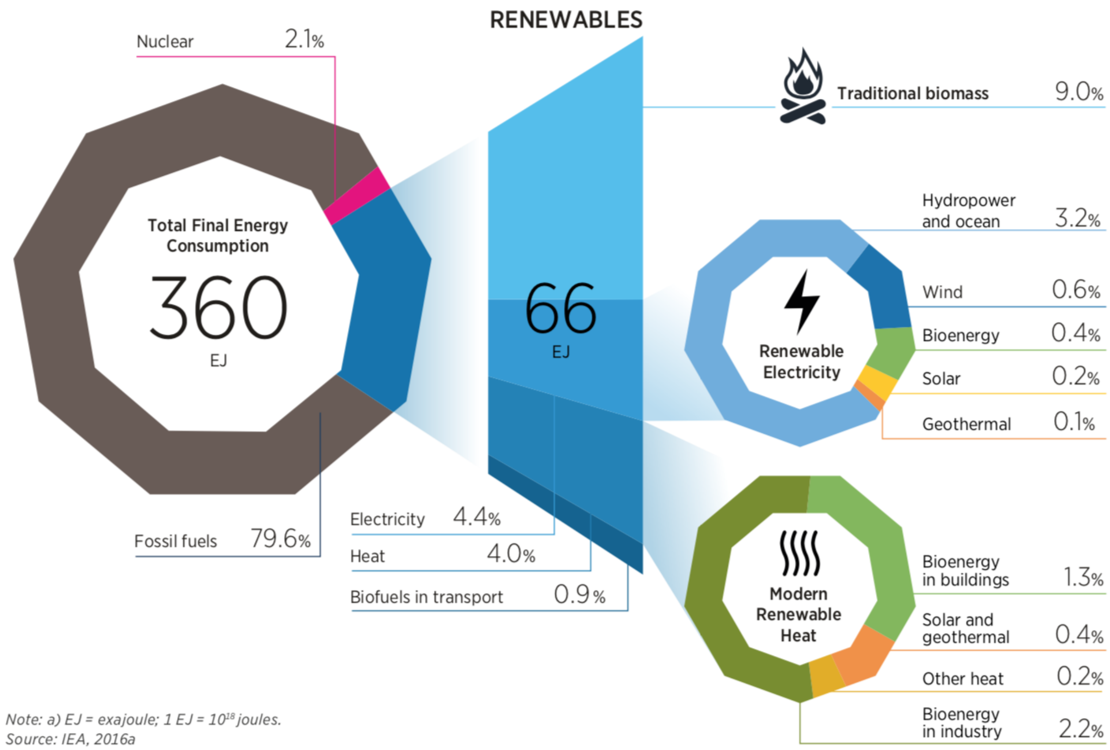
Introduction

With the adoption of the Paris Agreement at the end of 2015 and its entry into force in November 2016, the world's population has committed to acting to combat climate change. To that end, measures need to be implemented to limit the global temperature increase by 2° Celsius by the end of the century, as well as to try to keep this increase close to 1.5° Celsius. The main initiative to reach that goal is to increase the share of renewable, non-greenhouse gas (GHG) emitting sources in the global energy matrix.

In 2014, renewable energy sources accounted for 18.3% of total global energy consumption (Figure 1). This percentage includes both "modern"[1] renewables (9.3%) and the traditional and unsustainable use of biomass (9%). In 2015, countries that signed the Paris Agreement committed to increasing the share of renewables in the world energy matrix to 21% by 2030. However, some studies indicate that this goal will be easily achieved before 2030 due to the "new" renewables (wind and solar sources) great potential in the electric power sector.

Figure 1: Total Final Energy Consumption and Renewable Energy Participation, 2014



Note: a) EJ – exajoule; 1 EF = 10^{18} joules

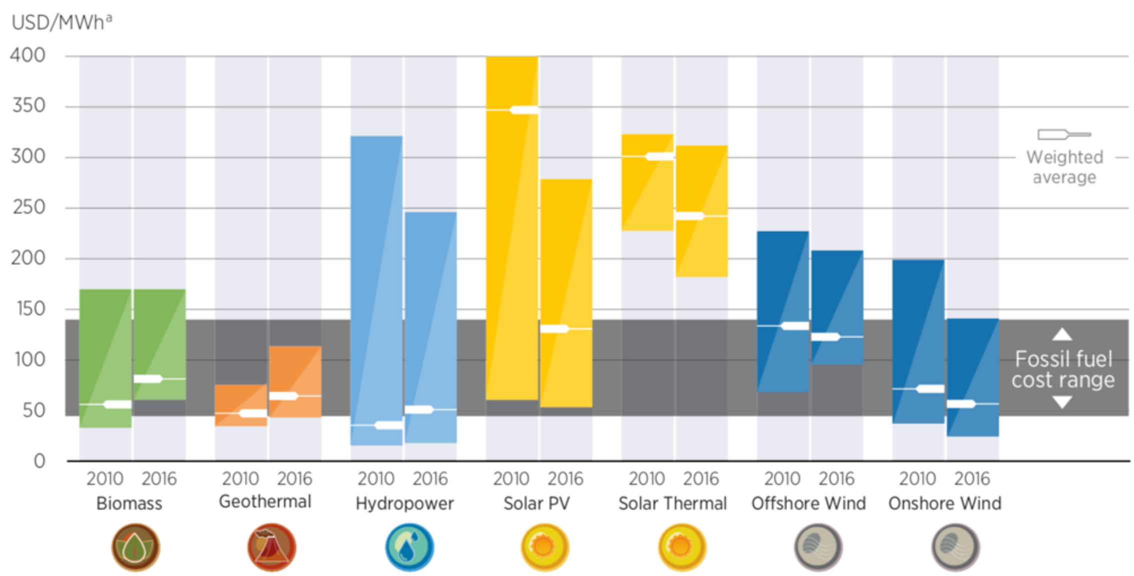
Source: REthinking Energy (IRENA, 2017).

