



26 / 2020

A Russia-EU-Africa Energy Strategy. Nuclear and Renewable Energy Security



Russian International
Affairs Council

Carla Leonetti
Romain Pradier

RUSSIAN INTERNATIONAL AFFAIRS COUNCIL

BOARD OF TRUSTEES

Sergey Lavrov – Chairman
of the Board of Trustees
Herman Gref
Aleksandr Dzasokhov
Leonid Drachevsky
Aleksandr Dynkin
Mikhail Komissar
Konstantin Kosachev

Mikhail Margelov
Yury Osipov
Sergey Prikhodko
Anatoly Torkunov
Andrey Fursenko
Aleksandr Shokhin
Igor Yurgens

PRESIDIUM

Petr Aven
Igor Ivanov – President
Andrey Kortunov – Director General
Fyodor Lukyanov
Igor Morgulov
Dmitry Peskov

Editors:

Ivan Timofeev, Ph.D. in Political Science
Elena Karpinskaya
Lora Chkoniya

Russian International Affairs Council (RIAC) is a membership-based non-profit Russian organization. RIAC's activities are aimed at strengthening peace, friendship and solidarity between peoples, preventing international conflicts and promoting crisis resolution. The Council was founded in accordance with Russian Presidential Order No. 59-rp "On the Creation of the Russian International Affairs Council non-profit partnership," dated February 2, 2010.

FOUNDERS



Ministry of Foreign Affairs of the Russian Federation



Ministry of Education and Science of the Russian Federation



Russian Academy of Sciences



Russian Union of Industrialists and Entrepreneurs



Interfax News Agency

RIAC MISSION

The mission of RIAC is to promote Russia's prosperity by integrating it into the global world. RIAC operates as a link between the state, scholarly community, business and civil society in an effort to find solutions to foreign policy issues.

The views expressed herein do not necessarily reflect those of RIAC.

Cover photo credits: REUTERS/Amr Abdallah Dalsh/Plxstream

A Russia-EU-Africa Energy Strategy. Nuclear and Renewable Energy Security

Africa is an ideal market for energy production. With a booming population, developing economies, a crucial need for energy security and international commitment to sustainability and green economies, this continent has all the characteristics of an attractive market for nuclear and renewable resources. The European Union and the Russian Federation are giants in the sphere of energy: not only do they develop and manufacture energy technologies and power plants, but also have a genuine interest in exporting them globally. This includes the African continent. However, Africa comes with challenges, namely a cruel lack of infrastructure in certain regions, political instability and lack of funds. How interesting can the African energy market be to Europe and Russia and how can the latter coordinate their comparative advantages on the field? This chapter will provide market research for policymakers in Africa, Europe and Russia.

European and Russian Competition in the Field of Energy

DOMESTIC PRODUCTION: A COMPARATIVE ADVANTAGE ANALYSIS

First, we should highlight the types of energy and parties that are included in our research.

Both the EU and Russia are producers of four major types of low-carbon energy resources for electricity production: nuclear, solar, hydro and wind. On the European side, three countries stand out as leaders in the energy industry: the Federal Republic of Germany, the French Republic and the Kingdom of Sweden. Below is a table indicating the respective production of each resource for each country mentioned above and an analysis of absolute and comparative advantages (Table 1). Upon calculation of comparative advantage based on domestic production¹, it seems that **France has the advantage to focus on the export of technology for the production of nuclear energy, Germany – solar, Sweden – wind and Russia – hydro.**

TECHNOLOGY AND POWER PLANT EXPORTS

It seems, however, that a country's domestic performance is not sufficient to be competitive on the technology export market. **Russia is the number one exporter of nuclear reactors in the world**, for instance, despite producing half of France's domestic nuclear energy production in 2017². Rosatom offers cheap design and receives strong government support³. Moscow already started targeting emerging markets, such as India, Iran, China or Turkey⁴. **Russia also has the upper hand in hydro.** Despite Swedish Swe-

TABLE 1: COMPARATIVE ADVANTAGE OF FRANCE, GERMANY, SWEDEN AND RUSSIA IN THE PRODUCTION OF LOW-CARBON ENERGY, 2017 (GWh)

GWh (2017)	Nuclear	Solar	Hydro	Wind	Comparative advantage
France	398359	9573	55108	24711	Nuclear
Germany	76324	46164	26155	105693	Solar
Sweden	65696	230	65168	17609	Wind
Russia	203143	558	187131	140	Hydro
Absolute advantage	France	Germany	Russia	Germany	

Source: Author's calculations based on data from the International Energy Agency, at <https://www.iea.org/data-and-statistics?country=WORLD&fuel=Energy%20supply&indicator=Coal%20production%20by%20type> (last visited on March 10, 2020).

