

Industrial Opportunities of the Energy Transition (Specifics and the importance of investing in renewable energy)

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Abstract. *The health crisis that has hit the planet over the course of several months will cause serious shocks. The global economy has been also suffering and it will take time for all socio-economic indicators to return to a positive trajectory. However, this particularly difficult situation presents us with a collectively unprecedented opportunity: to anchor economic, political and energy choices in the energy transition and make them an important lever to restart the economy.*

The research aimed at the preferences for renewable energies provides the ground for this paper. The main question that this paper seeks to answer is whether renewable energy is an engine of economic growth and an industrial opportunity that Russia can look at to become the world leader.

In the coming months and years, renewable energies will make it possible to provide concrete responses to the three objectives which should guide the recovery plan: fostering the creation of jobs and added value in the world; decarbonizing the economy (particularly in the industrial, building and mobility sectors), the only guarantee of generating sustainable jobs and activities; and developing the industrial sector of renewable energies

Keywords: Production of renewable energy, Economic growth, Labor market

JEL Codes : O13, Q40 , Q43, Q47

1. Introduction

The paper is based on the research devoted to industrial opportunities offered by the energy transition, such as renewable energies in Russia. It deals with the topical issues related to the problems of restructuring industrial production in Russia given the COVID-19 health crisis the world is going through, but also the economic sanctions imposed on Russia.

The article describes how renewable energy sources have become an engine of global energy development and an opportunity for reindustrialization, and a lever for competitiveness.

Investing in renewable energies means investing in a sustainable and profitable future, as the incredible growth of renewable energies has shown over the past decade [1].

In the months and years to come, renewable energies will provide concrete responses to three objectives that should guide the recovery plan:

- Fostering job creation and added value in our regions;
- The decarbonization of our economy (in industry, construction, and mobility), which is the only guarantee of job creation and sustainable activities;
- The development of the industrial renewable energy sector in Russia.

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According to the latest data (International Energy Agency), in the first half of 2020, renewable energy production in Europe has, for the first time, exceeded the production of traditional thermal power plants, and thus increased up to 40%. In some countries, green generation already provides up to 90% of all electricity production³.

The development of renewable energy technologies has economic benefits.

Renewable energies have the potential to reduce the dependence on imported fuels and solve energy access problems for over 1.4 billion people around the world who remain “energy poor”. The renewable energy industry can also help to create jobs and encouraging the creation of small industries in rural areas. [2,3]

This article aims to help to prove the relative importance of renewable energy on economic growth by analysing separate panels for developed and underdeveloped countries. The main research question that this paper seeks to answer is whether renewable energy is an engine of economic growth and an industrial opportunity that Russia can look at to become the world leader.

This research question is broken down into the 3 sub-questions below:

- (1) Does the renewable energy industry have an impact on economic growth?
- (2) Does the renewable energy industry increase the participation in labor market?
- (3) Is the cost of production advantage for investing in renewable energy?

To answer these questions, we are going to study the impact (the results) of this alternative energy on countries that have already a technological advance, and which have already switched to this mode of production.

2. Literature Review: Renewable Energy Development and Economic Growth

Over the past decades, the economy of emerging and developing countries has experienced significant growth rates which have been reflected in very sharp increases in energy production and consumption.

The “great leap forward” of the energy sector mobilized considerable investments, but also massive fossil resources as well as natural resources in biomass, land, and water.

Based on panel estimation techniques of 38 main renewable energy-producing countries in the period 1990-2012, Bhattacharya et al. [4] found that renewable energy consumption had a “significant positive impact” on long-term economic growth in 57% of the selected countries. This confirms the growth hypothesis and implies that the consumption of renewable energy is an engine of economic growth. This is in accordance with Ito's results. [5]

The growth hypothesis was also supported by Bilgili and Ozturk for a panel of G7 countries in the period 1980–2009. [6]

Today, the index of average energy consumption is one of the most reliable variables to assess the quality of life of a population and is strongly correlated with a number of other economic and social indicators. The correlations between energy and development prompted the International Energy Agency to propose an analysis of countries using an energy development index to complement the analysis with the United Nations Human Development Index (IEA 2010).

