



# BIMSTEC ENERGY CENTRE

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## Editorial



Welcome to 2<sup>nd</sup> Edition (October 2025) of our Quarterly (July-September 2025) BIMSTEC Energy Centre (BEC) E-Newsletter!

The July–September quarter marked a period of constructive engagement and significant milestones for the BEC.

To strengthen knowledge sharing and technical expertise, BEC organized its first ever Capacity Building Program (online) on “*Renewable Energy Integration in the Indian Context: Grid Operational Challenges and Solutions*”. The session provided valuable insights into managing renewable energy integration, addressing operational challenges, and exploring innovative solutions for ensuring grid stability.

In line with its mandate to foster regional collaboration, BEC along with the BIMSTEC Secretariat, attended the presentation of United Nations Office for Project Services (UNOPS) on the Energy Transition Partnership framework in the Southeast Asia region. The discussions explored pathways for enhancing regional energy cooperation, with a focus on sustainable and clean energy development across BIMSTEC member states.

A key highlight of the quarter was the Bhoomi Pooja ceremony for the permanent BEC building in Bengaluru. This culturally significant ritual marked the auspicious beginning of the Centre’s upcoming premises, symbolizing both spiritual blessings and the institutional growth of BEC as a regional hub for energy cooperation for BIMSTEC region.

Together, these activities reflect BEC’s ongoing commitment to advancing knowledge, strengthening partnerships, and laying the foundations—both literal and symbolic—for a more sustainable energy future in the BIMSTEC region.

As we step into the vibrant festive season of the last quarter of 2025, I extend my heartfelt greetings and best wishes to all citizens of the BIMSTEC Member States. From the grandeur of Durga Puja and Dashain, the colourful Thimphu Tshechu, and the shimmering light festivals of Deepavali, Thadingyut, and Loy Krathong, to the joy of Christmas, may this season fill your homes and hearts with happiness, peace, and prosperity. Let these celebrations also remind us of the spirit of unity and collaboration that binds the BIMSTEC region together, fostering stronger ties and shared progress for all our nations

**Ghanshyam Prasad**  
Executive Director

## Online Capacity Building Program on “Renewable Energy Integration in Indian Context: Grid Operational Challenges and Solutions”



BEC conducted first ever online Capacity Building Program on ‘*Renewable Energy Integration in India - Grid Operational Challenges & Solutions*’ on 19 August 2025.

This program provided a platform for engineers, experts from the BIMSTEC Member States to understand and exchange of knowledge on grid operational challenges due to fast and large penetration of RE generation into the system and solutions thereof and its relevance for the region. The session covered the contents viz., introduction to Indian power grid, thrust for RE & energy transition in India, grid operational challenges of RE integration like variability of RE (seasonal, diurnal variation and effect of cyclones, eclipses etc.), forecasting of RE, challenges on declining of Power System Inertia, operational uncertainties that impacts on frequency, voltage and their stability. Session also covered the requirement of ramping from thermal stations etc., flexibility resources, reactive power & voltage control along with case studies, regulatory reforms mandating the requirements for RE integration, transformative bidding frameworks etc.

Shri Ghanshyam Prasad, Executive Director, BEC, during his welcome address highlighted the India’s progress toward net zero and the region’s clean energy potential, particularly in hydro-rich countries like Bhutan and Nepal. He emphasized the importance of regional cooperation and initiatives such as the “One Sun, One World, One Grid” vision to optimize renewable energy use. He encouraged member states to suggest topics for future programs and actively participate in discussions to share experiences and solutions.

Shri Prasanth Chandran, Director (Security Division), BIMSTEC Secretariat, in his key

note address commended the BEC for its timely initiative and reaffirmed energy as a key pillar of regional cooperation. He highlighted the need for affordable, reliable, and sustainable energy, encouraged collaboration with regional and global bodies, and recommended prioritizing renewable energy, energy efficiency, and capacity-building programs. He expressed confidence that BEC's efforts will strengthen BIMSTEC's energy security and cooperation.

### **Summary of key learnings from the Programme:**

#### **Grid Scale, RE Achievements & Highlights of Indian Grid:**

- India operates the world's largest synchronous grid (484 GW total, >243 GW RE).
- Instantaneous RE penetration reached 47% (Sept 2024), supported by an active real-time power market.