Currently, one in five units of energy consumed already originate from renewable sources. This progress is even clearer in the electric power sector (IRENA, 2017). The advance of new renewable sources is occurring at high speed across the globe. By 2015, these sources accounted for 61% of all new global electric power generation capacity (IRENA, 2016a).[2]

This trend may be related to wind and solar sources increasing competitiveness in the power sector. In the last ten years, these sources have shown significant gains in competitiveness due to rising economies of scale in their production process, increased efficiency, market growth and access to international financial resources. According to the Power Generation Costs Report in 2017 (IRENA, 2018), since 2009, the cost of wind turbines has dropped by about a third, while the cost of photovoltaic solar modules has been reduced by 80%. Between 2010 and 2016, reductions found in the levelized cost of electricity provided by these sources meant that, even without subsidies, solar photovoltaic and onshore wind reached cost parity with traditional fossil fuel sources in several markets (Figure 2). Other non-subsidized renewable sources, such as hydropower, biomass and geothermal energy, are also either competitive or cheaper than coal, oil and natural gas thermal power plants. Consequently, renewables are now, according to IRENA (2017), the first choice to expand, refine and modernize electric power systems around the world, even in times of low oil prices on the international market.

Nowadays, onshore wind generation projects without subsidies can already be compared, regarding average cost, with those of hydro generation and, in some cases, can offer cheaper energy than fossil fuel thermal plants, even when the oil price is at a low level, as stated above. Based on the results of the latest auctions, IRENA predicts that by 2020, more efficient (and non-subsidized) wind and photovoltaic projects will be able to offer energy at a cost below US$30/MWh. This would result in these power sources being more competitive than the cheapest fossil fuel thermal plants (US$50/MWh). Regarding solar photovoltaic, the most competitive projects are in Abu Dhabi, Chile, Mexico, Peru, and Saudi Arabia. In the case of onshore wind, projects with lower energy costs are found in Brazil, Canada, Germany, India, Mexico, and Morocco.

Figure 2: Levelized Cost of Electricity for Utility-Scale Power (ranges and averages)

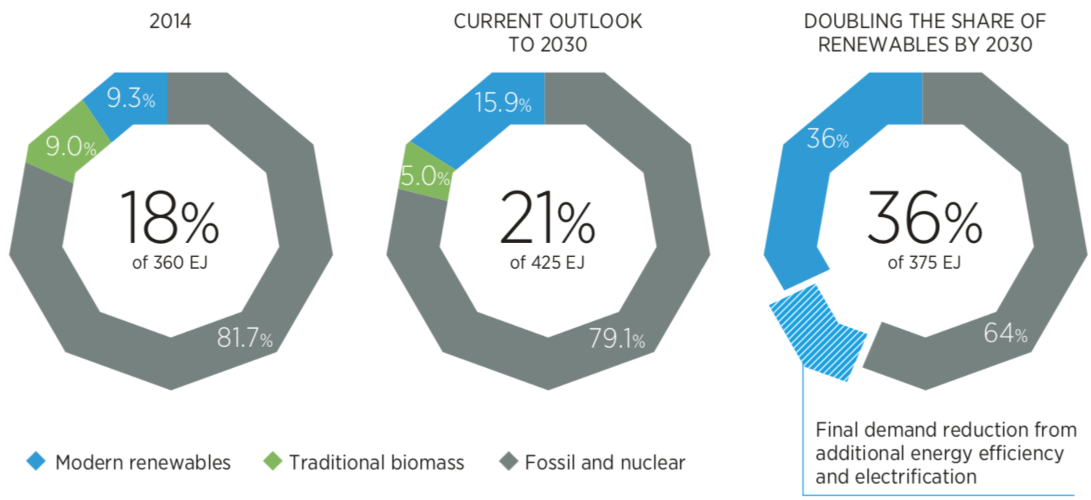


a) MWh – megawatt hour.
b) All costs are in 2016 USD. Weighted Average Cost of Capital is 7.5% for OECD and China and 10% for Rest of World.