In the German context, the energy transition is seen as a radical turning point. Thus, Deshaies points out: “In the eyes of the promoters of the energy transition, it is not only a question of achieving a change in the energy system but also a profound transformation of the economy and of society, comparable to that brought

³ URL: <https://www.iea.org/reports/world-energy-investment-2020/power-sector>

about by the industrial revolution. From this perspective, the objective of the energy transition is to replace the centralized production structures controlled by large capitalistic companies with a highly decentralized system of small production structures which, ideally, would belong to the citizens who can thus ensure their energy autonomy". [7]

Recent news, particularly with national declarations at COP21, have shown that emerging countries recognize that they will not be able to escape a transition of their energy systems, whether because of the impact of global warming, caused mainly by the production of energy (electricity, heating) and fuel for transport (mainly cars), or the (relative) scarcity of fossil resources. [8]

A recent study revealed that the albedo of transparent ice and inhomogeneous snow has changed from 30% to 98% and that the formation of internal radiant superheat has been discussed.

One of the major current challenges is to make such a transition coincide with the objectives of sustainable development for countries undergoing profound changes. The economic, environmental, and social dimensions require a balance or a compromise in the process of energy development. Thus, the forms of energy transition can turn out to be quite different from one continent and from one country to another.

3. Renewable Energy Sources in the World

Renewable energy is a cost-effective source of new energy that protects electricity markets and consumers from volatility strengthen economic stability and spur sustainable growth [9]

Renewable energies have continued to dominate the global power generation mix over the past year. Installed renewable energy capacity reached 2.537 gigawatts (GW) worldwide at the end of 2019, up 176 GW from the previous year⁴.

The 2020 Renewable Capacity Statistics Annual Report shows that renewables grew by 7.6% last year, and this growth was dominated by Asia, which accounted for 54% of totally new installations.⁵

Although the growth in renewables has been slower in the past year, their total growth was 2.6 times that of fossil fuels.⁶

Thus, the dominance of renewables in capacity expansion continues, which once again confirms the trend that began in 2012. In 2019, the share of solar and wind energy in the total capacity of renewable sources was 90%.⁷

Renewables account for at least 70% of new installations in virtually all regions in 2019, except for Africa and the Middle East, where their respective shares are 52% and 26% of net capacity growth. These additions increased the share of renewables in the global energy potential to 34.7%, up from 33.3% at the end of 2018.⁸

In 2019, solar energy increased by 98 GW, of which 60% came from Asia. Wind power generated an additional 60 GW. The growth leaders were China (26 GW) and the USA (9 GW).⁹

Today, these two technologies produce 623 GW and 586 GW respectively or almost half of the world's renewable capacity. Hydropower, bioenergy, geothermal and marine energy have shown moderate growth from last year, with 12 GW, 6 GW, 700 MW and 500 MW, respectively.¹⁰

⁴ Press release: The International Renewable Energy Agency (Abu Dhabi, United Arab Emirates, April 6, 2020)

⁵ URL: <https://bioenergyinternational.com>.

⁶ URL: <https://bioenergyinternational.com>.

⁷ URL: <https://www.irena.org/newsroom/pressreleases/2020>

⁸ Renewable capacity highlights 31 March 2020

⁹ Renewable capacity highlights 31 March 2020

Table 1 shows how the production of renewable energy has increased between 2015-2019 in the world, which explains that governments' production of renewable energy has an impact on economic growth.

Table 1: The production of renewable energy in the world and by region (2015-2019)

CAP (MW)	2015	2016	2017	2018	2019
World	1 846 060	2 008 547	2 182 449	2 361 061	2 536 853
Asia	716 899	808 844	915 052	1 023 514	1 118 969
Europe	465 097	488 661	513 087	537 993	573 266
N America	307 701	331 179	348 558	368 956	391 241
S America	177 663	192 215	202 682	212 693	221 130
Eurasia	88 140	91 220	98 764	102 748	105 800
Africa	35 288	37 950	42 724	46 462	48 443
Oceania	26 435	27 305	28 526	33 563	39 723
Middle East	16 919	17 757	18 891	20 177	22 710
C America + Carib	11 918	13 417	14 165	14 955	15 572

