

CONFERENCE PROCEEDINGS

FORUM ON ENERGY EFFICIENCY & DECARBONISATION (FEED 2023)

Transitioning Towards Carbon Neutral *Bharat* using Energy Efficiency as a First Fuel of Choice

02-03 February, 2023

The Ashok, New Delhi

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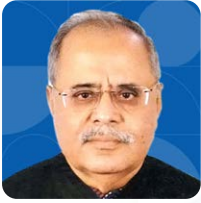
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**STEERING
COMMITTEE**

FEED 2023 was spearheaded by a team of seasoned professionals in the energy space. On our steering committee was:



Atul Bagai
Country Head, United Nations Environment Programme (UNEP) India



Ravichandran Purushothaman
President, Danfoss India



Chirag Baijal
Managing Director- India Region, Carrier



Sanjiv Bhatia
President, STENUM Asia



Luke Menzel
Chief Executive Officer, Energy Efficiency Council



Satish Kumar
President and Executive Director, AEEE



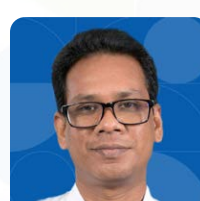
Mijo Vodopic
Senior Program Officer, MacArthur Foundation



Sneha Sachar
India Cooling Lead, Clean Cooling Collaborative



Pramoda Gode
Senior Advisor, Moving India, World Economic Forum



Soumya Prasad Garnaik
Regional Lead - Asia (GBI) | Lead (EE) & Green Investment Specialist, Global Green Growth Institute (GGGI)



Prarthana Borah
Director, CDP India

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LIST OF SPEAKERS



Ajay Mathur
Director General,
International Solar
Alliance



Amit Bhatt
India Managing
Director, ICCT



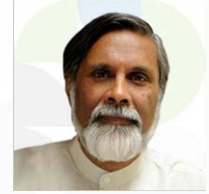
Aneesh Jain
Manager, Xynteo



Arti Chopra
Principal, Amity
International School



Asheesh Fotedar
Chief Operating
Officer, National
Center for Cold Chain
Development (NCCD)



Ashok Behari Lall
Design and
Technology Chair,
KRVIA, Mumbai



Ayaz Kamil
Head – Energy &
Performance Services
(EPS), Siemens Limited



**Bhaskar
Natarajan**
Director
Programme, AEE



Bijit Kundu
Strategy and
Policy Fellow,
Energy Solutions



Bishal Thapa
Senior Director,
India, CLASP



Chirag Bajjal
Managing Director-
India Region,
Carrier



Cornelia Schenk
Energy Efficiency
Policy Analyst | Energy
Efficiency, International
Energy Agency



Daniel Cornejo
Vice President,
Business Strategy,
Energy Solutions



Deb Mukherji
Managing Director,
Omega Seiki
Mobility



Devraj Singh
Chairman, Working
Group-Eurovent India
and Managing Director
Flakt Group India



Dhiraj Wadhwa
Director,
Commercial HVAC
- India, Carrier



Dushyant Ahuja
Vice President & Head,
Asset Management,
Tata Realty and
Infrastructure Limited



Gopal K Nariya
Vice President,
BSES Rajdhani
Power Limited



Gurneet Singh
Director,
Environmental
Design Solutions



Himanshu Chawla
Joint Director
(Tariff-Engineering)
in Delhi Electricity
Regulatory
Commission



Jayanta Chaudhuri
Director- Marketing,
Alliances and
Partnerships, AEE



Jyotirmay Mathur
Professor, Centre
for Energy and
Environment, MNIT
Jaipur



Manish Gupta
Executive Director,
Electrical Energy and
Management (EEM),
Railway Board,
Indian Railways



Manoj Meena
CEO & Founder
ATOMBERG
Technologies



Markus Lattner
International
Director, Eurovent



Matt O'Keefe
Head of Opower
at Oracle Energy &
Water



Mayank Bhardwaj
Lead – Procurement
and Private sector
investments | USAID
South Asia Regional
Energy Partnership
(SAREP) Project



Meenal Sutaria
Associate Partner
and Director at
MP ENSystems
Advisory Pvt
Limited



Muthukrishnan M
Airport Sector-
Head of
Environment,
Health, and Safety
and Sustainability-
GMR Group



N Mohan
CEO (Delhi EV
Cell), Transport
Department, Govt
of NCT of Delhi



Nitin Goel
Chief Executive Officer and Founder, Infocold India Pvt. Ltd.



