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ENERGY SECURITY IN INDIA IN CONTEXT OF GEOPOLITICS

📅 9th June 2026

📍 The Bengal Chamber Premises



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Present

19th Environment and Energy Conclave

Energy Security for Atmanirbhar Bharat
in a Changing Geopolitical Landscape

📅 10th September 2026 📍 Le Meridien, Delhi



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INTRODUCTION

The Bengal Chamber of Commerce and Industry (BCC&I) organized an Interactive Session on '**Energy Security in India in context of Geopolitics**' on **9th June 2026** at the **Williamson Magor Hall, The Bengal Chamber Premises, Kolkata**. The programme was presented as a **precursor to the 19th Edition of the Environment and Energy Conclave**, scheduled to be held on **10th September 2026** at **Le Meridien, New Delhi**.

The session brought together eminent policymakers, industry leaders, diplomats, technology experts and sustainability professionals to deliberate on the evolving geopolitical landscape and its implications for India's energy security, economic growth and energy transition journey.

The distinguished speakers highlighted the growing significance of energy security in an increasingly volatile global environment, emphasizing that ensuring uninterrupted access to affordable and reliable energy is fundamental to India's economic growth, commercial competitiveness and developmental aspirations. It was noted that the on-going geopolitical uncertainties in the Middle East, supply chain disruptions and changing global energy dynamics require countries to continuously reassess their energy strategies and strengthen domestic resilience. Given India's substantial dependence on imported crude oil and natural gas, such disruptions can significantly impact fuel availability, prices and foreign currency reserves. India must increasingly view energy security through the lens of national security, with strategic planning focused on diversification of energy sources, reduction of import dependence and accelerated deployment of domestic clean energy resources.

KEY TAKEAWAYS FROM ROUNDTABLE

ENERGY SECURITY IN A CHANGING GEOPOLITICAL LANDSCAPE

- Energy security must be viewed as a national security priority, with geopolitical conflicts and supply chain disruptions increasingly influencing energy availability and affordability.
- Diversification of energy import sources and greater refinery flexibility are necessary to mitigate risks arising from disruptions in key maritime routes and geopolitical uncertainties.
- Critical minerals, rare earth elements and advanced battery materials are emerging as strategic resources, requiring resilient supply chains and international partnerships.
- Strategic international collaboration, particularly between India and Japan, can strengthen energy security, industrial resilience and long-term economic stability.

ACCELERATING INDIA'S ENERGY TRANSITION

- Reducing dependence on imported fossil fuels requires accelerated electrification across transportation, public mobility and industrial applications.
- Grid modernization, transmission expansion and large-scale energy storage deployment are critical for integrating renewable energy while maintaining reliability.
- The rapid growth of electric mobility, particularly in public transport, two-wheelers and rural mobility systems, offers a practical pathway for reducing oil dependence.
- Energy efficiency should remain a cornerstone of India's energy transition through wider adoption of heat pumps, waste heat recovery systems and energy-efficient industrial processes.

BUILDING SELF-RELIANCE THROUGH DOMESTIC MANUFACTURING AND INNOVATION

- Strengthening domestic manufacturing and supply chains for solar modules, batteries, grid equipment, green hydrogen technologies and other critical energy infrastructure is essential for enhancing self-reliance.
- Emerging technologies such as green hydrogen, advanced batteries and alternative renewable energy solutions will play a crucial role in future energy systems.
- Institutional support, stable policy frameworks and investments in R&D are necessary to accelerate commercialization of clean energy technologies.
- Innovative technologies such as perovskite solar cells, osmotic power generation and ocean current energy present new opportunities for diversification of India's clean energy portfolio.

DIGITAL RESILIENCE AND CYBERSECURITY IN ENERGY SYSTEMS

- Digitalization is becoming central to modern energy systems, enabling improved grid management, renewable integration, demand forecasting and operational efficiency.
- Cybersecurity and digital resilience must be embedded within energy infrastructure planning as critical assets become increasingly connected.
- Artificial Intelligence, machine learning, blockchain and quantum cryptography can strengthen system security, operational efficiency and threat detection capabilities.
- As IT-OT convergence accelerates across the energy sector, balancing technological advancement with robust cyber protection measures will be essential.