#### **India's Growth Roadmap & Targets:**

- Minimal further new coal, expansion of hydro, storage scale-up.
- NDC target of 50% non-fossil capacity by 2030 achieved in June 2025, 5 years ahead of target year.

#### **Technical & Operational Challenges:**

- **Variability & Forecasting:** Weather-driven swings stress operations; AI-based tools improving accuracy.
- **Voltage & Power Quality:** Weak grids, inverter limits, and fluctuating flows require active management.
- **Inertia Loss:** Shift to inverter-based RE reduces system inertia, raising frequency risks.
- **Balancing & Flexibility:** Thermal plants adapting to rapid ramping and cycling; demand shifting supports RE.

#### **Solutions & Best Practices:**

- Renewable Energy Management Centres (REMCs) for real-time RE monitoring/forecasting.
- Advanced AI-based forecasting and satellite now-casting.
- Storage (battery & pumped hydro) to buffer variability.
- Mandated thermal flexibility (minimum operating levels at 55%, ramping at 1%/min).
- Expanded ancillary services, real-time markets, and green power exchanges.
- Updated technical standards for RE integration.

#### **Regulatory & Market Innovations:**

- Incentives for primary frequency response; DSM penalties/rewards for grid support.
- Broadened purchase obligations (RE, hydro, storage).
- Green Open Access Registry enables direct RE procurement.
- Forecasting deviation limits set ( $\pm 15\%$  wind,  $\pm 10\%$  solar).

## BIMSTEC, BEC & UNOPS Explore Pathways for Regional Energy Cooperation



The United Nations Office for Project Services (UNOPS) showcased its flagship initiative “*Accelerating Clean Energy Transition in Southeast Asia*”, which is implemented under the framework of the Energy Transition Partnership (ETP). The ETP, administered by UNOPS, serves as a multi-stakeholder and multi-donor collaborative platform aimed at advancing sustainable and inclusive energy solutions in the Southeast Asia, in line with the Paris Agreement and the Sustainable Development Goals (SDGs).

During the session, senior representatives from the BIMSTEC Secretariat and the BIMSTEC Energy Centre, participated actively to foster constructive dialogue, exchange perspectives, and identify practical opportunities for cooperation. The discussions emphasized the importance of regional partnerships in promoting clean energy development, enhancing energy security, and supporting the collective transition towards low-carbon growth pathways across the BIMSTEC member countries.



## Bhoomi Pooja ceremony for permanent BEC Building



Bhoomi Pooja was performed to mark the commencement of construction of the permanent BEC building in Bengaluru on 07 Aug 2025. The auspicious ritual, which is deeply rooted in Indian tradition, is performed to honour *Mother Earth* and seek divine blessings before undertaking any new construction activity. It symbolizes respect for the land, removal of obstacles, and the invocation of prosperity, harmony, and success for the project.

The pooja was performed by Shri. Ghanshyam Prasad, ED BEC/ Chairperson CEA, who led the rituals with reverence and devotion. DG CPRI, CMD Grid-India & ED SRLDC along with other dignitaries were present during the ceremony. This significant occasion not only marked the spiritual foundation for the new premises but also reflected the Centre's commitment to integrating cultural values with its vision of advancing regional cooperation in the energy sector.

## Energy Profile of BIMSTEC Member States

### BANGLADESH

- ❖ Gas dominated
- ❖ Interconnected with India
- ❖ Maximum Electricity Demand Met (Up to 30.09.2025): 16794 MW
- ❖ Annual Electricity Consumption (2024): 95996 GWH
- ❖ Annual Electricity Generation Mix (2024): Thermal (Majorly Gas): ~ 98 %, Hydro ~ 1 %, RES ~ 1%