Source: IRENA, 2017

Moving ahead on this successful trajectory, renewables' full potential can be further leveraged. Current commitments for their development, such as those undertaken by all signatory countries of the Paris Agreement, lead to the increase in renewables in the world energy matrix to 21% in 2030 from 18.3% in 2016. However, that half of the current 18.3% refers to the use of traditional forms of biomass for cooking and heating. Thus, given the technological developments and the recent accelerated gains in competitiveness, there is even more room for renewables development in the world. IRENA estimates that it would be technically possible and economically feasible to double the share of renewables in the energy matrix to 36% by 2030[3] (Figure 3). For this, increasing efforts in policy design, investments and technological advances are necessary. These three areas have already contributed greatly to the progress made so far by renewable energies in the world, but they can contribute more.

Figure 3: Estimated and Projected Share of Renewable Energy in Total Final Energy Consumption, 2014 and 203, under Current Outlook[a] and of Doubling Scenario[b]



[a]Mid-2015
[b]In the doubling scenario, reduction in final energy demand is due mostly to energy efficiency improvements. The rest of the reduction is due to electrification, which cuts final energy demand but not necessarily primary energy demand.

Source: IRENA, 2016d

The possibility of increasing renewables participation in the global energy matrix is good news given that current commitments will not be enough to limit global warming to sustainable levels. A study prepared by the United Nations, "The Emissions Gap Report 2016," states that even if all the efforts of the current NDC – which are the commitments made to implement the Paris Agreement – are put into practice, global temperature increase is likely to surpass 2° Celsius by the end of the century. Also, at today's levels, renewable energy investment is not enough to achieve the targets agreed worldwide. Government and the private sector worldwide need to work together to increase investment in renewables.[4]

In this context, Brazil would be, theoretically, in a comfortable position. In 2016, renewable sources accounted for approximately 44% of the Brazilian energy matrix (EPE, 2017),[5] a figure quite close to the NDC's 45% target for the participation of these sources in 2030. Several specific issues in the Brazilian energy sector, however, need to be considered before stating that the country has already finalized its transition in the energy sector.

Geopolitics of Renewables

In addition to the IRENA study (2017), the IEA (2016) considered several scenarios in which renewables reach a 30-45% share of the energy matrix in 2040 and 50-70% in 2050. Thus, it is important to analyze how the massive insertion of renewables can alter the current geopolitics. According to Sullivan et al., 2017,[6] some new geopolitics of renewables would affect the following areas:

1) **Supply chain of crucial materials:** The development of cartels involving countries that have scarce materials reserves can increase their influence worldwide. A good example is lithium, abundant in Chile, Bolivia and Argentina, and that is now widely used in batteries, such as those in electric vehicles. At the same time, China and Russia now hold more than half the rare earth element reserves,[7] especially China, which is quite advanced regarding mining, production and processing these materials.

2) **Technology and finance:** The distribution of resources and technology between developed and developing countries can trigger strategies of cooperation or rivalry, such as transfer of technology amongst them or potential conflicts for development and subsequent sharing of energy infrastructure among those involved. There is a question, however, as to

whether renewables expansion will happen through small enterprises or start-ups (decentralized and distributed, investing in revolutionary options) or large state-owned and private companies (such as Total, which acquired a solar panels start-up for $1.4 billion). The intellectual property sector will also gain. Patent development will become an important negotiating factor, as it will provide countries that invest heavily in research and innovation, an advantage over those who only have the resources.

3) **New "resources curse":** With the decline of oil-producing countries (which will lose much of their revenues in the entire oil and gas production system), new routes emerge for countries producing and exporting renewable energy or for those rich in unique elements such as rare earth metals (potential generators of conflicts between countries that own metals and those that own technologies in which they will be applied). Some mitigating factors, such as the fact that most renewable resources require a surface area and are not subject to a specific location, and the fact that cooperation among different economic and government sectors for renewables development is required, also can avoid the possibility of a "Dutch disease".

4) **Smart power grids:** The concept of *supergrids*, which consists of creating a multinational electricity network, benefits the integration between energy import nations (which do not have renewable resources) and energy exporting nations (which have the resources) and can generate positive or negative results because, while international energy trade can generate conflicts in importing countries (where regions that create conflict can be disconnected from the grid), it can also increase interdependence between countries by creating new alliances (in order to promote security).

5) **Reduction of oil and gas demand:** For oil-producing countries, political and economic reforms are expected to take place given the instability that will be caused by the sector's decline. In this light, some countries are looking for alternative sources and means to increase energy efficiency, while others are already preparing for possible retaliation, reinforcing their economic and security strategies. Even so, it is not possible to say that, in a world of renewable energies, regions like the Middle East will lose their importance, since in a time of oil scarcity countries that produce it at the lowest possible cost will be one step ahead of others. At the same time, oil consumer countries will acquire it less, save resources, and may even become exporters of technology or renewable energy (Chile, Jordan and Morocco are in this profile because they were large importers of oil and currently invest heavily in renewables).

