BRICS

ENERGY TECHNOLOGY REPORT

2021

BRICS
INDIA 2021

BRICS
ENERGY RESEARCH COOPERATION PLATFORM

Imprint

Study By

Indian Council for Research on International Economic Relations (ICRIER)

Plot No. 16-17

Pushp Vihar Institutional Area,

Sector 6, Saket

New Delhi – 110017

India

Commissioned on behalf of

Bureau of Energy Efficiency

Ministry of Power, Government of India

4th Floor, Sewa Bhawan, R.K.Puram

New Delhi 110066

India

September 2021

CONTENTS

ACKNOWLEDGEMENT

The BRICS Energy Technology Report 2021 is the outcome of collaborative efforts of the Bureau of Energy Efficiency (BEE) and Indian Council for Research on International Economic Relations (ICRIER). The team acknowledges the contribution of ERCP experts from the Ministry of Mines and Energy of the Federative Republic of Brazil; Oleg Zhdaneev, Vasiliy Chuboksarov and Pavel Bravko from the Russian Energy Agency, Ministry of Energy of the Russian Federation; all energy officials from the National Energy Administration (NEA) of China and the Ministry of Mineral Resources and Energy of the Republic of South Africa who spared their valuable time to provide key inputs for the analysis.

The team would like to express its sincere gratitude to Abhay Bakre, Director General (BEE) for his leadership and guidance. ICRIER acknowledges the co-operation and support extended by Arijit Sengupta, Director (BEE) for overseeing the preparation of this report. The team would also like to thank Siddharth Dhar (Project Engineer) and Sumit Mudgal (Project Engineer) for lending support in coordinating with various ministries and agencies, both national and international.

The report has been prepared under the leadership of Amrita Goldar, Senior Fellow (ICRIER). The project activities were carried out by Diya Dasgupta (Research Associate), Tarun (Research Assistant), Kumar Gaurav (Research Assistant) and Sajal Jain (Research Associate).

Bento Albuquerque

Minister of Mines and Energy of the Federative Republic of Brazil

I applaud the Indian presidency of the BRICS for updating and revising the BRICS Energy Technology Report.

This is a timely and useful instrument for fostering cooperation among our countries, bringing wider benefits for our societies and the world as whole.

I am confident this report will contribute to deepening cooperation on all dimensions of the BRICS platform.

N. Shulginov

Minister of Energy of the Russian Federation

The energy security of our states today depends, among other things, on access to advanced energy technologies. The technological reality in the energy sector is undergoing significant changes. The speed and depth of these changes force us to change both at the level of the development of national energy industries and the level of international cooperation in the energy sector. In this regard, a crucial component of the strategic priorities of BRICS countries is the development of technical cooperation.

We are now at the first stage of the implementation of the "Road Map for BRICS Energy Cooperation up to 2025", where we use research to identify the most promising new technologies of the interest of BRICS countries and develop mechanisms for practical cooperation. We attach particular importance to the possibility to produce technologies in the territory of our countries with the participation of our closest economic partners.

We welcome the launch of the "BRICS Energy Technology Report" prepared by the experts of the BRICS Energy Research Cooperation Platform. I am sure that the results of this research will serve as a solid basis for the formation of joint projects to develop energy technologies both in "traditional" energy sectors and in breakthrough areas, taking into account the needs and interests of our countries.

Raj Kumar Singh

Minister of Power, Government of India

India has demonstrated leadership in promoting energy efficiency and addressing the global issue of climate change. Government of India has undertaken a two-pronged approach to cater to the energy demand of its citizens while ensuring minimum rise in CO2 emissions, so that the global emissions do not lead to irreversible damage to the ecosystem. On the generation side, the Government is promoting greater use of renewables in the energy mix mainly through solar and wind and at the same time shifting towards supercritical technologies for coal-based power plants.

Key focus of the Indian government is on implementing the largest Renewable Energy (RE) expansion programme in the world, envisaging a 5-fold increase in the overall RE capacity from 32 GW in 2014 to 175 GW by 2022, and further to 450 GW in the country by 2030.

Owing to various energy efficiency measures undertaken so far, energy intensity of the country has declined from 0.273 mega joule per INR in 2012-13 to 0.223 mega joule per INR in 2019-20 indicating an efficiency increase of 18%. This will have direct impacts on reduction of emissions intensity which is aimed at 33-35% reduction by 2030 under the Paris Agreement . Energy efficiency is expected to contribute to achieve up to 55- 56% of this target.

The BRICS Energy Technology Report 2021, prepared under the Indian Chairship is a result of joint efforts by sector experts from all member countries. The theme this year was energy demand, which was selected in order to maintain continuity of the ongoing efforts to identify key technologies and build a comprehensive overview of technologies that cater to both the energy demand and the supply side. This report would promote latest technologies in the industrial, buildings and transport sectors that will play a pivotal role in ensuring decarbonization of economy. I am sure that this will open more avenues for cooperation among member countries in the short and long term.

ZHANG Jianhua

Administrator of the National Energy Administration of China

This year marks the 15th anniversary of the establishment of BRICS. In the 15 years, we have witnessed the continued improvement of our cooperation mechanism, expansion of collaboration areas, and enhanced global influence, which shows unique charm in maintaining and practicing multilateralism. Facing a pandemic and major changes both unseen in a century, BRICS countries maintained the momentum of cooperation while boosting domestic economic recovery, lending important impetus to the efforts by the five countries and beyond to combat the coronavirus and rebuild the economy.