REFORMING MARKETS AND INSTITUTIONS FOR A SUSTAINABLE FUTURE

- Institutional and market reforms are required to support the energy transition, including rationalization of power purchase agreements and transmission pricing mechanisms.
- Greater investment in transmission infrastructure is needed to facilitate efficient power flows and renewable energy integration.
- Policy frameworks must balance renewable energy growth with the operational and financial realities of existing thermal assets.
- Long-term energy security will depend on coordinated action across policy, regulation, technology and investment ecosystems.

POTENTIAL CHALLENGES TO BE ADDRESSED

➤ **Managing Geopolitical Risks and Import Dependence:**

India's continued reliance on imported crude oil exposes the country to geopolitical conflicts, supply chain disruptions, volatile prices and strategic vulnerabilities, underscoring the need for diversified sourcing and resilient energy policies.

➤ **Accelerating the Energy Transition while Maintaining Grid Stability:**

Rapid integration of renewable energy requires significant investments in transmission infrastructure, energy storage, grid modernization and flexible system operations to ensure reliable and uninterrupted power supply.

➤ **Securing Critical Minerals and Clean Energy Supply Chains:**

The transition to batteries, electric mobility and renewable technologies depends heavily on critical minerals and rare earth elements, creating new geopolitical and supply chain risks that require strategic international partnerships and domestic capability development.

➤ **Addressing Institutional and Regulatory Bottlenecks:**

Legacy power purchase agreements, transmission pricing mechanisms, market inefficiencies and regulatory complexities must be rationalized to enable faster renewable energy integration and improve overall power market efficiency.

➤ **Strengthening Digital Resilience and Cybersecurity:**

Increasing digitization of energy infrastructure, including smart grids, operational technologies and smart meters, expands the cyber threat landscape, making robust cybersecurity, AI-enabled threat detection, blockchain-based systems and quantum-safe encryption increasingly essential.

➤ **Scaling Domestic Manufacturing and Clean Energy Infrastructure:**

Meeting the growing demand for electric vehicles, batteries, heat pumps, charging infrastructure and advanced clean energy technologies requires substantial investments in domestic manufacturing capacity, technology transfer and resilient industrial value chains.

➤ **Balancing Energy Development with Environmental Sustainability:**

Expanding hydroelectric projects, transmission corridors and other large-scale energy infrastructure must carefully address ecological sensitivities, land-use concerns and environmental impacts while supporting long-term energy security.

➤ **Strengthening International Collaboration for Technology and Innovation:**

Deepening partnerships with countries such as Japan is essential to accelerate technology transfer, industrial decarbonization, precision engineering, grid resilience and sustainable infrastructure while enhancing India's long-term energy security and competitiveness.

SUMMARY

The session commenced with the context that India's energy transition must simultaneously support economic growth, climate commitments and national security. Participants noted that achieving the country's long-term development objectives, including the vision of Viksit Bharat by 2047 and net-zero emissions by 2070, will require accelerated deployment of renewable energy alongside investments in energy storage, domestic manufacturing, research and development, and modern transmission infrastructure. Stable policy frameworks, innovative financing mechanisms and resilient supply chains were identified as essential enablers of this transition.

A recurring theme throughout the deliberations was the growing influence of geopolitical developments on global energy markets. The discussions highlighted that disruptions in critical maritime trade routes and increasing volatility in international oil markets have fundamentally altered the concept of energy security. Participants emphasized that while diversification of crude oil imports remains necessary in the short term, long-term energy security will depend on reducing import dependence through electrification, renewable energy deployment, energy efficiency and the development of indigenous clean energy technologies. The deliberations further underscored that rapid electrification across industries, transport and emerging sectors such as data centres will significantly increase electricity demand, making grid resilience, energy storage and flexible power systems critical priorities. Participants stressed the importance of strengthening transmission infrastructure, improving power market efficiency and adopting digital technologies to enable reliable integration of renewable energy while maintaining grid stability.