Source: International Renewable Energy Agency ¹¹

The global energy transformation makes economic sense. The additional costs resulting from the long-term global energy transition are estimated to be \$ 1.7 trillion (US) per year in 2050. However, the savings from reducing air pollution, improving health, and reducing damage to the environment would more than compensate for these costs. The remap ¹² scenario estimates that the amount of savings in these three areas alone could already amount to an average of \$ 6 trillion per year until 2050. ¹³

Globally, GDP grows by 2050 in both the baseline and transition scenarios. The energy transition stimulates not the only economic activity but also growth as desired in a status quo approach. The cumulative gains from rising GDP between 2018 and 2050 would amount to \$ 52 trillion ¹⁴

Graph 1 below shows the impact of the energy transformation on GDP, indeed the impact on GDP compared to current plans has increased by 9% to reach near neutrality. Most regions/countries show a positive impact on GDP, largely due to increased investment and trade gains, energy transformation will increase GDP in most regions and countries above expected level current plans, which leads to answering first that the production of renewable energies has an impact on economic growth.

In addition, the energy transition would make the socioeconomic effects of the energy system at the global level much more positive than a status quo situation, by allowing the improvement of well-being, the increase of GDP, and growth of employment.

¹⁰ URL: <https://www.irena.org/newsroom/pressreleases/2019/Apr/Renewable-Energy-Now-Accounts-for-a-Third-of-Global-Power-Capacity>

¹¹ Renewable capacity statistics 2020

¹² IRENA's REmap programme determines the potential for countries, regions, and the world to scale up renewables

Note: EU28 = Member states of the European Union;

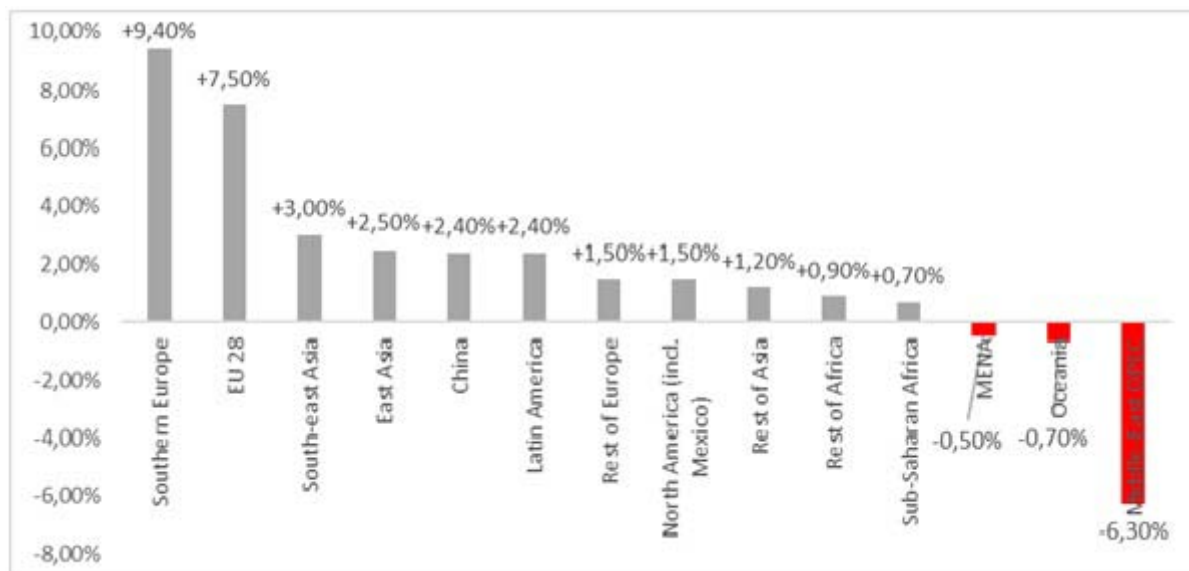
GDP = gross domestic product;

MENA = Middle East and North Africa;

OPEC = Organization of the Petroleum Exporting Countries.

¹³ Global energy transformation (A ROADMAP TO 2050)

¹⁴ Global energy transformation (A ROADMAP TO 2050)



Graph 1: Effect of Current Plans vs. Energy Transformation on GDP in selected regions and countries By 2050 (% difference)

Source: IRENA analysis 2019 (transforming the energy system) ¹⁵

With the global energy transition underway, renewable energies have a strong impact on employment.

