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Global Investment in Renewable Energy: Evolutions and Challenges Brought by Covid-19 Crisis*

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Abstract

Investments in renewable energy are considered a major objective of sustainable economic development all over the world as they are a driver of technological progress and a cornerstone in combating climate change. Our paper aims to present the progress made on investments in renewable energy globally, but also to highlight, through a comparative quantitative analysis, the impact of the COVID-19 crisis in the field. The research methodology is based both on a screening of the most relevant global reports, but also on the use of case studies presenting progress and challenges in two of the most advanced economies: US and China, given that prior to the COVID-19 crisis both states had ambitious targets for the development of renewable energy. The concluding part of the paper will present whether the pandemic crisis and its economic impact are an impediment to investments in renewable energy or may bring some opportunities for the future of these clean energy.

Keywords: Renewable Energy, Investment, US Economy, China Economy, COVID-19 Crisis

Introduction

It is now unanimously accepted that renewable energy represents a key element of sustainable economic development around the world, while some studies show that investment in renewable energy remains an indispensable factor for the technological progress, but also a guarantee of prosperity for the future generations (Aslani, 2013).

Although it is currently well known that renewable energy development programs are one of the most important challenges for both advanced economies and developing countries, numerous analyses (Aslani et al., 2012; Damon, Sterner, 2012; Filibi, Alonso, 2012) indicated that in all these economies the authorities are developing strategies for a greater involvement of the private sector in making investments in the field, thus being more likely to achieve the ambitious targets in the field. It is worth mentioning that according with Global Trends in Renewable Energy Investments 2020 Report (GTR, 2020), both governments and companies around the world have committed to adding some 826 gigawatts of new renewable power capacity in the decade to 2030, at a likely cost of around $1 trillion.

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Considering the importance of involving private investors in renewable energy, our analysis aims to highlight the economic impact of the COVID-19 crisis in the field against the consequences of the pandemic, highlighting the pre and post pandemic situation in two advanced economies: USA and China. While COVID-19 crisis has slowdown deal-making in renewables in recent months, along with that in other sectors, it is undoubtedly that the pandemic economic consequences will affect investment levels in 2020. However, our research aims to highlight if the COVID-19 crisis may also enable governments to tailor their economic recovery programs to accelerate the phase-out of polluting processes and the adoption of cost-competitive sustainable technologies.

Investments in renewable energy in 2019 - global trends and challenges

According to the report "Global Trends in Renewable Energy Investments 2020" (GTR, 2020) in 2019, private investors have contributed massively to the financing of renewable energy globally, while supporting the energy transition to sustainable economic development. The report shows, in 2019, a net increase in global renewable energy capacity, which increased by a record 184 gigawatts (GW). However, in 2019, total investment costs were only 1% higher, amounting to 282.2 USD billion. Meanwhile, the full cost of electricity production has continued to fall for solar and wind energy, amid technological advances and fierce competition in the field.

In 2019, several of the trends highlighted in previous years in terms of investments in renewable energy continued. Thus, the overall level of investment amounted to 282.2 USD billion, an increase of 1% compared to 2018 with a continuous decrease in costs for solar and wind energy, and China remained the world leader in investments in renewable energy (Chart 1), although the US recorded the largest increase in these investments compared to the previous year (Table 1).