The role of digitalization in future energy systems received considerable attention. It was observed that the convergence of information technology and operational technology is transforming the energy sector through intelligent grid management, automation and data-driven decision-making. However, increasing digital connectivity also expands exposure to cyber threats, making cybersecurity, data protection and digital resilience integral components of national energy security. Emerging technologies such as artificial intelligence, blockchain-based distributed ledgers and quantum cryptography were identified as important tools for strengthening operational efficiency and protecting critical infrastructure.

India–Japan cooperation emerged as a significant opportunity for advancing energy security and industrial decarbonization. Participants highlighted the potential for combining Japanese technological innovation with India's manufacturing capabilities and market scale through collaboration in green hydrogen, low-carbon industrial technologies, waste heat recovery, advanced mobility solutions and next-generation renewable technologies, including perovskite solar cells, osmotic power generation and ocean current energy. Such partnerships were viewed as important pathways for strengthening resilient value chains, accelerating technology transfer and enhancing industrial competitiveness.

The session concluded that India's future energy strategy must be built on diversified energy sources, resilient infrastructure, technological innovation, strong domestic manufacturing, digital security and international collaboration. A balanced approach integrating energy security, economic competitiveness, climate action and strategic diplomacy will be essential to build a reliable, sustainable and resilient energy ecosystem capable of supporting India's long-term development aspirations.

PHOTOS



(L-R): Shri M K De, IAS (Retd), Chairperson, Sustainability National Forum, BCC&I and Former Chief Secretary to the Government of West Bengal, **Mr. Deb A Mukherjee**, Chairperson, The Delhi Council and Former President, The Bengal Chamber and Managing Director, Cenergist Energy Pvt. Ltd., **Dr. Ajay Mathur**, Mentor, The Delhi Council, BCC&I and Former Director General, International Solar Alliance, **Mr. Navanit Narayan**, Senior Vice President, BCC&I and Whole-time Director & Chief Executive Officer, Haldia Petrochemicals Ltd., **Mr. Ashida Katsunori**, Acting Consul General, Consulate General of Japan, Kolkata and **Mr. Manojit Sengupta**, Delivery Centre Head – Eastern Region, Tata Consultancy Services Limited



Dr. Ajay Mathur, Mentor
The Delhi Council, BCC&I and Former
Director General, International Solar Alliance



Distinguished Participants during
the Interactive Session

SPEAKERS

-  **Mr. Navanit Narayan**
Senior Vice President, BCC&I and Whole-time Director & Chief Executive Officer, Haldia Petrochemicals Ltd.
-  **Mr. Deb A Mukherjee**
Chairperson, The Delhi Council and Former President, The Bengal Chamber and Managing Director, Cenergist Energy Private Limited.
-  **Dr. Ajay Mathur**
Mentor, The Delhi Council, BCC&I and Former Director General, International Solar Alliance
-  **Shri M K De**
IAS (Retd)., Chairperson, Sustainability National Forum, BCC&I and Former Chief Secretary to Government of West Bengal
-  **Mr. Manojit Sengupta**
Delivery Centre Head – Eastern Region, Tata Consultancy Services Limited
-  **Mr. Ashida Katsunori**
Acting Consul General, Consulate General of Japan, Kolkata

PARTICIPANTS

THE LIST OF COMPANIES THAT JOINED THE INTERACTIVE SESSION:

- Agam Water Industries
- All Wave Consultancy
- Arogyam Medisoft Solution Pvt Ltd
- Bensun Infra Private Limited
- Calderys
- Central Warehousing Corporation
- Centre for Responsible Business
- Currie and Brown India Pvt Ltd
- Datre Corporation Pvt Ltd
- Development Consultants Pvt Ltd
- Elogix Software Pvt. Ltd.
- EroEV India Pvt Ltd
- Exide Industries Ltd.
- Fox Mandal & Associates LLP
- IEST Shibpur
- IISWBM
- Indian National Trust for Art and Cultural Heritage (INTACH)

