INNOVATION: A KEY TO ENERGY SECURITY

In today's connected world, increasingly driven by technology, communication, and super human intelligence, energy is the fundamental element that makes everything possible. Without energy there can be no development. The growth of any nation therefore demands adequate available energy.

In India, that adequacy has eluded us thus far by a wide margin. Our per capita energy consumption needs to grow four times to enable us to be level with the world's most advanced countries in terms of the Human Development Index. Even at India's current low consumption levels, more than 42% of our energy requirements are met by imports. To boost consumption, contain imports, and increase domestic production, it is imperative to look at innovative ways to generate, store, and transmit electricity.

Recent government efforts have the nation inching closer to 100% electrification. The latest innovations in solar energy and light emitting diodes (LED) have significantly lowered consumption in terms of wattage and at the same time improved luminescence. But a lot remains to be done. The theme of this year's Global Innovation Index (GII), 'Energizing the World with Innovation', is very apt for India as well as the rest of the developing world. It captures the pulse of the key enablers of growth and economic development. Working towards ensuring energy security is a key agenda for the Confederation of Indian Industry (CII), in close partnership with the government and industry.

India's position on the GII has been keenly monitored by the Indian government for the past few years. Joint efforts of CII and the publishers of the GII, including WIPO, have led to significant collaboration on improving Indian innovation metrics and identifying innovation challenges and opportunities. Since 2016, the report has also launched separately in India at an event jointly organized by the Department of Industrial Policy and Promotion, the National Institution for Transforming India, and CII. In 2016 India's Minister of State for Commerce and Industry instituted a high-level Task Force on Innovation to suggest ways to improve the innovation ecosystem. As a follow-up, the first international consultative exercise was organized in January 2017 in New Delhi to address existing data gaps in the GII. Moreover, the first India Innovation Index—focused on ranking Indian states—was conceptualized in 2017 and reviewed along with India's performance in the GII at the Indian Innovation Summit in Delhi in October 2017. As a result, a State Innovation Index is now in the works. It is hoped that it will spur states to improve their innovation ecosystems.

Based on this year's theme, Chapter 8 presents India's energy story. This has largely been a quest for sustainable development with strained resources. Rising energy demand coupled with a less-than-adequate increase in domestic production has led to an alarming increase in the import component of India's energy basket. Tackling that challenge requires innovative thinking and a smart push towards technologies and services that provide maximum impact.

CII's partnership with GII continues to grow strong and I see it consolidating in years to come. I congratulate the GII team for their sustained efforts and untiring rigor in producing this latest edition of the index, which is based on a very apt theme and will lead to significant improvement in world energy scenario.

Chandrajit Banerjee
Director General
Confederation of Indian Industry

TOWARDS THE GOAL OF ENERGY FOR ALL

Innovation lies at the core of any solution to the challenges facing our world today. Whether it's the creation of new technologies that can help us stretch the limits of what is possible, or the development of new business models that make our world more efficient and interconnected, it is our business imperative as leaders to continuously reinvent, rethink, and reimagine.

The Global Innovation Index (GII), by creating metrics through which innovation can be measured across the globe, helps identify ways that innovation can better serve society and the challenges we face. At Strategy&, PwC's strategy consulting business, we are proud to be included as contributors to this volume for the second consecutive year.

Our purpose at PwC is to build trust in society and solve important problems—problems that erode trust, prevent expanding economic opportunity for all, and threaten the fabric of our society and culture. These are problems that require people to come together, bringing their best ideas and creativity to the table. The GII brings strategy and execution together to advance innovation in the service of making our world better.

The theme of the 2018 GII, 'Energizing the World with Innovation', offers an opportunity for some of the world's greatest minds to apply themselves to the critical issue of access to energy—from production to storage, from transport and distribution to consumption patterns. Supply has not kept pace with demand, and there is a growing need for sustainable solutions. In PwC's chapter, 'Energy for All: How Innovation Is Democratizing Electricity', Norbert Schwieters, Barry Jaruzelski, and Robert Chwalik report that an estimated 1.2 billion people worldwide are living without electricity, and 2.8 billion without clean and safe cooking facilities. This certainly represents a crisis of global concern.