6) **Climate change:** Climate change has been an issue studied by geopolitical experts and even national defence and security specialists as it can lead to a shortage of crucial resources such as food and water. This can cause serious political instability and even increase violence rates. On the other hand, reducing greenhouse gas emissions could reduce conflicts over climate change. African countries, for example, are constantly suffering from conflicts and mass migration motivated by climate change.

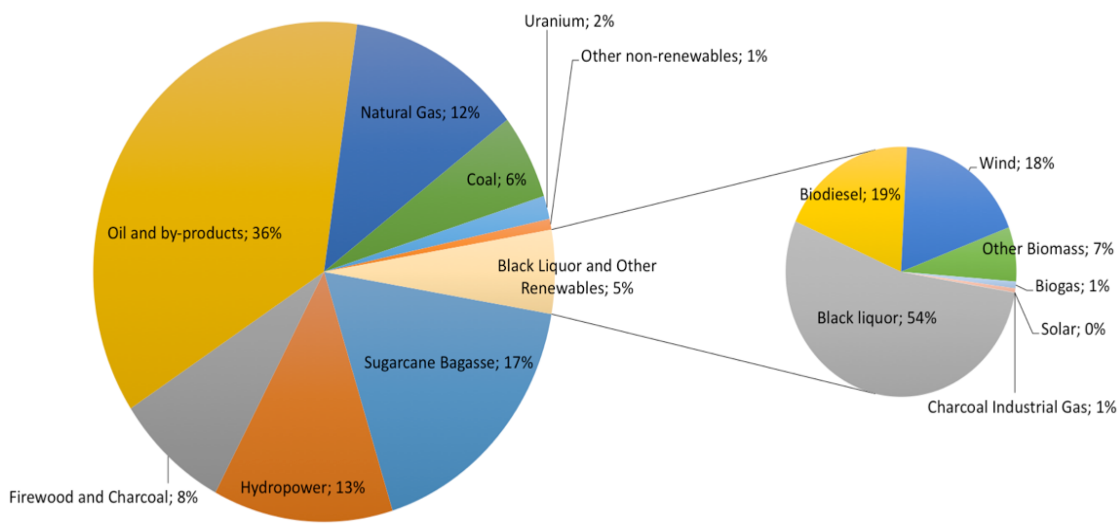
7) **Access to sustainable energy:** Energy poverty has different implications: adverse effects on human health, low economic development, fewer employment opportunities, poor access to education and risks to the environment. This causes serious internal and external problems for a country. Access to new forms of energy has the potential to change this pattern, mainly through decentralized options and, in general, in small and medium scale.

The Paris Agreement and the Brazilian Energy Choices

In its Nationally Determined Contribution (NDC), Brazil has committed to reducing its greenhouse gas emissions in relation to 2005 by 37% until 2025 and possibly by 43% until 2030. Given the Brazilian emission profile, much of the reduction efforts under the Paris Agreement are related to the Agriculture, Land Use Change and Forestry sectors.[8] Although comparatively, the energy sector emits less than those sectors combined, emissions reduction is also expected from it.[9]

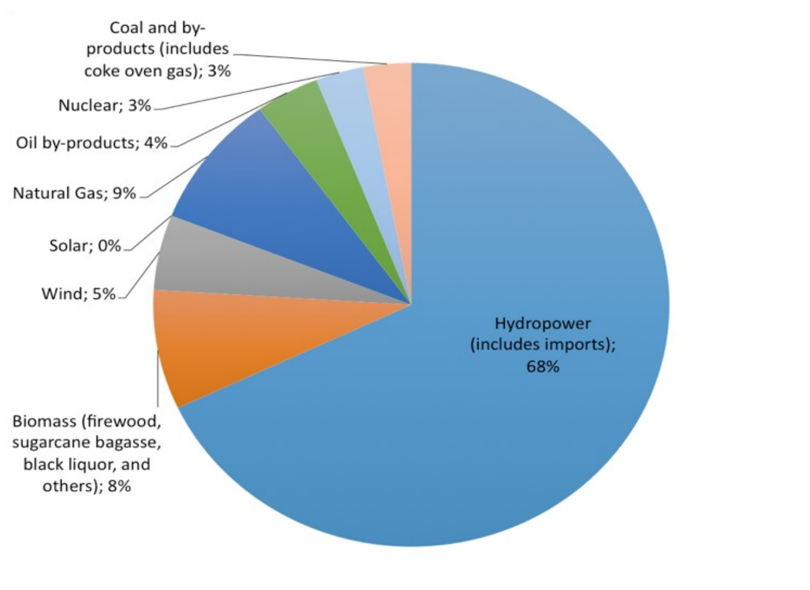
The Brazilian NDC does not have emission reduction targets by economic sector, but it does contain several indications on how the energy sector can collaborate to achieve these goals. Among these recommendations, it is worth highlighting the increase (or rather, maintenance) of the share of sustainable bioenergy[10] in the Brazilian energy matrix to 18% and the share of renewable energy in the energy matrix to 45%. To this end, the share of renewable sources in the energy matrix (besides hydropower) should increase between 28% and 33% by 2030. Domestic use of non-fossil and non-hydro energy sources in the supply of electric power is expected to increase to at least 23% by 2030, through the increase in wind, biomass and solar energy participation. Also, efficiency gains of around 10% are expected in the electric power sector by 2030.[11]