- Infinity Infotech Parks Limited
- International Combustion (India) Limited
- Intueri Consulting LLP
- Jadavpur University
- MGM Rubber co
- Peerless Group
- Platinum Trucking LLP
- Prerana Engineers & Consultants Pvt. Ltd
- Rising Asia Journal

- Solace Power
- Speedigo Engineering & Technology
- Sun Agro Tech
- Super Smelters Ltd
- Thermax Limited
- Uneverse
- WaterAid
- WWF-India

ANNEXURE



Mr. Navanit Narayan

Senior Vice President, BCC&I and Whole-time Director & Chief Executive Officer, Haldia Petrochemicals

Mr. Navanit Narayan, commenced the Interactive Session with his welcome address and set the context for the discussion by emphasizing India's evolving energy transition agenda. He noted that India's updated climate commitments seek to balance developmental priorities with climate responsibility while advancing the vision of becoming a developed nation by 2047 and achieving net-zero emissions by 2070.

- He noted, in the prevailing geopolitical landscape, energy transition has become closely intertwined with energy security, economic resilience and strategic self-reliance. The need to leverage India's renewable resources, including solar, hydro and wind energy, alongside the development of energy storage infrastructure, was underscored.
- While solar energy deployment has witnessed considerable progress, significant opportunities remain for innovation and the development of new financial and business models that can enhance the commercial viability of other renewable energy technologies.
- Increasing the share of renewable energy in the energy mix must be accompanied by sustained focus on affordability, accessibility and reliability of power to support India's long-term development goals.
- Existing policy interventions such as Production-Linked Incentives (PLI), Renewable Purchase Obligations (RPOs), rooftop solar programmes and transmission infrastructure development have contributed substantially to the sector's growth. The next phase will require accelerated investments in grid modernisation, energy storage, green hydrogen, domestic manufacturing and research and development.
- Stable policy frameworks, affordable financing mechanisms and targeted incentives will remain critical in making renewable energy commercially viable and dependable while strengthening the country's long-term energy security.
- Energy security is increasingly linked to domestic manufacturing capabilities, ownership of supply chains and access to critical minerals, advanced battery technologies, green hydrogen, biofuels, carbon capture solutions and resilient supply chains. The growing global competition for these resources and technologies is reshaping geopolitical relationships while creating both opportunities and vulnerabilities for nations.



Mr. Deb A Mukherjee

Chairperson, The Delhi Council and Former President, The Bengal Chamber and Managing Director, Cenergist Energy Private Limited

The chair of the session Mr. Deb A Mukherjee emphasized that India's energy security challenges are shaped not only by its significant dependence on imported crude oil and natural gas but also by the increasing vulnerability of global supply chains to geopolitical disruptions

- A growing concern is the weaponization of supply chains, where disruptions in the availability of critical energy resources, technologies and materials can be used as strategic tools, creating potential risks for national security and economic stability.
- The implications of supply chain disruptions extend beyond the energy sector and raise broader questions about how countries can strengthen resilience in an increasingly uncertain geopolitical environment.
- Rising energy demand driven by economic growth, industrial expansion and population growth presents a complex challenge for India as it pursues its vision of a developed nation. Ensuring adequate energy access while maintaining fiscal prudence will require careful policy choices.
- The possibility of trade-offs between developmental expenditure and defence spending was highlighted as a key strategic consideration, particularly in a world where energy security and national security are becoming increasingly interconnected.
- Greater regional cooperation and international partnerships could offer innovative pathways for addressing energy security concerns, reducing vulnerabilities and strengthening resilience against external shocks.
- The discussion was framed around identifying practical pathways to balance energy security, economic development and national security considerations while navigating an increasingly complex global geopolitical landscape.

Dr. Ajay Mathur

Mentor, The Delhi Council, BCC&I and Former Director General, International Solar Alliance

Dr. Ajay Mathur gave keynote address on 'Energy Security in India in context of Geopolitics'. He highlighted that the global understanding of energy security has undergone a fundamental shift due to evolving geopolitical tensions. While energy security was traditionally viewed primarily through the lens of price, access to energy resources has now become an equally critical concern as geopolitical developments increasingly disrupt established supply chains.