Pankaj Mehta
Managing Director, Carrier Transicold, India & South Asia



PK Goel
Industry and Technical Advisor, Eurovent Certita



Pragya Nehru
Director – CII's Food & Agriculture Centre of Excellence



Pramod Kumar Singh
Senior Director – Research & Programmes, AEEE



Pramoda Gode
Senior Advisor, Moving India, World Economic Forum



Prasad Vaidya
Director, Solar Decathlon India



Rajat Gupta
Senior Partner, Mumbai, McKinsey



Ravichandran Purushothaman
President, Danfoss India



Reena Rai
Executive Director (Technical), Airports Authority of India



Richa Chhabra
Divisional Manager, Marketing and Communications (South Asia Pacific)



Rohit Chashta
Deputy General Manager - Energy Efficiency & Sustainability - Schneider Electric



Saket Sarraf
Principal, ps Collective



Samrat Sengupta
Vice President-Business Development, EKI Energy Services Ltd.



Sandeep Kachhawa
Energy Efficiency Researcher



Sanjiv Aggarwal
Partner, Energy Infrastructure with Actis



Satish Kumar
President and Executive Director, AEEE



Shounak Ray
Business Development Lead - South Asia, Green Buildings, Climate Business Department, International Finance Corporation (IFC)- World Bank Group



Soumen Maity
Chief Technical Officer, TARA & Vice President at Development Alternatives



Srikanth
Group Head - Procurement DLF Limited



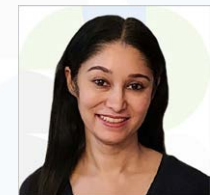
Srinivasareddy Tiyyagura
Vice President – R&D (Daikin India)



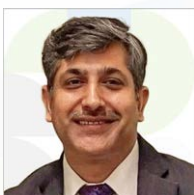
Sudheer Perla
Country Head, Tabreed India



Swatantar Kumar Singal
Chairman, HAREDA



Umit Bhatia
Director – Sustainability Strategy, West Asia Energy and Sustainability Services, JLL



Upendra Bhatt
Co-founder and Managing Director, cKinetics



Vishal Kapoor
Chief Executive Officer, Energy Efficiency Services Limited (EESL)



Vishal Garg
University Chair Professor and Director, Indorama Ventures Center for Clean Energy

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AGENDA

DAY 01 - 01 February 2023

Time	Session Title
09:00 - 09:30	Registration- Welcome and Tea/Coffee
09:30 - 09:45	Opening - Welcome Address by Chirag Bajjal, Chairman, AEEE
09:45 - 10:15	Keynote Address by Dr Ajay Mathur, Director General, International Solar Alliance (ISA)
10:15 - 11:15	Fireside Chat on Investments and Financing required for India to Achieve Decarbonisation Goals with Rajat Gupta, Senior Partner, McKinsey & Company
11:15 - 11:30	Networking Tea Break
11:30 - 12:30	Executive Dialogue 1 – Ensuring a Sustainable Cold Chain by India@100 Powered by Danfoss Industries
12:30 - 13:30	Executive Dialogue 2 – Facilitating Green Finance for Energy Efficiency through a Public-Private Partnership
13:30 - 14:30	Networking Lunch
14:30 - 15:30	Industry Session 1 – Energy Efficiency from the Boiler-Room to the Boardroom Powered by CLASP
15:30 - 16:30	Industry Session 2 – Making Sustainability a Reality: HVAC solutions Powered by Carrier
16:30 - 17:00	Energy Efficiency Market Trends and Implications for India, a presentation by International Energy Agency (IEA)
17:00 - 17:15	Networking Break & High Tea