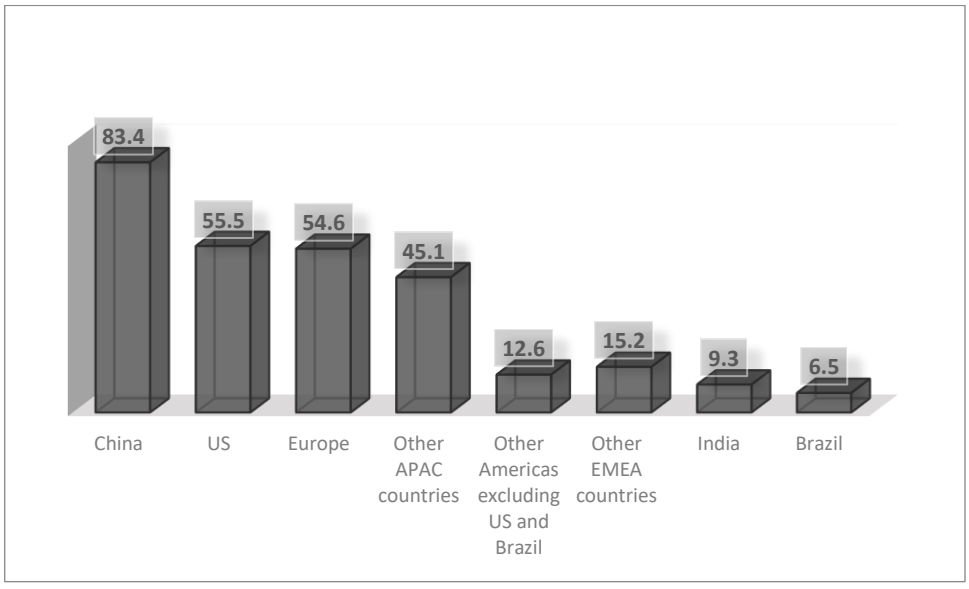

Chart 1: Global ranking of renewable energy investments in 2019 (USD billion)

Source: Authors based on the GTR 2020 Report.

Note on abbreviations: The EMEA includes countries in Europe, the Middle East and Africa, and the APAC includes countries in the Asia-Pacific region.

As can be seen from table 1, in 2019, Taiwan recorded the most spectacular increase in investment in renewable energy compared to 2018, while the first ranked (China) recorded a decline compared to the previous year.

Table 1: Investments in renewable energy in 2019, compared to 2018

Country	Investment in 2019 (USD billion)	Growth, compared with 2018
China	83.4	-8%
US	55.5	28%
Japan	16,5	-10%
India	9,3	-14%
Taiwan	8.8	390%
Spain	8.4	25%
Brazil	6.5	74%
Australia	5.6	-40%
Netherland	5.5	25%
United Kingdom	5.3	-40%

Source: Authors based on the GTR 2020 Report.

Even in the face of the economic difficulties generated by the COVID-19 pandemic, renewable energy have proved their resilience (Chart 2), but according to recent international analyses (Turk, Kamiya, 2020) future progress on investment in the field cannot be achieved without massive government support. Thus, according to official statistics (GTR, 2020), the growth of renewable energy sources will slow down towards the end of 2020, due to delays in the construction of new facilities caused by supply chain disruptions and social distancing measures. In this context, many projects, such as photovoltaic installations for businesses and households, could have a strong downward trend in the medium term, without government support.

This is all the more possible as, apart from electricity production, many renewable energy sectors have proved to be much less resilient. According to the GTR report, the production of biofuels for transport will be reduced by 13% in 2020, this being the first significant decrease in the last two decades. Also, the consumption of heat produced from renewable energy sources is likely to decrease in 2020, mainly due to low activity in the industrial sector. Adding to these difficulties, low oil and gas prices make biofuels and renewable thermal technologies less competitive.

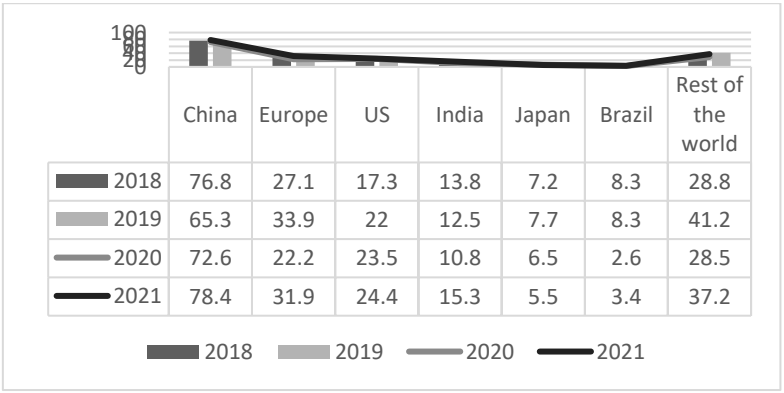

Chart 2: New capacities for electricity generation through renewable energy in the period 2018 - 2021 (GW)

Source: Authors based on IEA data (https://www.iea.org/data-and-statistics/charts/renewable-electricity-capacity-additions-2007-2021-updated-iea-forecast)
Note: Data for 2020 and 2021 are estimates and forecasts based on current trends.