- Recent tensions affecting major energy transit routes such as the Strait of Hormuz have highlighted the vulnerability of global energy systems. Disruptions in these corridors can simultaneously impact both the availability and cost of energy, creating uncertainty for energy-importing nations such as India and prompting expectations of sustained volatility in global oil markets.
- Rising fossil fuel prices and concerns over supply security are accelerating the transition towards domestically produced electricity generated from coal, solar, hydro and emerging clean energy technologies. Industrial sectors are increasingly adopting electrification solutions, including heat pumps for low-temperature industrial applications, demonstrating the growing commercial viability of electric alternatives.

- Measures such as increasing oil imports from alternative suppliers may provide short-term relief but do not constitute long-term energy security strategies. Sustainable solutions require structural changes that reduce vulnerability to global market disruptions while creating resilient domestic energy systems.
- Growing electrification across sectors is expected to significantly increase electricity demand. Alongside industrial electrification, the rapid expansion of data centres is emerging as a major driver of power consumption, with data centre demand estimated at around 20,000 MW and accounting for a substantial share of India's electricity requirements.
- Alternative value chains and regional partnerships can play a critical role in strengthening energy security. Collaboration between India and Japan was highlighted as a model for combining Japanese technological expertise with India's manufacturing capabilities and market scale. Such partnerships can support the development of advanced industrial technologies while enhancing competitiveness and export potential.
- Opportunities for cooperation are particularly strong in sectors such as steel, cement and petrochemicals, where technology transfer and joint manufacturing can improve energy efficiency and industrial productivity. The successful deployment of Japanese waste heat recovery technologies in India was cited as an example of the long-term value that high-quality and durable technologies can deliver.
- Three strategic priorities were identified for strengthening India's energy security. The first is accelerating electrification across sectors currently dependent on oil and gas, including the expansion of electric mobility and solar-powered charging infrastructure in rural areas. The second is prioritising energy efficiency as a cornerstone of economic growth and energy transition. The third is leveraging international trade corridors and strategic partnerships to access new markets, technologies and supply chains while reducing geopolitical vulnerabilities.
- Grid resilience, logistics efficiency and alternative energy systems were highlighted as key areas where deeper India–Japan collaboration could generate mutually beneficial outcomes while contributing to long-term energy security, industrial competitiveness and sustainable development.



Shri M K De, IAS (Retd)

Chairperson, Sustainability National Forum, BCC&I and Former Chief Secretary to the Government of West Bengal

Shri M K De, IAS (Retd) in his remark stated that India's dependence on imported crude oil is expected to continue for the foreseeable future, making diversification of supply sources a critical aspect of energy security. This will require greater flexibility in the refining sector so that refineries can efficiently process different grades and sources of crude oil depending on market conditions and geopolitical developments.

- Geopolitical tensions are creating significant uncertainties in global energy trade. While imports from countries such as Russia have helped contain costs, balancing economic interests with geopolitical pressures remains a challenge. Concerns were also raised regarding the security of major energy transit routes, including the Strait of Hormuz and the Red Sea, which continue to face risks from regional conflicts and maritime security threats.
- Energy security has become inseparable from national and economic security. Sustained high crude oil prices could adversely impact India's balance of payments, foreign exchange reserves and exchange rate stability, with cascading effects across the broader economy. In this context, an agile and pragmatic foreign policy driven by national interest will be essential for navigating evolving geopolitical realities.
- Although domestic oil production may increase modestly, India is likely to remain substantially import-dependent. This underscores the need for a rapid transition towards alternative energy sources and reduced reliance on petroleum-based energy systems.