Figure 4: Internal Energy Supply – Brazil, 2016



Source: EPE, 2017[12]

Figure 5: Electric Power Matrix – Brazil, 2016



Source: EPE, 2017

After analyzing Figure 4 and Figure 5, it can be argued that the Brazilian NDC was not very ambitious towards increasing renewables participation since in 2016 these already represented 44% of the Brazilian energy matrix and bioenergy already represented 18.5%. Nevertheless, increasing the use of renewable sources besides hydropower in the Brazilian energy matrix will require substantial additional investments in the coming years to meet the agreed targets.

For example, a study conducted by *FGV Energia* with the Ministry of the Environment (MMA)[13] shows that, in order to meet the targets set in the Paris Agreement for 2030, considering energy efficiency gains in the electric power sector of around 10%, R$ 430 billion of investments are needed to expand the Brazilian electricity grid to meet an incremental demand of 118,807 MWh. Regarding this amount, it is important to highlight that 35% would be due to wind power expansion, 19% to solar power growth and 5% to the development of biomass plants. This means that investments in new renewables would account for approximately 55% of the Brazilian electric power matrix planned expansion by 2030. Also, it should be noted that *FGV Energia's* study estimated that it would be necessary to invest 3% of that total investment in new natural gas thermal power plants to mitigate variability and inflexibility of new renewables. Taking into account emissions and investment levels, this was the best cost-benefit option identified by the study.

Besides compensating for the inflexibility of new renewables, using natural gas in thermoelectric generation is an option that Brazil should take into consideration due to new production volumes expected from the pre-salt exploration area. Oil and gas were discovered in this deepwater area in 2008, which now accounts for 50% of all domestic crude oil production, and almost 30% of all natural gas produced in Brazil. There are currently many projections on the increase in Brazilian production due to the huge exploratory effort devoted to the pre-salt area since its discovery, in addition to the already announced calendar of bidding rounds of these exploratory areas. The intense exploratory effort that the country has carried out will inexorably result in a substantial increase in oil and gas production. For Petrobras alone, for example, production is expected to reach 3.4 MM Boe/d in 2022, which will account for nearly 1 MM Boe/d more oil and gas production on the market in the next four years. Given that there are no indicators that support a considerable increase in oil and gas consumption in the Brazilian market for the next few years, this surplus should be destined to exports. The issue here is whether there will be demand for all this oil and gas in the world because of new renewable energies.

A larger exploration and use of fossil fuels may impact the emissions profile of the Brazilian energy sector. In particular, in the electric power sector, the greater use of natural gas can have two effects: if it is used to replace fuels that emit more greenhouse gases in thermoelectric generation, such as diesel or coal, the impact on emissions would be beneficial.[14] On the other hand, if natural gas thermoelectric generation replaces hydroelectric generation, which is becoming increasingly variable due to climate change, GHG emissions from the electric power sector are expected to increase. These are issues that the Brazilian planner needs to consider when using pre-salt natural gas to generate electricity.

In addition, as already mentioned in the previous section, it is understood that the current NDCs commitments will not be sufficient to achieve the Paris Agreement goals. More global ambition is needed in reducing greenhouse gas emissions, including from Brazil.

Therefore, while it appears that Brazil is close to meeting its emissions target in the energy sector, a greater effort will be required to increase the share of renewable energy if pre-salt exploration is increased. Consequently, how will the country balance the exploration of fossil fuels with the need to increase the share of renewable energies in its energy matrix?

These are issues that the Brazilian society needs to consider when planning its future energy matrix. At this time, the national energy sector has already reached or is very close to meeting what was settled in the Paris Agreement. Very soon, however, it is possible that the Brazilian NDC will be revised to consider more ambitious goals. In addition, since the domestic production of fossil fuels is likely to increase, other actions may be required for the country to maintain its climate targets.

The share of renewable energy sources worldwide has been growing because it is necessary to fight climate change. As these sources reach scale, their costs fall. They are already competitive with fossil fuel energy sources in many markets.

Final Remarks

This is good news for Brazil, which will need to invest significantly in renewable sources despite its not so ambitious NDC. Therefore, any reduction in the cost of renewable technologies will result in significant savings that will be passed on to Brazilian consumers through their electricity bill. In addition, the fall in costs of new generation sources, especially photovoltaic solar, will collaborate to increase development of distributed generation. In February 2018, according to data from ANEEL, Brazil already had an installed capacity of photovoltaic solar of 194 MW, and the Government's Energy Research Company – EPE (in its 2026 projections) estimates that the country can potentially develop 3.3 GW until 2026. This increase in the Brazilian distributed generation will contribute to increasing the capacity of clean energy generation.