ABOUT THE AUTHORS:

Carla Leonetti, RIAC Expert, Dual Master in Governance and Global Affairs (MGIMO) and International Relations (LUISS).

Romain Pradier, RIAC Expert, Dual Master in International Public Management (Sciences Po Paris) and International Security (MGIMO).

¹ For a description of the methodology for Table 1, refer to the Methodology section on page 7.

² Nuclear Reactors, The Observatory of Economic Complexity. URL: <https://oec.world/en/profile/hs92/8401/> (last visited March 10, 2020).

³ Russia Leads the World at Nuclear-Reactor Exports, The Economist.

URL: <https://www.economist.com/graphic-detail/2018/08/07/russia-leads-the-world-atnuclear-reactor-exports> (last visited March 10, 2020).

⁴ Ben Aris, Russia's Nuclear Power Exports Are Booming, The Moscow Times.


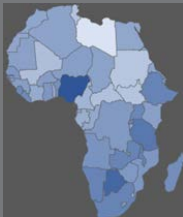

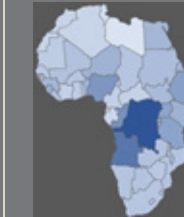
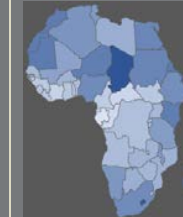
URL: <https://www.themoscowtimes.com/2019/05/09/russias-nuclear-power-exports-are-booming65533> (last visited March 10, 2020).

co's successful implementation in Europe and Africa⁵, with the particular example of Mozambique⁶, Russia has a much larger capacity and is already present in Central Asia⁷ and Africa⁸. Nevertheless, it is France that owns a more significant share of the African market for hydro, with a total of seven countries listed by International Rivers in 2015.

When it comes to solar energy, Germany is a strong player. The company BSW Solar has

already invested in Colombia and Brazil⁹ and has expressed interest in the Nigerian market¹⁰. However, the cut in subsidies, the euro debt crisis and FiT's (Feed-in Tariffs) fostering of global competition gave way to China, which has become the world's first exporter of solar panels¹¹. China is now interested in the Sahel and the Horn of Africa¹² and helped build a 50MW solar power plant in Kenya¹³. Wind is no different, with clear German leadership in Europe for both offshore¹⁴ and onshore¹⁵ wind power plants, but with

TABLE 2: WEIGHTED RANKING OF ENERGY MARKETS IN AFRICA (2017)

General	Nuclear	Solar	Hydro	Wind
				
1 Nigeria	1 Nigeria	1 Djibouti	1 DRC	1 Chad
2 Ethiopia	2 Botswana	2 Nigeria	2 Angola	2 Lesotho
3 Tanzania	3 Tanzania	3 Ethiopia	3 Rep. of Congo	3 Djibouti
4 Uganda	4 Malawi	4 Namibia	4 Nigeria	4 Cabo Verde
5 Malawi	5 South Africa	5 Tanzania	5 Ethiopia	5 Eritrea
6 Sierra Leone	6 Namibia	6 Malawi	6 Tanzania	6 Mauritania
7 DRC	7 Ethiopia	7 Botswana	7 Uganda	7 Morocco
8 Rwanda	8 Zambia	8 Chad	8 Rwanda	8 Madagascar
9 Madagascar	9 Rwanda	9 Niger	9 Sierra Leone	9 Kenya
10 Liberia	10 Uganda	10 Uganda	10 Burundi	10 Niger

Sources: Author's calculations based on data from Sources: EnergyData.info (2019); Gupta (2008); International Monetary Fund (2019); Nuclear Energy Agency & International Atomic Energy Agency (2016); World Bank (2017, 2018).

For a description of the methodology for Table 2, refer to the Methodology section on page 6.

Countries' acronyms: DRC (Democratic Republic of the Congo). No information for Somalia.

⁵ Sweco to Develop Hydropower in Europe and Africa, Sweco. URL: <https://www.sweco.no/en/news/press/2014/sweco-to-develop-hydropower-in-europe-and-africa/> (last visited March 10, 2020).

⁶ Sweco to Rehabilitate Large Hydropower Plant in Southern Africa, Sweco. URL: <https://www.sweco.se/en/news/press/2019/sweco-to-rehabilitate-large-hydropower-plant-in-southernafrica/> (last visited on March 10, 2020).

