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Energy Technology Report



BRICS
ENERGY RESEARCH COOPERATION PLATFORM

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The following ERCP experts took part in the research: (Brazil) Andre Luiz Rodrigues Osorio, Joao Antonio Moreira Patusco, (Russia) Oleg Zhdaneev, Vasiliy Chuboksarov, (China) Xu Xiaodong, Gu Hongbin, He Zhao, Yan Bingzhong.

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CONTENT

BRICS ENERGY TECHNOLOGY REPORT 2020

Welcome Remarks	06
Introduction	16

CHAPTER 1

COUNTRY PRIORITIES FOR ENERGY TECHNOLOGY DEVELOPMENT

1.1 BRAZIL	20
1.2 RUSSIA	23
1.3 INDIA	26
1.4 CHINA	30
1.5 SOUTH AFRICA	32

CHAPTER 2

MUTUAL INTERESTS

2.1 OIL AND GAS SECTOR TECHNOLOGICAL MUTUAL INTERESTS	43
2.2 ELECTRIC POWER SECTOR TECHNOLOGICAL MUTUAL INTERESTS	44
2.3 COAL SECTOR TECHNOLOGICAL MUTUAL INTERESTS	47
Conclusion	49



Bento Albuquerque

*Minister of Mines and Energy
of the Federative Republic of Brazil*

I applaud the Government of the Russian Federation for organizing this most timely and useful report on technology cooperation in power and fuel complex.

This report is another example of the various areas of cooperation we can develop among our countries based on our respective research and development efforts with a view to increase energy efficiency and the reduce carbon emissions.

This document showcases the enormous potential for creating new tools to encourage technology partnerships among our countries that will benefit our societies and the world as whole.



Alexander Novak

Minister of Energy of the Russian Federation

International relations are intrinsically linked with the fuel and energy complex and technology development. Exchanging experience and best practices on energy challenges and opportunities may create strong alliances and partnerships between countries and organizations. New technologies enable geographically diversified BRICS countries to create strong energy and economic ties. As never before, international scientific and technological cooperation is relevant nowadays. Global energy transition and the development of Industry 4.0 technologies stimulate countries to achieve national and global goals together.

All the five BRICS countries, being sovereign, self-sufficient and technologically advanced states, are among the ten largest world economies. The partnership of the BRICS countries opens wide opportunities for cooperation in various fields, including the creation of breakthrough technologies and equipment in the fuel and energy complex.

For successful cooperation, it is necessary to understand what technologies are the most required in individual countries and what common interests and challenges they share. In addition, it is essential to determine the resource potential of the countries, as well as competencies and experience they can exchange.

In preparation for the BRICS summit chaired by the Russian Federation in 2020, the “BRICS Energy Technology Report” was prepared by the joint effort of the international experts. More than 60 companies from the five countries assessed around 550 technologies based on various criteria and chose the most relevant and commercially interesting ones for the period of next 15 years. The study can be a guiding document for further cooperation in the development of new technologies in the Union. The main goal of the research was to show that in a rapidly changing world there are numerous areas of technological cooperation in the fuel and energy sector that we should work together on.



Raj Kumar Singh

Minister of Power of the Republic of India

India has been at the forefront of addressing global challenge of climate change and has committed to an ambitious Nationally Determined Contributions (NDCs) of reducing emission intensity by 33-35% in 2030 against the levels of year 2005.

Technological advancements play an important role in mitigating climate change. India has proactively pursued mitigation and adaptation activities and achieved a reduction in emission intensity of GDP by 21% over the period 2005-2014.

The ensuing report provides a peek into the environmental friendly technologies being deployed by the BRICS countries in the energy sector.



Zhang Jianhua

Administrator of National Energy Administration of China

The BRICS has always been an essential platform for major emerging markets and developing countries to strengthen collaboration and safeguard common interests. With joint efforts of the top leaders from the five member states, the BRICS spirit of openness, inclusiveness, and win-win cooperation has been upheld by all members to strengthen unity and address challenges together. Pragmatic cooperation have been achieved in various fields, especially in this year, facing crucial changes in the international landscape, BRICS countries have pulled and supported each other to overcome all the difficulties, made all-out efforts to overcome the impact of the COVID-19 pandemic and thus fully promoted economic recovery and set a model for building a new type of major-power relationship around the world. As President Xi Jinping illustrated at the Plenary Session of the BRICS Brasilia Summit in 2019, “Faced with profound changes rarely seen in a century, major emerging markets and developing countries like us must grasp the trend of the times. We must respond to the call of our people, and shoulder our responsibilities. We must remain true to our unwavering commitment to development and strengthen solidarity and cooperation for the well-being of our people and for the development of our world.”

Energy cooperation is an indispensable part of pragmatic cooperation in the economic field of BRICS countries. Among the five countries, there are both energy producers and energy consumers. Each country has its own advantages in resource endowment and technological innovation. Strengthening energy cooperation and seeking ways to energy development and transition will not only help to jointly fight against external risks and climate change, but also have a positive impact on the global energy transition and sustainable development.

According to the consensus reached at the Forth Meeting of BRICS Energy Ministers, with the active initiative by Rotating Presidency of Russia, the BRICS countries have overcome many difficulties and completed the BRICS Energy Report and BRICS Energy Technology Report- the first two cooperative reports under the ERCP framework. I hope that there will be more fruits under the ERCP framework in the future. China is always looking forward to working with all parties to promote energy technology for BRICS and wide around the world with more extensive and mutually beneficial cooperation, so as to lay a solid foundation for the sustainable development of mankind.