Challenges for the development of renewable energy in 2020

According to the latest international statistics (IEA, 2020) in 2020, the global demand for renewable sources has increased due to their use in the electricity sector. Even if the demand for electricity for

end-use has fallen significantly due to the lockdown measures imposed by the health crisis, low operating costs of electricity based on renewable sources along with priority access to the grid in many markets have allowed renewable networks to operate almost at full capacity and even expand. However, supply chain disruptions, construction delays and macroeconomic challenges increase uncertainty about new investments in renewable energy capacities in 2020 and 2021.

A recent IEA report (2020) predicts that net renewable electricity additions in 2020 will be 13% lower than in 2019, due to delayed construction activity from supply chain disruptions, but also amid blockages and social distancing and emerging financial challenges. Hence, it should be noted that many of the renewable energy projects (whether in the field of solar, wind or biomass) are expected to face implementation delays in terms of the stages allocated for 2020, amid financial difficulties caused by the economic crisis, but also due to the new investment priorities of companies triggered by the new challenges brought by the pandemic.

Thus, the IEA report estimates that additions to photovoltaic capacity will decrease by 17% in 2020, compared to 2019, while for wind energy projects there is a decrease of 12%. Moreover, due to the forecast uncertainty for the projects that were to be financially completed in 2020 and become operational next year, it is estimated that total PV additions in 2021 will decrease from 2019 due to the slower recovery of distributed photovoltaic applications, because individuals and small businesses need to reset their investment priorities.

It is currently an undeniable reality that the pandemic has the potential to change the priority of government policies and budgets, as well as having a strong impact on companies' investment decisions on financing renewable energy in the coming years.

This new reality implies a high degree of uncertainty for the renewable energy sector, despite its rapid expansion over the last five years. At the same time, several countries are introducing significant stimulus programs to respond to the current economic development and support their economies. Some of these incentives may be relevant for renewables, especially in the context where competitive technologies developed for renewable energy can provide structural benefits such as economic development and job creation, while reducing emissions and encouraging innovation.

While capital expenditures for renewable energy increased moderately in 2019, by 1%, due to onshore wind energy and the fact that hydropower has surpassed solar energy, capital costs for some technologies have continued to fall. For example, solar installation costs for utilities have fallen by more than 10%, continuing a downward trend due to support policies (e.g., expanding competitive bidding) along with expanding implementation in large, lower-cost markets, such as India. Practically, nowadays, thanks to new technologies, with the same level of investments, much more renewable energy can be produced compared with the previous years. Thus, the necessary expenses for the production of 1 MW of renewable energy in 2012 allow the generation of 1.5 MW today.

The decrease in capital costs contributed to the reduction of the average costs of electricity production currently calculated taking into account the entire lifetime of the installation (leveled costs of electricity - LCOE), for solar energy and onshore wind energy, along with other factors, such as average load factors. For wind projects, for example, larger turbines and increasing the height of the hub means that wind farms are able to produce more energy with a smaller number of turbines. This trend also leads to reductions in operating and maintenance costs driven by efficiency gains from digitization. Financing costs are also a key component of the LCOE, and low average capital costs (WACCs) have been vital to expanding investment in renewables globally.

For example, applying a standard average WACC of 8% to a US solar project in 2019 would produce an LCOE of about 80 USD / MWh in 2019. The LCOE for the same project with access to lower cost financing (4% on average) is just over 50 USD / MWh. The actual return required depends very much on the degree of risk from the associated market. The involvement of public finances has been key to reducing the cost of capital in emerging markets, such as India, which on average face higher financing

costs (given higher risks to the country, technology and revenue).

In terms of loans, financing conditions have improved globally. This is due to lower base interest rates and lower debt risk premiums. For example, according to the IEA (Clean Energy Investment Trends, 2019), lower risk perceptions have contributed to improved availability and pricing of project financing in India for solar photovoltaic and wind projects in 2014-2018. The risk premiums applied to loans decreased by 75-125 basis points for both technologies during that period, with banks wishing to provide longer-term loans. In terms of equity, their expected returns have also declined globally, as support policies and growing market experience have helped reduce risk perceptions for investors.

The result is that LCOE for utility installations and wind turbines have fallen to levels between about 35-55 USD / MWh in China, Europe, India and the United States (assuming low-cost financing). Even lower prices have appeared in the tenders for the capacities that will be put into operation in the coming years, e.g. prices below 20 USD/ MWh in Brazil, Mexico, Portugal, Qatar and the United Arab Emirates.