⁷ Russia to Develop Two Large HPPs in Uzbekistan, Vostock Capital. URL: <https://www.vostockcapital.com/en/hydropower/russia-to-develop-two-large-hpps-in-uzbekistan/> (last visited on March 10, 2020).

⁸ Hydropower in Africa: Africa Damns Briefing, International Rivers. URL: https://www.internationalrivers.org/sites/default/files/attached-files/africa_dams_briefing_.pdf (last visited on March 10, 2020).

⁹ Exporters' Stories: German Solar Panel Company Shines Internationally, European Commission. URL: <https://ec.europa.eu/trade/trade-policy-and-you/in-focus/exporters-stories/german-solar-panels-ibc/> (last visited on March 10, 2020).

¹⁰ German Solar Industry Examines Nigeria's Vast Solar Power Potential, Clean Energy Wire. URL: <https://www.cleanenergywire.org/news/eu-lifts-tariffs-chinese-solar-panels-co2-fills-germanyscoffers/german-solar-industry-examines-nigerias-vast-solar-power-potential> (last visited on March 10, 2020).

¹¹ German Solar Industry Getting Hammered by Cheap Chinese Imports, CleanTechnica. URL: <https://cleantechnica.com/2012/06/17/german-solar-industry-getting-hammered-cheap-chinese-imports/> (last visited on March 10, 2020).

¹² Edith Mutethya, China Helps Light up African Countries, Chinadaily. URL: <http://www.chinadaily.com.cn/a/201907/12/WS5d27e2daa3105895c2e7d156.html> (last visited on March 10, 2020).

¹³ Kenya Launches Chinese-Built 50MW Solar Power Plant, Xinhua. URL: http://www.xinhuanet.com/english/2019-12/14/c_138631435.htm (last visited on March 10, 2020).

¹⁴ Arthur Neslen, Germany Leads Europe in Offshore Wind Energy Growth, The Guardian. URL: <https://www.theguardian.com/environment/2016/feb/02/germany-leads-europe-in-offshore-wind-energy-growth> (last visited on March 10, 2020).

¹⁵ Sören Amelang and Benjamin Wehrmann, German Onshore Wind Power – Output, Business and Perspectives, Clean Energy Wire. URL: <https://www.cleanenergywire.org/factsheets/german-onshore-wind-power-output-business-and-perspectives> (last visited on March 10, 2020).

Chinese leadership in wind energy world-wide. Indeed, the growing Chinese middle class provided the country with sufficient internal demand to foster the industry, which was then able to compete internationally¹⁶.

Russia, therefore, has an advantage in both nuclear and hydro energy. For solar and wind, it is China that leads internationally. **Europe, on the other hand, can rely on Germany's excellent quality reputation and France's historical and continuous proximity to African countries to remain competitive.**

AFRICA: AN INTERESTING MARKET FOR SUSTAINABLE ENERGY?

Need-Capacity Analysis

Is Africa a lucrative energy market for Europe and Russia? It is hard to provide a simple answer due to the continent's diversity. Variables such as an economy's health, access to electricity, urbanisation rate, political stability and the availability of natural resources will depend on many factors respective to each individual nation. The table below presents a weighted ranking of African states depending on their attractiveness as energy markets, as a whole first and then for each resource (Figure 1). **Nigeria is by far the most interesting country to invest in**, being both the most populated¹⁷ and the richest¹⁸ country in Africa and ranking first in 'General' and 'Nuclear' and second in 'Solar'. **Ethiopia and Tanzania also appear in the top ten for several energy categories.** Some countries are therefore extremely attractive markets for different types of resources, being economically healthy and politically stable nations with high demand for energy.

Rosatom in Africa

In the field of nuclear energy, Russia has already developed a wide network of cooperation on the continent. Russia's state-owned nuclear company Rosatom has already signed several memoranda of understanding, intergovernmental agreements and roadmaps with most countries ranked in the 'Nuclear' section of Table 2. Rosatom has, indeed, signed cooperation agreements with Rwanda¹⁹, the DRC, Egypt, Ethiopia, the Republic of the Congo²⁰, Nigeria, South Africa, Tanzania, Zambia²¹, Algeria, Ghana, Morocco, Tunisia and Sudan²². In some of these countries, namely Nigeria and Ethiopia, the agreements entail cooperation on the construction of nuclear power plants. Nigeria is where Russian activity in the nuclear field is most active, as Rosatom is currently carrying out the construction of nuclear power plants, research and small modular reactors²³.