DAY 02 - 03 February 2023

Time	Session Title
10:00 - 10:15	Opening Address – AEEE Team
10:15 - 11:15	Industry Session 3 – Market Transformation at the Sub-national Level: The Cases from California Powered by Energy Solutions
11:15 - 11:30	Tea Break
11:30 - 12:30	Industry Session 4 – Decarbonizing India's Cooling Sector through Adoption of District Cooling and other Cooling Technologies Powered by TABREED India
12:30 - 13:30	Executive Dialogue 3 – E-mobility Landscape: A Strategy to Decarbonise the Road Transport Sector
	Executive Dialogue 4 – Creating 10GW market for Demand Flexibility by 2030
13:30 - 14:30	Lunch
14:30 - 14:45	Structured Presentation: AAI's Efforts to Benchmark Energy Consumption and Enhance Energy Efficiency at Airports
14:45 - 15:45	Executive Dialogue 5 – Intensifying Private Sector Climate Action through Datadriven Enterprise-level Energy Management Powered by Schneider
	Executive Dialogue 6 – Advancing Construction Sector- Decarbonising through Alternate Materials and Demand Optimisation Techniques
15:45 - 16:45	Industry Session 5 – Maximising Energy Efficiency Gains and Savings by an Efficient Air Side in the HVAC Industry Powered by Eurovent
16:45 - 17:00	Valedictory Session
17:00 - 17:15	Tea Break & Dispersal

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FEED OUTCOMES

The challenges faced by governments worldwide to balance efforts to accelerate climate solutions with responding to global crises such as inflation, energy crisis, and political instability in some countries are high. The urgency to increase the affordability, accessibility, resilience, and security of the supply of humanity's most essential commodities and services, such as energy and food, has never been greater. In such contexts, the need for collaborative, cross-sectoral approaches to address complex challenges like climate change and sustainable development becomes even more pressing.

Against this backdrop, the "Forum on Energy Efficiency and Decarbonisation 2023 (FEED 2023)" was curated by AEEE to serve as a unique platform for stakeholders from diverse sectors to collaborate and discuss energy policies, market transformation strategies, technology, and business-model led transformations.

FEED 2023 brought together more than 600 stakeholders and sectoral leaders including innovators, influencers, researchers, thought leaders, key policymakers, government agencies, stakeholders from the ecosystem, multilateral and bilateral agencies, and leading energy-efficiency companies. Through their collective efforts, we envision to drive the transition to a more sustainable and equitable future, ensuring emerging solutions are affordable and accessible for all.

This year's conclave identified several critical questions that need to be addressed to achieve the deployment of clean energy at the scale and speed necessary to meet our climate goals. These questions ranged from the need for accurate energy and carbon data disclosures to the role of industries and financing in promoting sustainability. These were addressed through 8 key thematic areas – low-carbon built environment; low carbon manufacturing; sustainable cooling and refrigeration; smart and resilient power distribution; energy and emissions benchmarking and analytics; ESCO market enablement; decarbonisation of the transportation sector; and energy efficiency at the sub national level.

As we embark on this journey towards a more secure and sustainable energy system, it is crucial that we press hard and not be deterred by the challenges ahead. Only through concerted efforts and collaboration can we hope to achieve a more sustainable future for ourselves and future generations.