To stimulate growth, central banks are likely to keep interest rates low. However, some emerging countries may face challenges as sovereign risks increase and there are signs that commercial banks could increase lending margins to offset higher liquidity costs. Uncertainty can also lead to more difficulties in mobilizing capital globally. A smaller annual decrease in LCOE is expected in 2020, with financing costs remaining at the same level or increasing as a result of new risks.

The impact of the COVID-19 crisis on investments in renewable energy

In the current international environment, governments have an unprecedented opportunity to accelerate clean energy transitions, making investment in renewables a key part of stimulus packages to revitalize their economies in the wake of the COVID-19 crisis. Investments in renewable sources, whose costs continue to fall rapidly, can stimulate job creation and economic development, while reducing emissions and fostering further innovation (Box 1).

Box 1: Promoting investment in renewable energy – driver of economic recovery after the pandemic crisis

Energy efficiency recovery - While it is now unanimously accepted that citizens' health remains the number one priority for governments facing the COVID-19 pandemic, it is also clear that there is a need to limit the economic impact of the COVID-19 crisis. In these efforts to protect economic stability and to support the recovery of global economies, energy efficiency can play a key role in stimulating jobs, while supporting clean energy transitions around the world. Energy efficiency can stimulate an intensive increase in employment globally. Even before the pandemic crisis, in the United States and Europe alone, more than 3.3 million people were employed in the energy efficiency industry, most of them employed by small and medium-sized enterprises. Given this reality, investments in well-designed economic recovery programs can use the potential of energy efficiency to support existing jobs, create new jobs and stimulate economic activity in key labour-intensive sectors such as construction and manufacturing. In addition, energy efficiency offers a number of long-term benefits, through improved competitiveness, improved energy accessibility and lower energy bills, while reducing the dependence on energy imports and the greenhouse gas emissions.

Stimulating technological advancement - Governments often provide incentives directly to consumers (or through manufacturers or retailers) to replace old, inefficient products with new and more efficient models through technology replacement programs for cars, refrigerators or other appliances. This may include investments in so-called "cash for clunker" programs for machines, refrigerators or other digital devices and devices. Applied to the manufacturing industry such governmental programs could provide substantial job creation results, while achieving significant environmental benefits. Of course, the global environmental impact of early technology replacement

must be taken into account: jobs can be created in the recycling industry through specific circular economy programs. Some analyzes (Li, Linn, Spiller, 2013) show that cash replacement programs such as "cash for clunkers" can help create an effective economic stimulus and support jobs and production which is particularly important given the imperative of the post-pandemic economic recovery. Moreover, investment in technology replacement programs can support the manufacture and launch of new technologies, such as heat pumps, digital building management systems and electric vehicles. Moreover, supporting investment in fleet modernization programs focused on buses, trains, vans or taxis can also lead to economic stimulus and energy efficiency.

Contributing to economic digitalisation in the context of post-pandemic challenges - government investment in the post-pandemic period could focus on large digital infrastructure projects, including those related to renewable energy that generate economic efficiency and new jobs. Such projects include investments in energy-efficient infrastructure, such as smart grids and charging stations, as well as next-generation digital connectivity for a more efficient and resilient future energy system. To further support jobs even in the face of increased digitalisation, infrastructure projects could also include investment in public transport infrastructure, the creation of bicycle lanes and pedestrian areas and the widespread implementation of smart upgrades. Smart street lighting upgrades can provide, for example, more infrastructure services, as street light poles can also serve as charging stations for electric vehicles and can include 5G telecommunications infrastructure.

Source: Authors, based on studied literature.

Case studies: US and China

USA

In January 2020, the US Government's Energy Information Administration (EIA) predicted a record year for wind and solar power in the US, with 18.5 GW of wind power and 13.5 GW of solar power for consumption, which will begin commercial operations. However the outburst of COVID-19 crisis had inevitably complicate or even postpone some of these projects. Presently, the pandemic is likely to cause a temporary, albeit significant, disruption to the growth of renewable energy on the US energy markets, while renewable energy ownership and investment landscape will be transformed.

In terms of the investment level in energy produced from renewable sources (Chart 3), we can see that the trend was increasing in the period 2013-2019, with the exception of 2018. Due to the Coronavirus pandemic, experts forecast a further slowdown in renewable energy investment for 2020, which may be even more pronounced than the one registered in 2018.