EXISTING SUPPORTING ENERGY POLICIES

Some African governments have implemented specific funding programmes or policies to support the development of sustainable energy production in their country. This is the case in **Nigeria**. With a booming population and a set goal of 90% of national access to electricity by 2030, the government has invested USD 20 million in solar panels and developed the Mambilla hydro power station thanks to Chinese loans and 10 000 solar-powered mini-grids via World Bank loans²⁴. **Djibouti** attracted funding from different institutions to implement a 60MW wind farm²⁵ and a 30MW solar complex²⁶. The **DRC**, given

¹⁶ Marc Prosser, China Is Taking the Worldwide Lead in Wind Power, SingularityHub.

URL: <https://singularityhub.com/2019/04/04/china-is-taking-the-worldwide-lead-in-wind-power/> (last visited on March 10, 2020).

¹⁷ Data Bank: Population, total, World Bank. URL: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=ZG-ZQ> (last visited on March 10, 2020).

¹⁸ IMF Data Mapper: GDP, current prices (Billions of U.S. dollars), International Monetary Fund. URL: <https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEO/WORLD/BWA/BFA/CMR/CAF/TCD/COM/COG/GAB/GMB/GIN/GNB/STP/SEN/ZMB/UGA> (last visited on March 10, 2020).

¹⁹ Russia and Rwanda signed a Memorandum of Understanding on cooperation in the field of peaceful uses of atomic energy, Rosatom.

URL: <https://www.rosatom.ru/en/presscentre/news/russia-and-rwanda-signed-a-memorandum-of-understanding-on-cooperation-in-the-field-of-peaceful-uses-/> (last visited on March 10, 2020).

²⁰ Russia signs more agreements with newcomer countries, AFRICIS.

URL: <https://africis.org/2019/04/23/russia-signs-more-agreements-with-newcomer-countries/> (last visited on March 10, 2020).

²¹ International relations, Rosatom. URL: <https://www.rosatom.ru/en/aboutus/international-relations/> (last visited on March 10, 2020).

²² Emerging Nuclear Energy Countries, World Nuclear Association.

URL: <https://www.world-nuclear.org/information-library/country-profiles/others/emerging-nuclear-energy-countries.aspx> (last visited on March 10, 2020).

²³ Ibid.

²⁴ Isabelle Gerretsen, Nigeria Is Turning to Renewables to Meet the Energy Demands of a Growing Population, World Economic Forum. URL: <https://www.weforum.org/agenda/2018/12/oil-rich-nigeria-turns-to-renewable-energy-as-population-booms-ac99c93f-025e-4fd5-b9be-e9c5aca7b216/> (last visited on March 10, 2020).

²⁵ Nicholas Nhede, Djibouti's First Renewables Project Launched, Smart Energy. URL: <https://www.smart-energy.com/renewable-energy/djibouti-first-renewable-project-launched/> (last visited on March 10, 2020).

²⁶ Teresia Njoroge, Djibouti Signs a Framework Deal for Construction of 30 MW Pv Power Plant, Construction Review Online. URL: <https://constructionreviewonline.com/2019/06/djibouti-signs-a-framework-deal-for-construction-of-30-mw-pv-power-plant/> (last visited on March 10, 2020).

its central location and the number of streams crossing the country, could be a major provider of cheap electricity to all of Africa thanks to Inga I and II hydropower projects²⁷. However, due to insufficient maintenance and the lack of existing infrastructure, the DRC is far from exploiting its full potential. As part of the 'Desert to Power' initiative, **Chad** massively invested in solar energy. With the help of loans from the African Development Bank, the goal would be to build 10GW-worth of solar panels in the Sahel by 2025, plus the required distribution infrastructure²⁸. However, despite our analysis highlighting the wind potential of Chad, no supportive policy has been implemented. Lastly, **Angola** has set the expansion of the hydropower scheme as a priority under its Energy Security Policy and its 2025 strategy. Luanda is seeking investments to reach full capacity.²⁹

RECOMMENDATIONS

This market analysis provides compelling findings. It seems that the true competitors are Russia versus France on the one hand and Germany versus China on the other for two sets of energy resources respectively. **In the case of nuclear and hydro energy, Russia has the upper hand on France.** Moscow is already well implanted in Angola and South Africa. However, **France will probably be a preferred choice for members of the Francophonie**, which already have strong political and economic ties with Paris. Regarding the hydropower market in the DRC, the country offers true potential, with France and Russia presumably being able to participate without friction.

As for solar and wind energy production, Germany has a hard task ahead. Not only do countries like Chad have no supportive policies for the targeted energy, but **China is well implanted in the Horn of Africa and provides much cheaper products.** In order to remain competitive, **Germany could emphasise the quality of its products, employ and train local labour and provide interesting loans** to help finance the projects.