To accelerate the implementation of the 2030 Agenda, economic recovery through green and low-carbon development represents a compelling consensus shared by the international community. More than 100 countries around the world have pledged to reach carbon neutrality, who are actively promoting energy transition. As Chinese President Xi Jinping pointed out in his remarks at the 12th BRICS Summit, all of us are indeed passengers in the same boat. When the wind is strong and the tides are high, we must be even more focused on our direction. We must keep pace and work as a team to break the waves and navigate steadily toward a brighter future. BRICS countries have respective strengths in energy resource endowments and technical innovation. Facing the common opportunities and challenges of development and transition, BRICS countries hold broad cooperation perspectives in enhancing energy security and low-carbon energy transition. In this context, we BRICS countries should secure new prospects amidst changes. We should work together to enhance all-round cooperation in energy field, explore the future course for green recovery and energy transition, and contribute BRICS' share to tackling common challenges brought by climate change.

This year, at the Indian Presidency's active initiative, BRICS countries overcame difficulties and jointly completed BRICS Energy Report 2021 and BRICS Energy Technology Report 2021 as the ERCP outcomes for this year. The reports update the latest development in energy fields and the progress combating Covid-19, which are of great importance. China is willing to stand with all other countries, actively practice green development philosophy, and contribute to promoting intra-BRICS practical cooperation in energy.

Samson Gwede Mantashe

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

South Africa has one of the most energy-intensive economies globally, and accounts for approximately 40% of all electricity in the African continent. This unsustainable pattern of electricity usage has reduced the country's margin to unsustainably low levels, subjecting the reliability power supply to be under threat. This has undoubtedly have had adverse effects on the country's economy, environment and health.

The South African National Climate Change Response Policy White Paper has already acknowledged that the most promising greenhouse gas mitigation options are primarily energy efficiency and demand side management, coupled with increasing investment in cleaner energy programmes in the electricity sector. It is for these reasons that South Africa adopted the Energy Efficiency Strategy (NEES) in 2005. The NEES was developed with the target of having economic wide energy intensity reduction of 12% by 2015 against the baseline of 2000, and the recently published post-2015 NEES document that will contribute 16% reduction in energy demand by 2030, relative to 2015 energy consumption baseline.

The following are key Energy Efficiency and Demand Side Management projects that are currently being implemented in South Africa to accelerate energy efficiency improvement; namely:

- Energy Efficiency Labelling that prescribes minimum energy performance standards and energy performance rating label of electrical equipment and appliances.
- Industrial Energy Efficiency that is aimed at achieving a wide-scale adoption of energy management systems and methodologies, enhancing institutional frameworks and regulatory environments to accelerate energy efficiency and improve the technical capacity of industry to implement energy savings measures.
- Building Energy Efficiency focusing on the improvement of energy performance of existing and buildings including investment support to implement integrated renewable energy and energy efficient technologies.
- Municipal Energy Efficiency and Demand Side Management Programme with the aim of achieving a net-zero energy of wastewater treatment facilities and improving the energy efficiency of public street lighting.
- Energy Efficiency in Public Buildings and Infrastructure Project aimed at introducing innovative financing mechanism and accelerate the implementation of energy efficiency in the public buildings and infrastructure sector.
- Energy Efficiency Income Tax (12) Allowance, a tax incentive in terms of section 12L of the Income Tax Act, 1962 (Act No. 58 of 1962) that allow for tax deduction of 95c/kWh saved on energy consumption.

South Africa remains committed to continue working with its BRICS member countries on the agreed energy efficiency plan of action, with the view to exchange experiences and good practices.

1. INTRODUCTION

As a part of the BRICS Memorandum of Understanding (MoU) in Energy Saving and Energy Efficiency, energy cooperation among countries has been institutionalised by way of joint research, capacity building and sharing of best practices. Over the course of subsequent Energy Ministers Declarations, several other topics have been included in the fold.

The recently held deliberations of the BRICS Energy Ministers in October 2020 in Russia deepened the scope of work further by focussing on how technology cooperation can be enhanced by way of tangible steps. Two reports namely the BRICS Energy Report and the BRICS Energy Technology Report were presented for consideration. These reports outlined the areas of current deployments and strengths of individual countries. In particular, the reports elaborated on the most essential energy technology requirements in the countries and the common interests and challenges they share. In an attempt to provide a complete picture, it defined the current energy landscape of BRICS nations to identify the potential of each country and the competencies and experience that they can collaborate on. From a future perspective, an attempt was made to tabulate the top 10 BRICS technologies of mutual interests in various sectors/industries. This idea of concretizing areas of mutual technological interest is also contained in the recently circulated 'Roadmap for BRICS Energy Cooperation up to 2025'.

Lessons from Energy Technology Report (2020)

The report emphasised on comprehensive measures that are needed to promote foreign direct investment in the fuel and energy complex in BRICS nations, to create a transparent system for partners' access to licenses for exploration and development of oil and gas fields, to liberalize technological transfer, and customs and tax and tariff incentives for partner countries. It stresses that the development of mutually favourable strategies in the oil and gas sector will be instrumental for BRICS countries for facilitation of trade in energy machines, materials, equipment, and components.

Keeping in mind the dependence of national fuel and energy complex on traditional types of energy, it is essential to account for and include general projects on oil production and oil refining, storage and transportation of oil, organizing trading in oil, natural gas, hydrogenated coal and other clean energy resources, general commercially viable projects for the establishment, financing and equipping of international power generation enterprises using materials, equipment and technology created in the BRICS member countries, general projects for electricity generation, import and export of electrical energy. At the same time, it is also vital to encourage cooperation of scientific, research organizations, technology centres and institutions of the participating countries. Further, the report discussed the challenges that energy cooperation between BRICS countries faces.

With the pandemic having modified energy transformation plans for the near future, the report exerted that BRICS nations will need to strengthen the circulation of information on energy policy,