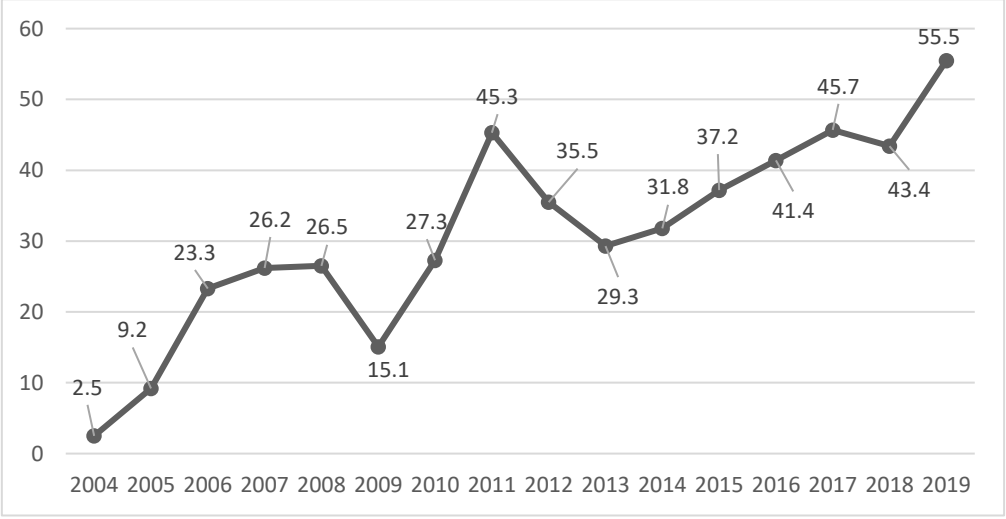

Chart 3: Investments in renewable energy in the US (USD billion)

Source: Authors based on GTR 2020 Report

According to the American Wind Energy Association, the year 2019 was the third best year in terms of new wind power capacities to the United States (9.1 gigawatts), bringing the total to 105.6 gigawatts. At the same time, the Solar Energy Industry Association registered the entry into service of 13.3 gigawatts of solar energy, bringing the total solar power capacity to 77.7 gigawatts. Together, the two sources accounted for 2/3 of the new United States energy generation capacity in 2019.

The projected increase in facilities in 2020, especially wind power, is largely the result of projects that began construction in 2016 and must be operational before the end of the year to qualify for the entire Production Tax Credit. This federal tax incentive represents about USD 24 / MWh for 10 years.

In the case of solar energy, the tax credit for investment has begun to emerge for projects that will begin construction this year. A similar increase in solar installations is likely to occur in 2023, the last year in which projects must be put into operation to claim their full value (representing 30% of the eligible costs of the project).

The imposed lockdown had severe economic consequences in US, but may not have a significant impact on the long-term prospects for renewable energy, although the imposed measures in response to the health crisis have certainly caused short-term disruption. In April, EIA revised by 5% and 10% the 2020 forecasts for the addition of solar and wind capacities.

Many wind projects working on a strict schedule in order to qualify for Production Tax Credit (PTC). The inconveniences caused by COVID-19, such as supplying, moving of equipment through the supply chain and personnel issues, could halt projects and affect their capacity to be authorised for PTC or tax credit for investment (ITC) credits. The risks posed by a delayed installation, which put a project outside the regulations, have pushed the investors to seek guidance from the Government on the situation in which the pandemic delays could be an exception to the regulations.

Looking into the future, some entities from the industry are concerned that an economic slowdown caused by the coronavirus will reduce the investors' appetite for tax capital for tax credits. These traders, usually investment banks, are likely to have lower tax revenues in the short term to offset these loans. However, the signals from investors are positive about their permanence in the market.

While the coronavirus is a short-term impediment to renewables, the long-term outlook remains favourable. One of the powerful engines of this sector is the clean or renewable energy goals set by a growing number of countries.

Thirteen states, including New York and California, have set 100% targets to be reached in the period 2040-2050. Additionally, the improved performance and low costs of renewables, along with growing concern for corporate sustainability, have encouraged utility distribution workers to consider renewable energy sources when building new facilities.