### BHUTAN

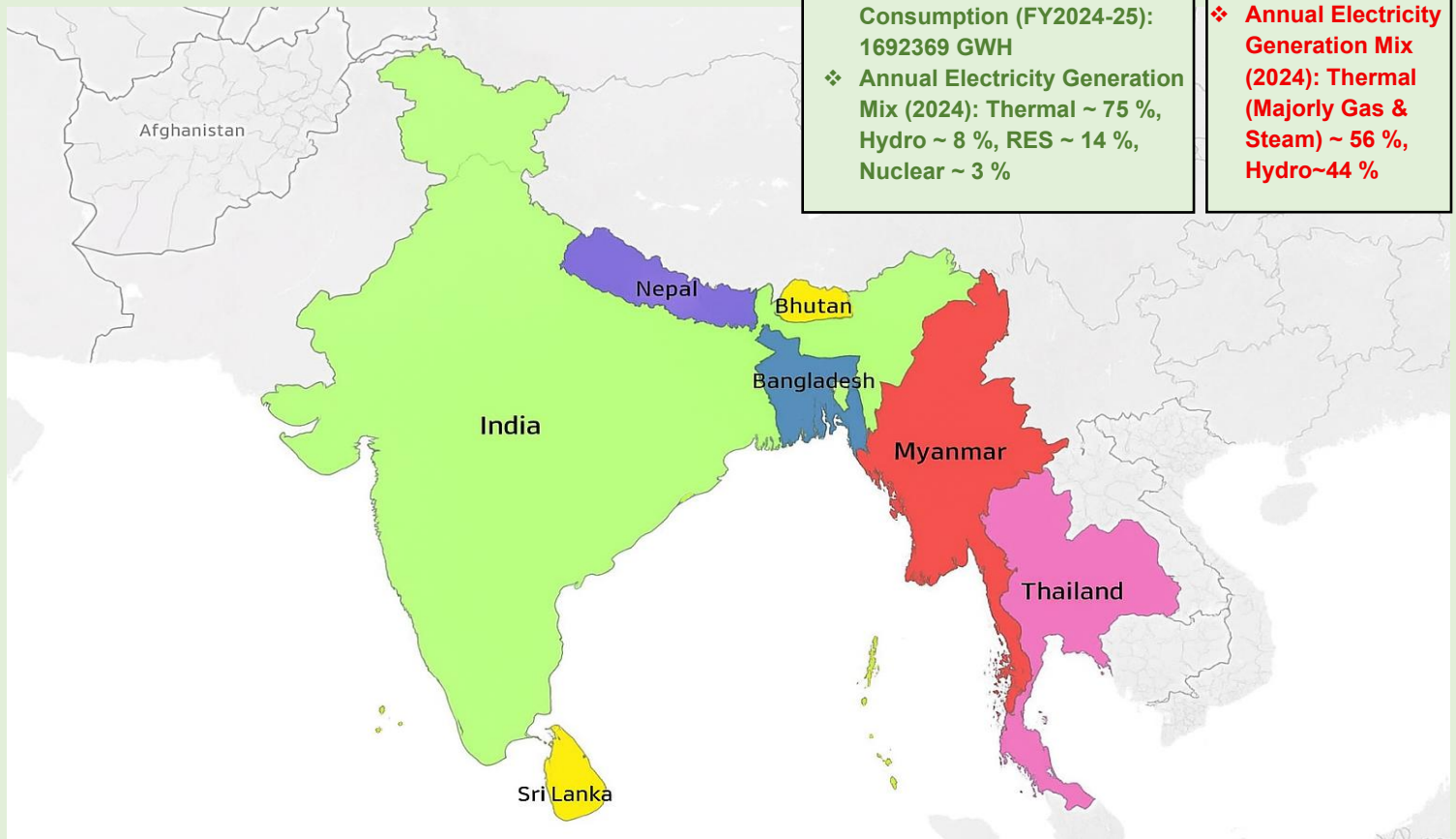
- ❖ Hydro dominant
- ❖ Highest per capita generation & consumption in the Region
- ❖ Net Exporter of power to India
- ❖ Maximum Electricity Demand Met (Up to 30.09.2025): 1237 MW
- ❖ Annual Electricity Consumption (2024): 7125 GWH
- ❖ Annual Electricity Generation Mix (2024): Hydro~100 %

### INDIA

- ❖ Largest energy consumer & supplier in the Region
- ❖ Large coal reserves, coal-based generation is predominant
- ❖ Non fossil fuel IC overtaking fossil fuel IC
- ❖ Dependent on the imports of oil & gas
- ❖ Interconnections with Nepal, Bhutan, Myanmar & Bangladesh
- ❖ Maximum Electricity Demand Met (Up to 30.09.2025): 250070 MW
- ❖ Annual Electricity Consumption (FY2024-25): 1692369 GWH
- ❖ Annual Electricity Generation Mix (2024): Thermal ~ 75 %, Hydro ~ 8 %, RES ~ 14 %, Nuclear ~ 3 %