The renewable energy sector generated 500,000 new jobs in 2019, bringing the number of professionals worldwide to 11.5 million.¹⁶

Solar technology maintains its leadership position with 3.8 million jobs, of which 3.1 million are concentrated in Asia. The region has in fact added 55 GW of the 97 GW of new solar power plants built last year. The number of jobs in the solar sector has grown by 4% over the past year. Africa, on the other hand, provided 3.7% of jobs in the solar PV sector in 2019. Around 372,000 jobs in Asia and Africa were created by off-grid solar (Table 2).¹⁷

The socio-economic benefits of technologies linked to the energy transition would create 5,5 million more jobs by 2023 than would be possible in the less ambitious planned energy scenario, based on the current plans and commitments of nations.

In the longer term, investing in the energy transition would result in 100 million people employed in the energy sector by 2030 under the energy transformation scenario, up to 74% from the 58 million today and 15 million more than in the planned energy scenario.¹⁸

Renewable energy jobs are expected to increase to nearly 30 million in 2030, up from around 12 million in recent years. Employment in energy efficiency would increase from less than 10 million to 29 million, while the flexibility of energy networks and systems would likely see an increase from 7,4 million to 12

¹⁵ Transforming the energy system IRENA analysis 2019

¹⁶ URL: <https://www.irena.org/publications/2020/Sep/Renewable-Energy-and-Jobs-Annual-Review-2020>.

¹⁷ URL: <https://www.agenceecofin.com/energies-renouvelables>

¹⁸ Global landscape of renewable energy finance 2020, IRENA, 2020

million workers, which confirms that renewable energy production increases participation in the labour market.¹⁹

Table 2: Estimated Direct and Indirect Jobs in Renewable Energy, by Country/Region and Technology, 2017-2018

	World	China	Brazil	United States	India	European Union
Solar PV	3,605	2,194	15.6	225	115 ^k	96
Liquid biofuels	2,063	51	832 ^g	311 ^h	35	208
Hydropower	2,054	308	203	66.5	347	74
Wind power	1,160	510	34	114	58	314
Solar thermal heating/cooling	801	670	41	12	20.7	24 ^m
Solid biomass b, c	787	186	-	79 ⁱ	58	387
Biogas	334	145	-	7	85	67
Geothermal energy	94	2.5	-	35 ^j		23
Concentrating solar thermal power (CSP)	34	11	-	5	-	5
Total	10.983	4,078	1,125	855	719	1,235ⁿ

Source: International Renewable Energy Agency²⁰

The last point which is important, and encourages investment in renewable energy is the decrease in the production cost of the latter, the production cost of renewable energies (RE) has continued to decrease since 2010. And the figures speak for themselves: a decrease in 82% of production costs for photovoltaic panels, 47% for thermal solar, 39% for onshore wind and 29% for offshore wind.²¹

Graph 2 below shows us how newly installed renewable energy capacity is costing less and less than cheaper power generation options based on fossil fuels.

A rapid and phenomenal decline can be explained by the fact that renewable energies are not experiencing the scarcity effect (unlike fossil fuels) and that their development depends solely on our technological advances.

The significant reductions in the cost of wind and solar power over the past few years have changed the choice of policymakers. These technologies were always low in carbon and relatively quick to build. Now, in many countries around the world, wind or solar power is the cheapest option for generating electricity [10]