Persistent low natural gas prices as a result of the economic slowdown have the potential to shift investment decisions in favour of energy production through natural gas-fired facilities, although the likely scale is currently unclear. The EIA still forecast that the renewable energy will rise to 38% of electricity by 2050, from the current 19%, with natural gas falling slightly, to 36% from the current 37%, and coal from 24% to 13%.

The industry is pushing for the support of the United States Congress as part of broader stimulus funding. In this case, concern about job losses caused by the coronavirus will be critical to gain support; the Solar Energy Industry Association warned that 50 percent of the 250,000 jobs in the solar sector

could be affected, while the American Wind Energy Association estimates that 35,000 wind jobs are at risk.

According to Eroglu, H. (2020), the number of employees laid off in the US renewable energy sector was significant: around 70,000 people. To overcome this hurdle, some suggestions proposed by specialists in the field are related to allowing companies in the solar energy sector to use the Investment Tax Credit (ITC) or to double the "Green Incentive" stimulus.

In this context, although at a lower than expected level, government actions following COVID-19 crisis have specifically targeted at the renewable energy being linked to the fact that the Treasury and the IRS have provided tax incentives for renewable energy projects by further extending the deadlines for financially supporting tax credits.

A domain with an unique demand for support is the offshore wind power. Because the technology is less mature than the onshore one, and because it can offer new capacities and jobs, there is momentum in Congress to offer a special treatment for the offshore sector. The American Wind Energy Association forecasts that the market will grow from almost zero today to 20-30 GW by 2030.

Energy storage is also poised for strong growth. The sector registered a record development in the last quarter of 2019, with a new added capacity of 186MW / 364MWh, according to indications of the Energy Storage Association. This Association and Wood Mackenzie forecast the market to grow to 7.3 GW in 2025 after the annual rollout of 523MW in 2019, with growth largely driven by public procurement.

While the pandemic undoubtedly caused short-term challenges and disruptions, cost cutting, technological advancements, and financial innovation will remains powerful drivers for the renewable sector development in the US especially because the strong user demand and the clear environmental imperative.

China

In 2020 China lost its spot on the Renewable Energy Country Attractive Index (RECAI) for the first time since October 2016, ranking second behind the United States in its quest to cut costs from its renewable energy subsidy regime.

As shown in Chart 4 the level of investments in renewable energy in China for the period 2004-2019, expressed in billions of dollars indicate that over the past three years China has reduced the amounts allocated to investments in renewable energy. It is also forecast that the COVID-19 pandemic will further slow these investments.

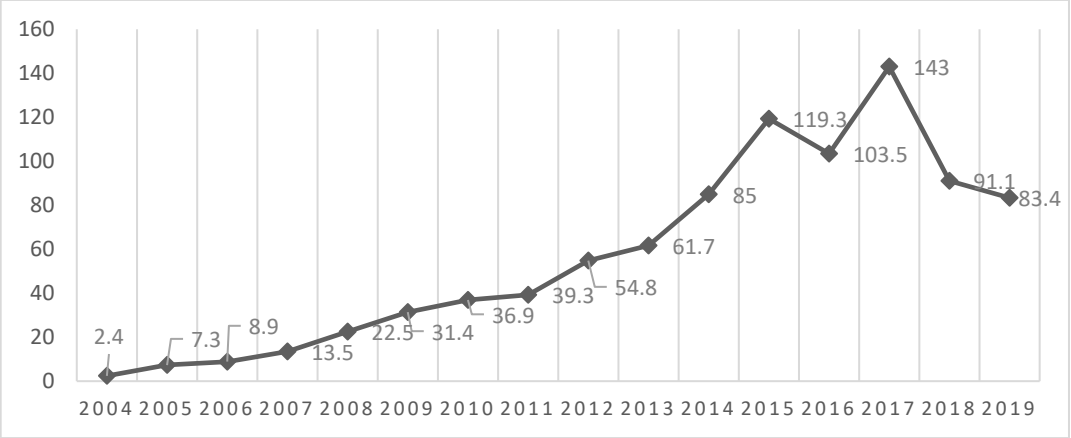

Chart 4: Investments in renewable energy in China (USD billions)

Source: Authors based on GTR 2020 Report

The government has gradually reduced subsidies paid for onshore wind and solar power projects, which currently support around 210 GW of wind capacity, while trying to reduce the USD 14 billion deficit in its Renewable Energy Development Fund. According to Wood Mackenzie (WoodMac), the Ministry of Finance has budgeted just USD 700 million to subsidize new renewable capacities in 2020, which is expected to support 8-10 gigawatts of new onshore wind capacity (Wood Mackenzie, 2020).