On the other hand, Brazil has also been expanding its fossil fuel production through the increase in pre-salt exploitation. Pre-salt natural gas can be used to compensate for variable renewable electric power generation and to replace more polluting sources such as diesel and coal. Nevertheless, to maintain its climate goals, or even to make them more ambitious, Brazil needs to consider how to promote diversity in its energy matrix while also focusing on low greenhouse gas emissions. This is a trade-off that the Brazilian society will need to discuss soon.

About the Authors

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Endnotes

[1] Including solar power and heat, wind power, hydropower, ocean energy, geothermal power and heat, and modern bioenergy.
[2] IRENA (2016a), *Renewable Capacity Statistics 2016*.
[3] Even without the unsustainable use of biomass as it is today.
[4] For more details on how global investment in renewables can be leveraged, see IRENA, 2017.
[5] Energy Research Company - EPE. "National Energy Balance 2017, Synthesis Report, base year 2016". June 2017.
[6] Sullivan, M. et al; 2017 "The Geopolitics of Renewable Energy". Columbia, Harvard Kennedy School.
[7] Rare earths or rare earth metals are a group of 17 chemical elements, of which 15 belong to the group of lanthanides in the periodic table of elements, to which are added scandium and yttrium, elements that are found in the same minerals and present similar physic-chemical properties. The main economic sources of rare earths are the monazite, bastnasite, xenobiotic and loparite minerals and the lateritic clays that absorb ions.
[8] Such as: strengthen compliance with the Forestry Code; restore 12 million hectares of forests; and end illegal deforestation in the Brazilian Amazon. For more details, see: "Intended Nationally Determined Contribution towards Achieving the Objective of the United Nations Framework Convention on Climate Change" Federative Republic of Brazil: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf
[9] Brazilian emission profile can be accessed at: http://cait.wri.org/profile/Brazil
[10] Sustainable bioenergy is defined as sugarcane and biodiesel products.
[11] "Intended Nationally Determined Contribution towards Achieving the Objective of the United Nations Framework Convention on Climate Change" Federative Republic of Brazil: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf
[12] Energy Research Company - EPE. "National Energy Balance 2017, Synthesis Report, base year 2016". June 2017.
[13] http://www.mma.gov.br/images/arquivos/clima/ndc/documento_base_ndc_2_2017.pdf
[14] See, for example, the US greenhouse gas emissions profile, which is decreasing as natural gas replaces coal in electric power generation.

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Russian energy policy can be roughly divided into the Russian geopolitics of energy and domestic energy policy. While domestic energy policy is determined by economic rationality and implemented in accordance with Russian economy development, Russia's geopolitics of energy is highly politicized and largely based on goals and personal preferences of the Russian government. To have some landmarks for making current energy policy decisions, the Russian government released its Energy Strategies, which provided the following information:

- the main trends and forecasts of the socio-economic development in Russia;
- the interactions between the economy and the national energy industry;
- the prospects of demand for Russia's energy resources; and,
- the forecast of the Russian energy industry development.

There have been four energy strategies since the fall of the Soviet Union. Each strategy has changed the principles of state policy towards the energy industry, quantitative parameters and qualitative characteristics for energy industry development.

Russia's energy policy under the new economic conditions of the collapse of the Soviet Union was first proclaimed in May 1995. The Presidential Decree approved the "Major Directions of Energy Strategy of Russia for the Period up to 2010" (ES-2010). The first Energy Strategy was accepted at the time when the role of the energy industry in the Russian economy declined rapidly. Oil production fell from 516 mln t in 1990 to 311 mln t in 1995. Gas production for the same period decreased from 590 bcm to 544 bcm. Coal production fell from 405 mln t to 270 mln t.

This abrupt fall of the energy industry production aggravated the deep economic crisis that occurred after the collapse of the USSR, which in turn resulted in a decrease in energy investments. The annual amount of energy investments in comparable prices was reduced by half over the period from 1990 to 1995. The lack of the investments made it impossible to maintain the production capacities of the energy industry and to construct new power plants. This led to an increase in the average age of the generating plants.

The main goal of ES-2010 was to develop ways to restore the stable operation of the energy industry, as well as to improve energy efficiency. ES-2010 encouraged domestic natural gas use and the rapid development of the oil and gas industry to overcome the recession of the economy.

In 2003, the government approved a new version of the "Energy Strategy of Russia for the period up to 2020" (ES-2020). The second energy strategy's main priorities were reliable energy supply to consumers, energy cost savings, energy efficiency enhancement, and ecological safety. During the period from 2003 to 2009, the Russian government carried out the following reforms:

The electricity market was liberalized.[1] The reform involved three stages. At the first stage, the generating, network and retail companies were divided from RAO UES (the state-owned electric power holding company in Russia). At the second stage, Territorial Generating Companies (TGC) and Wholesale Generating Companies (WGC) based on the assets of RAO UES were established to participate in the wholesale power market. The Wholesale Generating Companies integrated power plants specialized in the production of electric power only. The Territorial Generating Companies produced heat along with electric power. At the third stage, the wholesale electricity market formation was completed.