4. Conclusions and Policy Recommendations

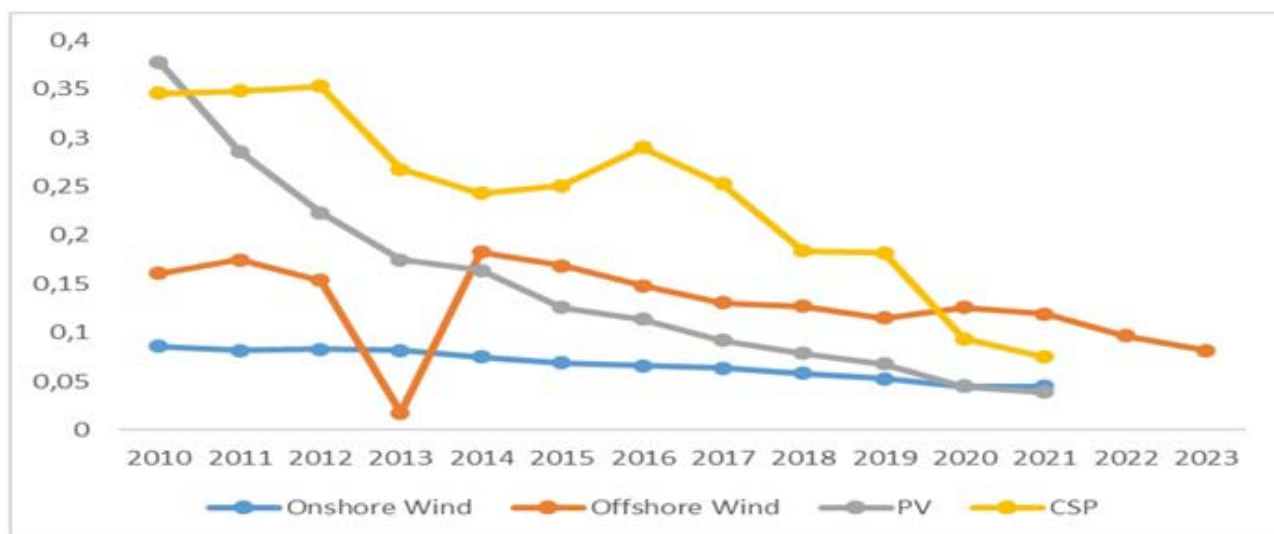
Over the past few years, we have seen how energy based on renewable sources confidently pushes the traditional sources. Hundreds of gigawatts of renewable energy are built each year around the world.

For five years in a row, green production has overtaken coal, gas and nuclear in terms of commissioning, and global investments in renewable energy sources exceed \$ 300 billion annually.

¹⁹ The socio-economic benefits of the energy transition (GLOBAL LANDSCAPE OF RENEWABLE ENERGY FINANCE 2020), IRENA, 2020

²⁰ Renewables 2019 global status report

²¹ <https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019>



Graph 2: Completion year for committed projects per technology (2010-2023)

Source: IRENA Renewable power generation costs in 2019 ²²

This article contributes to the existing literature on the relationship between renewable energy production and economic growth. We analyzed the relationship between renewable energy production and economic growth, using three key economic indicators: real GDP, the number of jobs created, and the cost of production.

The main findings of this research revealed that there is a statistically significant and positive relationship between renewable energy production and economic growth for developed and developing countries. These results confirm the existence of a growth hypothesis and imply that renewable energies can be an important source of sustainable economic growth in the future.

This study also examined the contribution of renewable energy production to labor market participation. Results varied between developed and developing countries. The production of renewable energy has been found to have a statistically significant impact on the workforce.

These findings have contributed to the literature on the links between renewable energy production and economic growth. This research provides new and rich information on the channels through which renewable energy production influences economic growth. In addition, in this study, we use the production of renewable energy as the main dependent variable, to see its impact on the economy (increase in GDP, job creation, decrease in the cost of production). Although the energy transition is technically feasible and economically advantageous, it will not happen by itself.

There is an urgent need for political action to redirect the global energy system on a more sustainable path. Among the decisions that governments must make, one can mention:

- Security of supply. This involves ensuring a regular (uninterrupted) supply flow of final energy.
- Accessibility and economic efficiency. This includes guaranteed access (physical and economic) to a minimum modern energy service for the entire population. Likewise, this criterion concerns the impact of energy prices on the competitiveness of other economic sectors.

²² URL/ <https://www.irena.org/newsroom/articles/2020/Jun/How-Falling-Costs-Make-Renewables-a-Cost-effective-Investment>

- Cleanliness. This implies minimizing environmental impact at the global (mainly GHG emissions) and local (pollutant emissions, water, or soil contamination, etc.) level.
- Support innovation throughout the system. Just as the development of new technologies has played an active role in the advancement of renewable energies in the past, continuous technological innovations will be needed in the future to ensure the success of the energy transition globally.
- Exploitation of the strong synergies existing between energy efficiency and renewable energies. These two elements should figure among the main priorities in the design of energy policies because their combined effects would make it possible to economically meet the decarbonisation needs linked to energy.

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