- The remarkable growth of renewable energy in India demonstrates the feasibility of energy transition. However, the increasing share of solar power also highlights the importance of developing adequate storage infrastructure, including battery energy storage systems, pumped storage projects and emerging hydrogen-based solutions. Access to critical minerals, rare earth elements and battery materials introduces new geopolitical dependencies that must be carefully managed.
- Electrification of mobility, particularly public transportation, was identified as one of the fastest pathways for reducing fossil fuel dependence. Expansion of electric buses, electric three-wheelers and modern electric tram systems, supported by appropriate public policies and investments, can significantly reduce petroleum consumption while accelerating the clean energy transition.
- Electric vehicles can also contribute to grid stability through vehicle-to-grid mechanisms. Time-of-day tariffs, smart charging systems and the ability to feed surplus electricity stored in vehicle batteries back into the grid can enhance grid management and improve overall energy system efficiency.
- Strengthening transmission infrastructure and improving power market efficiency will be critical for integrating larger shares of renewable energy. Existing transmission constraints continue to limit the free flow of electricity across regions, while evolving transmission pricing mechanisms will need to balance the promotion of renewable energy with the financial sustainability of the transmission network.
- The transition towards renewable energy must also address the operational and financial implications for conventional thermal power plants. While renewable energy capacity continues to expand rapidly, thermal power stations remain essential for grid reliability and balancing requirements. Managing plant utilisation levels, fixed costs and system stability will require carefully designed regulatory and market frameworks.
- Hydropower and nuclear energy can contribute to India's energy mix but face their own limitations. Expansion of hydropower projects often encounters environmental and ecological concerns, particularly in sensitive regions, while nuclear power primarily provides baseload generation and cannot fully address grid balancing requirements associated with variable renewable energy sources.
- Several institutional and structural reforms are necessary to accelerate the energy transition. Existing power purchase agreements, transmission arrangements and coal transportation patterns were highlighted as areas requiring rationalisation to improve efficiency, reduce unnecessary energy expenditure and optimise utilisation of transmission corridors.
- Achieving a smooth and equitable energy transition will require continuous stakeholder engagement, regulatory innovation and mechanisms to address commercial imbalances among market participants. Alongside accelerated deployment of renewable energy, energy efficiency measures and emerging technologies, India must pursue a resilient energy strategy supported by pragmatic diplomacy and long-term policy stability.

Mr. Manojit Sengupta

Delivery Centre Head – Eastern Region,
Tata Consultancy Services Limited

Mr. Manojit Sengupta emphasized that Energy security must ultimately deliver three key outcomes—availability, affordability and reliability. As energy systems become increasingly digitized, ensuring these outcomes requires not only secure energy supplies but also resilient digital infrastructure capable of supporting modern energy networks



- The integration of renewable energy into power systems presents significant technical challenges. Much of the world's grid infrastructure, including those in developed economies, was designed decades ago and was not originally built to accommodate large-scale renewable energy integration. As a result, extensive grid modernization and digitalization are required to manage distributed and variable energy resources effectively.
- Power utilities across the world are increasingly adopting digital technologies to improve operational efficiency, grid management and system reliability. A major transformation underway is the convergence of Information Technology (IT) and Operational Technology (OT), enabling real-time monitoring, automation and intelligent management of energy infrastructure.
- Historically, operational technology systems in the power sector functioned in isolated environments with limited external connectivity. However, growing digital integration has increased the exposure of critical energy infrastructure to cyber risks. Since generation, transmission and distribution systems constitute national critical infrastructure, maintaining operational continuity and preventing outages remain paramount concerns.
- The expansion of renewable energy, distributed energy resources and digital technologies can increase grid complexity and create additional challenges for maintaining system stability. Digital tools are therefore becoming essential for balancing supply and demand, managing distributed resources and ensuring reliable grid operations.
- Greater digitalization also expands the attack surface for cyber threats. Cyberattacks targeting critical energy infrastructure have demonstrated the potential to disrupt power systems, compromise operational technology networks and threaten national security. Examples from international incidents underscore the growing importance of cybersecurity as an integral component of energy security.
- Smart meters and connected consumer technologies are generating vast amounts of data that can help utilities improve service delivery, optimize energy consumption and develop new business models. At the same time, the collection and monetization of customer data raise important concerns regarding privacy, data protection and cybersecurity.
- Cyber threats to the energy sector originate from multiple sources, including state-sponsored actors, criminal organizations and ransomware groups. As geopolitical tensions increasingly extend into the cyber domain, digital infrastructure has become a strategic target in national security considerations.
- Artificial Intelligence and Machine Learning are emerging as both defensive and offensive tools in cyberspace. While malicious actors can leverage AI to identify vulnerabilities, automate attacks and steal sensitive information, utilities and governments can employ the same technologies to strengthen threat detection, enhance monitoring capabilities and improve cyber defence mechanisms.
- Emerging technologies such as blockchain-based distributed ledger systems and quantum cryptography have the potential to strengthen digital resilience. Blockchain can improve the security and transparency of energy transactions, while quantum cryptography is expected to play an increasingly important role in protecting digital systems against future threats posed by advances in quantum computing.
- Digital resilience must be viewed as a core pillar of energy security. As power systems, refineries, oil and gas infrastructure and other energy assets become more interconnected and technology-driven, balancing the benefits of digitalization with robust cybersecurity safeguards will be critical for ensuring long-term energy reliability and national security.
- The transition towards highly digitized energy systems creates both opportunities and vulnerabilities. While advanced digital technologies can improve efficiency, flexibility and operational performance, they also provide adversaries with a larger attack surface. Building secure, intelligent and resilient digital ecosystems will therefore be essential for safeguarding future energy infrastructure.