But as we go on to discuss, innovations in energy sources such as renewables, as well as distribution and storage solutions such as micro-grids, batteries, and smart technologies, can be game-changers. In regions where centralized power grids are inefficient and unreliable, distributed energy systems can be built from the ground up, thanks to off-grid renewable energy technology. Even in developed countries, where the shift is happening more slowly because centralized power generation via long-distance power grids is well established, customers are installing solar panels, producing their own energy, and sending unused energy back to the grid.

It's clear that, across the globe, traditional energy frameworks are witnessing a fundamental change. Private-sector investment will play a significant role as these new systems take shape, both from traditional utilities—many of which are seeing this new way forward as an opportunity rather than as disruption—and from the start-ups and entrepreneurs developing and applying new technologies in the renewables space. Around the globe companies are implementing projects, often in close coordination with public-sector partners, that demonstrate the transformative potential of these innovations.

The realization of 'energy for all' is a powerful and worthy goal, and one that we owe ourselves and future generations to continue to pursue. As a GII Knowledge Partner, we hope to contribute to bridging the gap between innovation goals and tangible societal benefits.

Tim Ryan
U.S. Chairman and Senior Partner
PwC

INNOVATION: CENTRAL TO BRAZIL'S ENERGY SECTOR

Sustainable development is a priority for the Brazilian National Confederation of Industry (CNI), the Social Service of Industry (SESI), the National Service of Industrial Training (SENAI), the Brazilian the Brazilian Micro and Small Business Support Service (Sebrae), and the Entrepreneurial Mobilization for Innovation (MEI). Sustainable development demands innovation and, since 2008, Brazilian business leaders, including those from the energy sector, have been promoting innovation as the centre of business strategy, aiming to increase the strength and efficiency of innovation policies in Brazil.

The energy sector is essential for sustainable development. The rational use of natural resources has room to improve significantly, and the use of renewable sources is increasing fast. Those processes can contribute to making good on the commitments undertaken by Brazil in the Paris Agreement. The goal is to promote the reduction of greenhouse gas emissions as part of a transition towards a low-carbon economy.

The theme of this year´s Global Innovation Index, 'Energizing the World with Innovation', deals with a crucial issue for the world´s industry: the role of innovation to promote a cost-effective energy transition. The great challenge in energy transition is to reduce the trade-off between energy cost and environmental impacts. This challenge is being tackled with the help of new vectors of technological innovation, which are helping transform the technological basis and the structures of energy supply and demand.

Each country's endowment of energy resources and demand allow multiple strategies and policies to meet this challenge. In this context, Brazil has lessons to offer and new challenges to overcome. The size of its national energy sector, as well as its diversity and unique circumstances, impose important technological challenges that have been met with an important innovation effort. The result is an energy matrix with a large share of renewable energy in transport and electricity. In 2016 renewable energy supplied 43.5% of the country's total energy consumption needs. Sugarcane products used for transport (ethanol) and for heat and electricity generation (bagasse) provided 17% of total energy supply. Hydropower dominates Brazil's electricity generation, at 13% of total supply.

Brazil has been able to build a complex ecosystem of innovation in the energy sector. To adapt to new challenges of energy transition, however, this ecosystem must adopt an energy and innovation policy compatible with the energy, business, and institutional challenges, and with the need to include small businesses in the process.

The adoption of technological solutions supported by digital tools is an important driver for business strategies and government policies in the medium and long term. Three trends stand out: fostering the intelligent management of complex systems, increasing the sophistication of the data analytics tools, and instituting new paradigms of automation.

Based on this new technological foundation, important transformations in the energy industry can be induced that facilitate the diffusion of renewable sources (wind, solar, and biomass) and the necessary intelligent management of the electric system to make distributed generation possible.

The theme of Global Innovation Index this year represents an excellent opportunity to assess the Brazilian experience of innovation in the energy sector and draw lessons for an innovation strategy compatible with the major challenges imposed by energy transition on the national and worldwide economy.

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