Samson Gwede Mantashe

*Minister of Mineral Resources and Energy
of the Republic of South Africa*

South Africa pragmatically embraces the changing energy landscape and is engaged in a continuous process of identifying how best to transition as a country in a manner that ensures energy security, improves electricity affordability, re-invigorates manufacturing, global value-chain participation and broader industrialisation. Technological advancement and innovation, as well as cooperation is a central feature of our efforts, and we are a firm supporter of intensified BRICS efforts in this regard. Our own efforts are aimed at initiatives and policies that enable widespread employment and does not come at the expense of broader society, so that no one is left behind as the country continues to shift to a more environmentally sustainable energy system, ecological landscape and socio-economic development.

Initiatives such as the BRICS Energy Technology Report assist to enhance data sharing and collaboration on information and knowledge management. Importantly, it provides a platform for ongoing and sustained engagement between national experts to drive dialogue that will benefit all BRICS countries collectively. Moreover, it strengthens our joint actions, as it outlines a clear and concise roadmap towards technology cooperation in a practical and measurable manner.

South Africa wishes to acknowledge the effort of the BRICS 2020 Chairmanship under the Russian Federation for its efforts in forging all BRICS countries into a common programme, drawing on the strengths of the collective, but also allowing for space that will further nurture national actions towards a shared goal. We hope that this tool will be used by experts to further strengthen their joint cooperation, and assist BRICS to navigate the exciting new realities which confronts the globe.

INTRODUCTION

Creating the conditions for the development and exchange of advanced energy technologies is an essential part of BRICS energy cooperation, especially from the energy transition point of view.

The development of technological cooperation between the BRICS countries has long been on the agenda of the leaders of the five countries. For the first time, technological cooperation in the energy sector was singled out in a separate direction in the joint declaration of the leaders of the BRICS countries in 2010. It emphasized the possibility of cooperation between the union countries in technology transfer in the energy sector.

Subsequently, the leaders of the five countries have repeatedly called for the exchange of knowledge in environmentally friendly technologies, the promotion of the use of energy-efficient technologies, taking into account national policies, priorities and resources, and the expansion of access to technology. In 2017, following the results of the BRICS Summit in China, countries agreed to promote the development of open, flexible, and transparent technologies in the energy field.

Issues of joint development of energy technologies are traditionally part of the ministerial dialogue. Technological cooperation in energy-efficient and clean technologies has become one of the key topics of the Memorandum of Understanding in energy conservation and improving energy efficiency between the BRICS ministries and departments responsible for energy, which was signed in 2015 in Moscow following the first meeting of the BRICS Energy Ministers.

Technological cooperation is included in the list of priority areas of work of the BRICS Energy Research Cooperation Platform. In addition, according to the Energy Platform Terms of Reference, the development of joint energy technologies is one of the key tasks of its activities.

According to the BRICS Economic Partnership Strategy 2020 the BRICS countries support the creation of conditions for the development and transfer of energy-efficient and environmentally friendly technologies and equipment and the promotion of such development and transfer, enhancing public-private partnerships to stimulate investment in energy-efficient technologies, conducting research and development (R&D) in advanced technologies that contribute to energy efficiency in areas of mutual interest, and the study of such technologies.

The publication of the BRICS Energy Research Cooperation Platform on technological cooperation of the unification countries is the first joint attempt to determine the mutual interests of the BRICS countries in energy technologies.

Such a study will provide a solid basis for identifying workable ways of practical cooperation between the five countries.



CHAPTER 1

COUNTRY PRIORITIES FOR ENERGY TECHNOLOGY DEVELOPMENT

There are two important processes of transformation in the global fuel and energy complex today. The first is the transition to Industry 4.0 and, in general, the development of engineering and technology, and the second is the energy transition and lean manufacturing which complement each other perfectly. Also, one can observe a global change in corporate culture in the fuel and energy complex when operators think not only about shareholders profit or even operational efficiency but also pay attention to social and environmental obligations. Today sustainable performance is the key priority for many countries and regions and can be achieved by smart combination of all tools and tracking all trends we have today.

One of the most important tools for achieving companies and global goals is international scientific and technical cooperation. Development of new technologies generally takes from 5 to 10 years, and if it is developed by one company in a narrow market, most likely the project will never pay off. In this regard, the question arises of international scientific and technical cooperation, which helps to accelerate the speed of development by transferring technologies and specialists and expand the market by increasing the potential number.

BRAZIL

RUSSIA

INDIA

CHINA

SOUTH AFRICA

[1.1]

BRAZIL

Brazil is one of the largest developing countries in the world. In 2019, Brazilian GDP, calculated by PPP, amounted to \$6828 billion, in terms of per capita - \$8.7 thousand. An important role in the country's economy is played by industry, whose share in GDP in 2017 amounted to 20.7%. Brazil has significant reserves of iron, manganese ores, titanium, bauxite, copper, chromite, niobium, etc. In recent years, significant reserves of hydrocarbon resources have been discovered on the Brazilian shelf. The country's electricity industry is characterized by a high share of generation at hydroelectric power stations. The key industries in the manufacturing industry are ferrous metallurgy, aluminum production, mechanical engineering, and the chemical and food industry.

In the past, the Brazilian government stepped up efforts to reduce the country's dependence on foreign energy suppliers and to encourage domestic energy sources to grow. These policies and their outcome benefited the trade balance, national security, and capital goods industry, as well as labor market, of the country. Many innovative energy policies and programs have helped the country grow socially, economically and to achieve renewable energy growth. Technology advancement has been increasing in Brazil's energy sector since the government made efforts to build on the country's energy balance, which relied heavily on hydropower. The government has invested in innovation (R&D, pilot programs, and marketing) to develop the capacity to consume technologies and create important partners for technologies cooperation.

Today manufactures in the country provide up to 90% of domestic demand for industrial goods. Demand for machinery and equipment is satisfied by more than 80%. A positive out-