Sector-wise recommendations and solutions to ensure energy efficiency



Low-Carbon Built Environment

- Encourage and incentivize brownfield projects that prioritize sustainable HVAC practices.
- Lack of tools to measure and monitor the sustainability of green building certification. Develop AI and data analytics tools to monitor and measure the sustainability of green building certification.
- Establish a baseline for embodied energy/carbon intensity for building types to guide sustainable building practices.
- Lack of public declaration of Environmental Product Declarations (EPDs) for building materials like cement and steel. Encourage manufacturers to publicly declare EPDs for key building materials.
- Government to create demand for low carbon cements through regulations, incentives, and subsidies.
- Advocate for the development of codes and regulations for airside of HVAC to shift towards performance efficiency



Low-carbon Manufacturing

- Industry to balance standardisation and customisation to scale up energy-efficient technology for the masses to ensure accessibility and affordability for consumers.
- Government regulations to promote demand for smart and energy-efficient appliances, driving innovation in the industry.
- Product certification is essential for reliability and performance testing, which will enable consumers to make informed choices about the energy efficiency of products. Manufacturers should prioritize obtaining 3rd party certification for their products.
- Certification for designing professionals and professionals conducting installations is necessary to ensure that products are installed correctly and functioning at their optimal energy efficiency levels.
- Performance certification for air purifiers is essential as the demand for clean air increases.



Energy Efficiency at the Sub-national Level

- A successful sub-national market transformation requires an enabling framework for states.
- Designing and implementing state-specific programs should be led by states themselves.
- In a diverse country like India, it is critical to choose the best-fit technology at the sub-national level.
- Energy efficiency efforts should not only aim to reduce energy intensity but also focus on holistic decarbonisation.



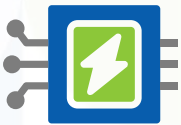
Sustainable Cooling and Refrigeration

- Collaborative efforts between the government and industry are necessary to establish sustainable cold chain development in India, encompassing regulations, technologies, and finance.
- Adopting a multi-model logistics approach can promote sustainable cold-chain practices, resulting in reduced food loss and improved post-harvest management.
- Implementing digital solutions in the cold-chain system can contribute to the decarbonisation of the cold chain system making it more efficient and sustainable.
- District Cooling Solutions (DCS) can serve as a feasible long-term solution, but natural and passive cooling techniques should be explored in the short term.
- A regulatory framework and viable business model must be established to ensure that all stakeholders benefit from the adoption of DCS. The Indian market can learn from past errors made in foreign regions while introducing DCS.



Decarbonisation of the Transportation Sector

- Overcome hindrances to the transition towards electric vehicles by implementing solutions such as battery swapping and retrofitting.
- Collaborative endeavors between the government and industry to encourage the uptake of electric vehicles.
- Take inspiration from the Indian Railways, which has introduced a new policy to endorse electric mobility and established charging stations at railway stations.
- Encourage the adoption of electric vehicles by providing incentives and subsidies.



Smart and Resilient Power Distribution

- Demand Flexibility can be induced through behavioural nudges.
- Metering technology that is intelligent promotes measurement and verification (M&V) of demand response (DR) programs.
- An appropriate and creative financial framework is necessary for expanding DR initiatives to a larger scale.
- The transition of DR initiatives from pilot to commercial scale needs to be facilitated. A thorough cost-benefit analysis should support pilot DR projects from the outset.
- Avoided CAPEX and avoided power purchase cost in the short term is essential from the regulators point of view



Energy & Emissions Benchmarking and Analytics

- In order to effectively manage energy in large businesses, it is crucial to allocate energy usage budgets among various end-uses.
- To ensure accountability and success, it is important to monitor and analyze energy data, track progress towards targets, and hold individuals responsible for meeting these goals.
- To achieve enterprise objectives, it is imperative to implement sophisticated systems that streamline the tracking of ESG data.



ESCO Market Enablement

- Implementation of funding strategies and policy incentives to encourage the growth of ESCOs.
- Adoption of standardized measurement and verification procedures for ESCO projects to ensure high-quality services and establish consumer confidence.
- Development of a supportive ecosystem for ESCO market expansion by fostering cooperation between ESCOs and other stakeholders such as utilities, regulators, and financial institutions.
- Provision of access to advanced technologies to ESCOs.
- Promotion of awareness programs aimed at businesses and consumers to highlight the benefits of ESCO services.
- Enhancement of technical and business expertise of ESCO professionals through capacity building.
- Encouragement of performance by offering incentives to ESCOs for achieving energy conservation objectives and other performance metrics.