The nuclear energy industry was reformed. In 2007, the Russian government abolished the Federal Atomic Energy Agency, and the State Atomic Energy Corporation "Rosatom" was founded. The Russian nuclear industry was restructured, and the vertically integrated holding company started to control all stages of nuclear energy production (from uranium mining to fuel production to the construction of reactors and power plants).

The rise of oil prices in the period from 2001 to 2008 allowed Russia to implement its plans to increase oil and gas production.[2] Russia's crude oil production was forecast within the ES-2020 to be 490 mln t in 2010; the actual production level was 511.8 mln t. In 2010, natural gas production was less than the planned 635 bcm by 46.1 bcm. Also, the goal of renewable energy development was also not achieved. In that period Russia consumed 0.1 toe per year from renewable energy sources (excluding hydropower).

In 2009, the third Energy Strategy ("Energy Strategy of Russia for the period up to 2030" (ES-2030)) was approved by the government of the Russian Federation**.** The main topic of ES-2030 was the transformation of the Russian energy industry into a driver of Russia's economy development.

Though energy production, domestic energy consumption and oil and gas exports were within or close to the expectations within ES-2030, the development of the energy industry did not ensure full achievement of the target indicators. By 2017, the Russian energy industry had not made significant improvements in its energy and economic efficiency. The old problems such as the low amount of investments and sensitivity of the national economy to oil price fluctuations remained. In addition, during that period, along with a growth of the share of hard-to-recover hydrocarbon reserves, no progress was made in oil recovery enhancement and increasing the depth of crude oil production.

The next "Energy Strategy of Russia for the Period up to 2035" (ES-2035) was prepared to consider the growing competition between energy producers, the increasing consumption of renewable energy sources, and the beginning of a transition to sustainable energy. Such issues as the Russian economic crisis and sanctions against the Russian energy industry greatly influenced the development of ES-2035. The crisis has led not only to a temporary decline in economic activity but also to a long-term slowdown in economic growth due to severe institutional constraints on producers. ES-2035 assumes that Russia will have GDP growth lower than in ES-2030. According to ES-2035, the key targets for Russia will be the following changes in economic indicators:

- GDP growth rate would be 2%-3% annually;
- electricity consumption would rise from 1064 TWh in 2015 to 1380-1420 TWh in 2035;
- total domestic energy demand would rise by 13-16% for the period under consideration;
- energy intensity of GDP would decrease by 34% in 2035, the same level of energy intensity as in 2015.

ES-2035 conforms to all the objectives claimed in ES-2030 (getting access to energy markets of other countries; ensuring the reliability of energy supplies; increasing the efficiency and profitability of the energy industry; diversification of energy sources). However, there are new issues in the current Russian energy strategy. These include:

- changes in the assessment of Russia's position in the world energy market for the period up to 2035;
- tax changes, including the transition from a severance tax to a profit-based tax on the oil industry;
- introduction of a set of measures for human capital development.

Despite the importance of ES-2035, it does not determine decisions of the government in any given situation. In the case of domestic energy policy, it contains landmarks which help the Russian government make its current energy decisions. Meanwhile, the Russian geopolitics of energy is mainly based on the government's current political preferences. This has resulted in some inefficient and risky international energy projects being implemented. For example, one of the most debatable decisions was the construction of new oil and gas export pipelines. Another example is that the Russian government has made several attempts to expand energy cooperation with China by implementing risky and probably inefficient construction of power plants to export electricity.

Despite those challenges, over the past 15 years, Russia's exports of crude oil have increased from about 150 mln t to 257 mln t, and the existing oil export network is more than enough to deliver crude to consumers.

Some studies reveal that there remains a considerable surplus of Russia's oil export pipeline capacity.[3] In 2016, Russia exported 177.4 mln t of crude oil to Europe and 62.5 mln t to China and Japan. About 90% of the oil was transported by Transneft, the national oil pipeline operator, through five main pipelines:

- the Druzhba pipeline for direct oil sales to European refineries (full design capacity of 69.5 mln t of oil per year);
- the two pipelines of the Baltic Pipeline System (BPS-1 and BPS-2) for oil exports via Russian ports on the Baltic coast (106 mln t);
- the Novorossiysk pipeline for oil exports through the Black Sea port of Novorossiysk (50 mln t); and
- the Eastern Siberia-Pacific Ocean oil pipeline (ESPO) for oil sales to Asian markets (45 mln t).

The total capacity of the five pipelines is 270.5 mln t. With the consideration of additional export outlets for Russian crude oil, the total Russian pipelines export capacity is 323 mln t. It exceeds the amount of the Russian oil export in 2017 which was 257 mln t. Moreover, ES-2035 assumes an increase in oil export up to 308 mln t in 2035 which will not exceed the current export capacity.