### MYANMAR

- ❖ Has huge hydro, gas & RE potential
- ❖ Largely dependent on hydro & gas generation
- ❖ Maximum Electricity Demand Met (Up to Jan 2025): 4400 MW
- ❖ Annual Electricity Consumption (2024): 25180 GWH
- ❖ Annual Electricity Generation Mix (2024): Thermal (Majorly Gas & Steam) ~ 56 %, Hydro~44 %



### NEPAL

- ❖ Predominantly hydro based generation.
- ❖ Export to India during hydro season & import from India during off-hydro
- ❖ Maximum Electricity Demand Met (Up to 30.09.2025): 2266 MW
- ❖ Annual Electricity Consumption (2024): 13966 GWH
- ❖ Annual Electricity Generation Mix (2024): Hydro~100 %

### SRI LANKA

- ❖ Hydro power potential has been harnessed
- ❖ Focussing on Clean Energy sources
- ❖ Proposed interconnection with India
- ❖ Maximum Electricity Demand Met (up to 30.09.2025): 2844 MW
- ❖ Annual Electricity Consumption (2024): 15191 GWH
- ❖ Annual Electricity Generation Mix (2024): Thermal (Coal + Gas) ~ 47 %, Hydro ~ 32 %, RES ~ 21 %

### THAILAND

- ❖ Dependent on energy import
- ❖ Gas is the primary fuel for electricity generation, also substantial amount of hydro, coal and lignite, and renewables.
- ❖ higher per capita electricity consumption in the Region (after Bhutan)
- ❖ Maximum Electricity Demand Met (Up to 30.09.2025): 36792 MW
- ❖ Annual Electricity Consumption (2024): 232796 GWH
- ❖ Annual Electricity Generation Mix (2024): Thermal (Majorly Gas) ~ 85 %, Hydro ~ 3 %, RES ~ 12 %

## The Trilemma of Energy Transition: Balancing Sustainability, Reliability & Affordability

The evolution of human civilization has always been about identifying challenges and finding solutions to leapfrog progress and this is not different even in the case of energy transition. Early humans relied on muscle energy of the humans and animals for their survival. With the invention of wheel, and through the mediaeval period, there were attempts to exploit the nature for energy via water mills & windmills. There was again a significant energy transition happened in human civilisation with the invention of Steam Engine in 18<sup>th</sup> Century. The world had understood how to extract energy out of fossils and that had revolutionised an era of the human civilisation till date, when the fossils started to reach near the tipping point of the climate change. This again forced humans to find a suitable sustainable solution.

The solution was once again inspired by our earlier civilizations that looked to nature—water and wind—and, with the progression of technology, the solar resource too is now being harnessed. Fossil fuels had long been regarded as greater acquaintances by power system operators, owing to the flexibility with which they could be deployed—as base load, peak load, or through ramping up and down in accordance with demand. In the case of Renewable Energy (RE), however, the terms of operation are dictated by nature. In the transition from fossils to RE, operators are compelled to adapt to nature's inherent qualities, namely uncertainty and intermittency.

Energy security is basic necessity for the development of any nation. Electricity is one of the easiest and efficient energy sources. Thanks to most flexible form, that it can transform into any Avatars of energy such as light, heat, motion etc. Access to electricity determines the socio-economic development of citizens. Hence, electricity needs to be affordable to every citizen of the country. For ensuring a sustainable living, several countries have started integrating RE to the grid.

Integrating RE mandates power system operators to adopt robust grid management techniques, flexible generating stations, demand response systems, storage solutions, and the maintenance of large reserves at all times to ensure reliable grid operation. Reliability, however, comes with a cost. As the degree of reliability increases, it impacts the affordability of electricity. Nevertheless, it must be noted that maintaining affordable energy prices is vital for the economic stability and social equity of the country.

IEA's World Energy Outlook 2024 observes: *"Policy makers need to balance goals related to energy security, affordability and sustainability. Some policy choices can simultaneously boost all three, but many require trade-offs."*


There is a great responsibility on policy makers in this regard. They must take a conscious and cautious call on balancing the trio of reducing the carbon footprint for a sustainable planet, while ensuring both reliability and affordability. There is no 'one-size-fits-all' guiding document for this; each country has to develop its own by strategically considering economic development, requirements, and available resources. Regional cooperation is a low-hanging fruit that can help balance the three objectives of sustainability, reliability, and affordability.


***The energy transition is not just a technological shift—it is an art of strategic balancing.***






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