Recommendations and Suggestions for Policy Interventions

Strengthen energy efficiency measures: The government should fast-track and strengthen the emphasis on energy efficiency measures in reducing consumption and emissions intensity. Specifically, it should accelerate the adoption of efficient appliances, provide clear investment guidelines for industrial users, and enable Energy Service Companies (ESCOs) to provide energy efficiency services.

Integrate Energy Efficiency with Decarbonisation: India must adopt a holistic approach that integrates energy efficiency measures with decarbonisation to achieve its net zero goal. It should encourage the adoption of renewable energy sources and energy-efficient technologies to reduce emissions across sectors such as transportation, buildings, and industry, after taking the full benefits from energy efficiency.

Provide Project-based Financing: Key implementation strategies for achieving the Net Zero emission goal include integrating energy efficiency with decarbonisation and providing project-based financing for energy efficiency and renewable energy.

Decarbonise Hard-to-abate Sectors: India should focus on developing alternative options and electrification solutions to decarbonise the hard-to-abate cement and steel sectors. This will require significant investments in research and development to find new solutions.

Ensure Policy Stability: Policy stability is crucial for attracting investments in green business and decarbonisation. The government should ensure that its policies provide a stable and predictable regulatory environment to support the growth of decarbonisation business, which is set to grow 4 times faster than non-decarbonisation business.

Foster a Culture of Energy Efficiency in the Younger Generation: India must increase the emphasis on energy efficiency in the academic curriculum to educate and foster energy-efficient practices in the upcoming generation of thinkers and leaders. This will ensure that the younger generation is equipped with the necessary skills to lead India towards a sustainable and net-zero future.

Strengthen Building Code and Standards: The implementation of a mandatory building codes and standards will ensure that new buildings are designed and constructed to high energy efficiency standards. This policy could also include mandatory labeling of energy-efficient appliances and equipment to incentivise consumers to buy more energy-efficient products.

Data Analytics and Benchmarking: The establishment of a national database of building energy performance data, along with a benchmarking system, will allow building owners and operators to identify areas of improvement and make data-driven decisions about energy efficiency upgrades.

Sustainable Cooling: The promotion of energy-efficient cooling technologies and practices, including low-energy or no-energy technologies, passive technologies, will help reduce the energy demand associated with cooling in buildings. This should also be accompanied with low GWP technologies for emissions management.

Thermal Comfort for All: Meeting the thermal comfort needs of a billion lives and across sectors will require an energy-intensive effort. The rapid growth of cooling in India over the next two decades call for identifying and promoting low-carbon, climate-friendly, and market-appropriate passive cooling technologies and solutions such as District Cooling Systems (DCS).

Electric Vehicles: The promotion of electric vehicles (EVs) through incentives such as tax credits, rebates, and subsidies will encourage the adoption of zero-emission vehicles. This could also include policies that require public buildings and businesses to provide EV charging infrastructure.

Embodied Carbon Management: In India, the building sector accounts for almost 30% of the country's total energy consumption, with most of this energy being used for cooling. Conventional building practices and materials contribute significantly to the heat island effect and emissions. A data-driven approach to design solutions for varied building typologies, such as residential, commercial, and industrial, and considering regional differences in climate and building design is vital.