There is also surplus capacity for Russian natural gas exports. Nowadays there are four main gas export pipelines:

- Nord Stream gas pipeline (55 bcm);
- Yamal-Europe gas pipeline (33 bcm);
- Ukraine transit route (142 bcm);
- Blue Stream gas pipeline (16 bcm).

A. Vatansever[4] shows that in 2014 Russia's gas pipeline export capacity exceeded actual export flows by 107.6 bcm. In this situation, the decision to build additional gas pipelines is politically motivated. At the same time, Gazprom announced plans to bypass Ukraine as a transit country by 2019. This can be done by constructing two new gas pipelines (the Turkish Stream and the Nord Stream-2). With both pipelines built, Russia will be able to export 340.5 bcm of gas to Europe, whereas in 2016 the export was 166.1 bcm.

Another important area where the Russian government's geopolitical views prevail over economic efficiency is energy cooperation between Russia and China. The traditional direction for Russia's oil and gas export was to the countries of Europe. However, with increased tension between Russia and Europe, Russia turned its attention on energy cooperation to the countries of the Asia-Pacific Region and China in particular.

China's energy market could be valuable for Russia because of the following factors:[5]

1. China is the largest consumer of energy resources in the world (22% of the world demand) with potential for future growth of energy consumption. Its total primary energy consumption per capita is 2-3 times lower than other developed countries.
2. As China's energy production does not fully meet its need in primary energy resources, its import covers 66% of domestic crude oil demand, 34% of gas demand, and 11% of coal demand.

Petersen and Barysch[6] demonstrate that the energy relationship between Russia and China is complex. The Russian government more than once announced plans to increase significantly gas and electricity exports to China. However, Russia's "turn to the East" has not happened. In recent years, there have been limited achievements in energy cooperation between Russia and China. However, the great hope of a gas supply infrastructure connection with China has yet to occur.

In 2014, a gas agreement between Russia and China was signed. According to the agreement China was promised gas supply of 38 bcm annually over 30 years starting from 2018. Natural gas was planned to be transported through the Power of Siberia gas pipeline and the Power of Siberia-2 ("Altai") gas pipeline, which was planned to be constructed. Due to the drop in oil prices (to which gas prices were linked), lack of funding, and China's economic growth slowdown, the new pipeline construction project was postponed. Moreover, negotiations between the two countries on terms of the gas supply from Sakhalin Island had reached a deadlock. As a result, there has been no change in gas exports to China.

Large-scale export of electricity from Russia to China is another politically motivated project of the Russian government.[7] In 2016, during the Eastern Economic Forum in Vladivostok, the president of Russia highlighted the Asian Energy Ring project. The Asian Energy Ring would connect the grid systems of Russia, Mongolia, China, Japan, and South Korea, giving the opportunity to increase cross-country electric power flows. However, because of high risks, questionable economic efficiency, technological complexity, and the need for multilateral negotiations, the work on this project has not yet started.

The export of electricity from Russia to China started in 1992 through the 110 kV Blagoveshchenskaya-Heihe and 220 kV Blagoveshchenskaya-Aygun transmission lines. The export did not exceed 200 mln kWh per year. In 2007, since an agreement on electricity price had not been achieved, Russia stopped exporting electricity to China. Electricity exports resumed in May 2009. By 2013, electricity exports increased and over the period from 2013 to 2015, annual electricity exports were about 3.3 bln kWh.

In order to increase the electricity export from Russia to China, additional generation capacity is being considered. The project calls for the construction of three new coal power plants in the Amur Region and Eastern Siberia, with total installed generating capacity of 6 GW. The implementation of the project has great risks. Given that the Russian Far East nowadays has 9.2 GW of generating capacity, which is sufficient to meet the demand for electricity of the regional economy, construction of a further 6 GW would create the dependence of Russian energy companies on only one consumer, namely China. Besides, there is no technical opportunity to change the export flows of electricity from the Russian Far East to the Central Federal District, and to other countries, where the additional electric power could be consumed. The situation is aggravated by the fact that China's dependence on the Russian electricity export would be insignificant, considering the amount of electricity consumed by China. Therefore, the construction of three new power plants would create a situation in which China would be able to dictate to Russia its terms about the electricity price.

Most of the international energy initiatives of the Russian government confirm the ambiguity of Russia's energy policy. Russian domestic energy policy is based on the energy strategies, which were developed with regard to economic and technical efficiency. At the same time, the Russian geopolitics of energy depends on the current international situation with little concern for economic efficiency. Since at present one of the main geopolitical goals claimed by the Russian government is to increase Russia's influence on the world energy market, rather than transition to sustainable energy, there is a conflict of interests between two parts of the Russian energy policy. As a result, domestic energy policy adapts to the geopolitical goals, which leads to underfunding of innovative projects and to increasing energy production along with construction of new oil and gas export pipelines. The Russian energy industry follows not an intensive path of development, but rather an extensive one. There is no fundamental work done by the Russian government to overcome obstacles to sustainable energy. In the long term, this will lead to increasing the technological gap between Russia and developed countries, as has already happened with Russia in the case of development of renewable energy technologies.

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