Methodology

TABLE 1

Absolute advantage

Country A holds an absolute advantage over country B when, over the same time period, it produces more of a product than country B.

Example from Table 1:

In the case of 'Solar' → Germany > France > Russia > Sweden

In the case of 'Wind' → Germany > France > Sweden > Russia

Germany has an absolute advantage over France, Russia and Sweden in both 'Solar' and 'Wind'.

Comparative advantage

Country A holds a comparative advantage over country B when, over the same time period, it produces a product more efficiently than another one relatively to country B.

Example from Table 1:

In the case of 'Solar' → Germany (46164) / France (9573) = 4,82 (approximation)

In the case of 'Wind' → Germany (105693) / France (24711) = 4,28 (approximation)

Since 4,82 > 4,28, then Germany has a comparative advantage over France in 'Solar'.

TABLE 2

In order to create an index for the weighted ranking, five variables (four in the case of 'General') have been taken into consideration and were given a respective coefficient relative to their importance.

General

Variable 1 (Purchasing power) = GDP (2019) – share of debt (2019) (coefficient 1)

Variable 2 (Demand) = share of the population without access to electricity (2017) (coefficient 1)

Variable 3 (Market size) = total urban population (2018) (coefficient 1)

Variable 4 (Risk) = political stability and absence of violence/terrorism (2018) (coefficient 1)

²⁷ Democratic Republic of the Congo, International Hydropower Association.
URL: <https://www.hydropower.org/country-profiles/democratic-republic-of-the-congo> (last visited on 10 March 2020).

²⁸ Cecilia Keating, Sahel Summit Backs 'Desert to Power' Plan to Bring Solar to 60 Million, PV-Tech.
URL: <https://www.pv-tech.org/news/sahel-summit-backs-desert-to-power-plan-to-bring-pv-power-to-60-million> (last visited on March 10, 2020).

²⁹ República de Angola: Ministério da Energia e Águas, New Large Hydro, Angola Energia 2025.
URL: <http://www.angolaenergia2025.com/en/conteudo/new-large-hydro> (last visited on March 10, 2020).

Nuclear

Variable 1 (Purchasing power) = GDP (2019) – share of debt (2019) (coefficient 2)³⁰

Variable 2 (Demand) = share of the population without access to electricity (2017) (coefficient 1)

Variable 3 (Market size) = total urban population (2018) (coefficient 1)

Variable 4 (Risk) = political stability and absence of violence/terrorism (2018) (coefficient 1)

Variable 5 (Specificity) = amount of uranium (2015) (coefficient 0,5)³¹

Solar

Variable 1 (Purchasing power) = GDP (2019) – share of debt (2019) (coefficient 1)

Variable 2 (Demand) = share of the population without access to electricity (2017) (coefficient 1)

Variable 3 (Market size) = total urban population (2018) (coefficient 1)

Variable 4 (Risk) = political stability and absence of violence/terrorism (2018) (coefficient 1)

Variable 5 (Specificity) = average specific photovoltaic power output per day (2019) (coefficient 4)³²

Hydro

Variable 1 (Purchasing power) = GDP (2019) – share of debt (2019) (coefficient 1)

Variable 2 (Demand) = share of the population without access to electricity (2017) (coefficient 1)

Variable 3 (Market size) = total urban population (2018) (coefficient 1)

Variable 4 (Risk) = political stability and absence of violence/terrorism (2018) (coefficient 1)

Variable 5 (Specificity 1 + 2) = drainage area (coefficient 2) + average discharge (coefficient 2)³³

Wind

Variable 1 (Purchasing power) = GDP (2019) – share of debt (2019) (coefficient 1)

Variable 2 (Demand) = share of the population without access to electricity (2017) (coefficient 1)

Variable 3 (Market size) = total urban population (2018) (coefficient 1)

Variable 4 (Risk) = political stability and absence of violence/terrorism (2018) (coefficient 1)

Variable 5 (Specificity) = mean wind power density for the 10% windiest areas (coefficient 4)³⁴

³⁰ Purchasing power is important since a nuclear power plant requires a large upfront payment.

³¹ The possession of uranium is desirable but not necessary to order a nuclear power plan.

³² This is a crucial requirement for the production of solar energy.

³³ These are crucial requirements for the production of hydropower.

³⁴ This is a crucial requirement for the production of wind energy.



Tel.: +7 (495) 225 6283
Fax: +7 (495) 225 6284
welcome@russiancouncil.ru

119049, Moscow,
8, 4th Dobryninsky pereulok

russiancouncil.ru