Mr. Ashida Katsunori

Acting Consul General,
Consulate General of Japan, Kolkata

Mr. Ashida Katsunori gave Special Address on 'India-Japan cooperation in clean energy, industrial decarbonization and sustainable infrastructure'. The ongoing geopolitical developments in West Asia have reinforced the importance of energy security for both India and Japan. While the crisis has exposed vulnerabilities in global energy systems, it has also strengthened cooperation between the two countries, creating new opportunities for strategic partnership in energy and economic resilience

- He highlighted democratic institutions, transparency and freedom of expression as important foundations for long-term stability and sustainable development. Strong democratic systems enable nations to make balanced decisions and respond effectively to emerging economic and geopolitical challenges.
- Artificial Intelligence is rapidly transforming economies and societies and is becoming increasingly interconnected with the energy sector. AI-enabled technologies are being used to forecast energy demand, optimize grid operations, enhance energy management and accelerate the development of new clean energy solutions, making AI an important enabler of the future energy transition.
- High-level engagement between India and Japan continues to strengthen bilateral cooperation across strategic sectors. The Japan-India Clean Energy Partnership is advancing collaboration in clean technology transfer, green hydrogen, low-carbon steel production and next-generation mobility solutions with the objective of building more sustainable and secure economies.
- Perovskite solar cell technology was presented as a promising innovation with significant potential for future deployment. Unlike conventional silicon-based solar panels, perovskite cells are lightweight, flexible and can be installed on curved surfaces, building facades, infrastructure and other locations unsuitable for traditional panels. The technology also offers transportation energy security advantages due to its reliance on iodine, a resource for which Japan is a major global producer.
- Osmotic power generation, which harnesses the pressure difference created when freshwater and seawater interact across a specialized membrane, was identified as another emerging clean energy technology. With the ability to generate electricity continuously and independently of weather conditions, the technology may hold significant potential for river delta regions such as the Sundarbans and other coastal areas of India.
- Advances in ocean current power generation are creating new opportunities for renewable energy development. Japan has successfully tested underwater turbine systems that generate electricity from stable ocean currents, demonstrating the potential of marine energy technologies. Similar applications could be explored along India's extensive coastline and within the Indian Ocean region.
- Clean energy collaboration between India and Japan extends beyond technology transfer and encompasses joint efforts to strengthen energy security, industrial decarbonization and sustainable infrastructure development. Combining Japanese technological innovation with India's scale and growing energy demand can support the development of resilient and low-carbon energy systems.
- The convergence of democratic values, advanced technologies such as AI and a shared commitment to clean energy provides a strong foundation for deeper India-Japan cooperation. Strategic collaboration in these areas can contribute significantly to energy security, economic growth and sustainable development for both nations.

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