As a result, the Chinese government is encouraging wind energy projects that at the moment receive feed-in tariff payments to move to an unsubsidized system, through which they will be offered energy purchase agreements and privileged payments of unpaid subsidies for the long-term. WoodMac estimates that approximately 60 gigawatts of previous capacity, which had recovered its initial capital investment, can keep its current yield by making the change, removing some of the subsidies.

Despite these issues, WoodMac estimates that the annual onshore additions to 18.8 gigawatts in 2021 will increase to 23 gigawatts by the year 2028. However, WoodMac warns that a surge in the offshore wind market will be obstructed by the political unpredictability, limited share of subsidies and disruption caused by the pandemic in supply chains.

In the base scenario, total capacities will reach 14.5 gigawatts by the end of 2021, and new capacities will drop to just 2 gigawatts the next year before recovering to 5 gigawatts in 2025. At worst, China could reach to 11 gigawatts by the end of next year, followed by less than 0.5 gigawatts added each year for the rest of the decade if the sector does not have the support of local governments and low demand fails to produce local supply chains.

While the short-term outlook for new domestic capabilities looks bleak, Chinese companies continue to invest and position themselves for the low-carbon global transition. GCL system integration technology for the solar producer invests USD 2.5 million in a solar module factory in Hefei, Anhui Province, which will have the capacity to produce 60 gigawatts of modules, the world's largest production platform, capable of meet about half of current global energy demand for solar modules.

According to Norouzi et al. (2020), it is possible that in China, in terms of the fight against climate change, an advantage will be gained from the coronavirus pandemic, given the decline of greenhouse gas emission sectors. At the same time, they consider that there is the possibility of rapid development of renewable energy due to major energy security problems.

However, following the analysis of the stimulus package, it can be seen that the Chinese government is not focusing on renewable energy. Many investments are focused on fossil fuel industries, while support policies for the renewable energy industry are absent from the Beijing recovery programme.

China could have chosen to follow the example of the EU and Germany and direct COVID's incentive towards sustainable mobility, the hydrogen-using industry and renewable energy sources, which are the sectors where China is trying to be competitive. A small incentive was indeed created for electric vehicles, which benefited from tax exemptions in response to the COFID crisis, although only as part of a measure aimed at stimulating demand for vehicles. Until recently, Beijing promoted the use of hydrogen through several local pilot projects. Although it would have been the right time, China did not want to launch a national hydrogen strategy, leaving only in the project phase (Gosens, 2020).

Conclusion

Although renewable energy in several markets were already facing some funding uncertainties in early 2020, the COVID-19 crisis has brought new challenges. However, the post-pandemic situation could

give governments the opportunity to make progress in the field, making investing in renewable sources a key part of stimulus packages designed to revive their economies. They can take advantage of the structural benefits that increasingly affordable renewables must offer, including job creation and economic development opportunities, while reducing emissions and fostering innovation.

Far from being a major impediment to the development of renewable energy the COVID-19 crisis could be an incentive. The dramatic decrease in production in the fossil fuel sector thanks to COVID-19, combined with the fact that renewable energy have proven their resilience, could stimulate new investment from the public sector, but also from the private sector, many financed even with aid to the financial support and economic reconstruction packages allocated by most states in the context of the COVID-19 crisis.

However, in order to be able to play a role in boosting economic recovery in the post-pandemic period, investment in renewable energy should take into account lessons in good practice from previous funding programmes, focusing on two major factors: expanding existing programmes with new incentives, but also reducing unnecessary regulatory barriers (given that excessive regulatory barriers, such as planning and development rules, can often hinder energy efficiency and renewable energy projects, hence requiring the elimination or simplification of red tape in order to facilitate the successful implementation of economic incentives).

In the United States, while at a lower-than-expected level, government actions following the coronavirus pandemic targeted specifically at renewable energy that have been adopted so far have been linked to the fact that the Treasury and the IRS have provided tax incentives for renewable energy projects. As for China, the government is not focusing on renewable energy, with many investments being targeted to fossil fuel industries, while support policies for the renewable energy industry are absent from the recovery programme.

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