Opportunities and Scope

Laydown groundwork for potential policy changes and shifts in 8 critical sectors within the Indian energy landscape



Financing and Funding

Forge partnerships to tap and drive new business opportunities



Partnerships and Collaborations

Drawing in novel partners and affiliates capable of providing support in advancing AEEE's vision and mission

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PROCEEDINGS

DAY 01

09:30-09:45 Welcome Address by Chirag Bajjal, Chairman, AEEE

Key Takeaways of the session

- India aims to reduce the emission intensity of its Gross Domestic Product (GDP) by 45% by 2030, compared to 2005 levels. India has also updated its cumulative energy savings targets to 150 MTOE by 2030, up from the previous target of 86.9 MTOE.
- State Energy Efficiency (SEEI) is one of the energy consumption and efficiency mapping tool started in 2018. To name a few, states such as Karnataka, Andhra Pradesh, and Assam have performed exceptionally well in reducing energy consumption.
- To enable opportunities in energy efficiency and decarbonisation, a triple-sector leadership approach involving the government, NGOs, and industry is necessary to adopt and implement energy efficiency and consumption measures.

Session Video Link:

https://www.youtube.com/watch?v=Sx2W2Jgg_7Y

09:45-10:15 Keynote Address by Dr Ajay Mathur, Director General, International Solar Alliance (ISA)

Key Takeaways of the session

- Integrating energy efficiency and decarbonisation is the key to achieving Net-Zero emissions by 2070.
- Three key points to promote and implement energy efficiency measures across all sectors are: promoting energy-efficient appliances, providing clarity on energy efficiency investments for industrial users, and promoting ESCOs.
- To achieve the NDC goal of Net-Zero emissions by 2070, two key implementation strategies are required: integrating energy efficiency with decarbonisation applications and front-loaded project-based financing for promoting and implementing energy efficiency and renewable energy on a large scale.
- Some emerging technologies that combine energy efficiency with decarbonisation include standalone electric cookers, EV charging stations, water electrolyzers for hydrogen production, etc.

Session Video Link:

<https://www.youtube.com/watch?v=NgwC4yNORic&t=1504s>

10:15 -11:15 Fireside Chat on Investments and Financing required for India to Achieve Decarbonisation Goals with Rajat Gupta, Senior Partner, McKinsey & Company

Session Brief

As we seek ways to accelerate the pace of energy transition, India is uniquely positioned in many ways. Through the fireside chat, we aimed at exploring the pathways towards enabling and integrating energy efficiency culture in this decisive decade to catalyse financing in the decarbonisation space.

Session Moderator & Speaker(s)

- **Dr Satish Kumar**, President & ED, AEEE
- **Rajat Gupta**, Senior Partner, McKinsey

Panel Discussion

Dr Satish Kumar

- The challenge is to stack up energy savings from energy efficiency options in different sectors, such as buildings, electric mobility, appliances, and cold chains, with the right business and financing models to meet the national target of 150 MTOE by 2030.
- An integrated approach that combines operations, designs, electrification, RE, EE, and other elements of decarbonisation is necessary, rather than focusing solely on efficiency or renewables, to achieve net zero.
- Biomass presents a low-hanging fruit for technological interventions. By resolving supply-side issues, alternate pathways can be developed to channel biomass into cooking and organised sectors, such as decarbonising steel production and electricity generation.
- In India, fuel efficiency standards are outdated due to the emergence of electric vehicle technology. The country is gradually adopting 2W and 3W EVs and, to some extent, e-buses. However, due to existing legacy issues and corporate average fuel economy (CAFE) standards, 4W EVs remain unaffordable in India. Coordinated technology, financing, and policy interventions are necessary to accelerate the adoption of 4W EVs.

Quote –

“Electrification is included in the ambit of efficiency because energy consumption decreases due to fuel switching”

“Fire can be used to keep ourselves warm, but it can also be used to burn down houses; the same is true of electricity and nuclear energy. Making energy available for human use is an important accomplishment, but learning how to use this energy well is at least as essential.” – from the book, ‘Finding Flow’ by Mihaly Csikszentmihalyi

Rajat Gupta

- India needs to plan its decarbonisation journey with structured thinking about energy efficiency and carbon efficiency in the new base that will be built, as 75% of India's infrastructure which will exist in 2050 is yet to be built.
- Energy efficiency and renewable energy cannot exist in isolation. The marginal abatement curve offers a low-hanging fruit for already installed infrastructure. Financing and technological innovation are necessary for the decarbonisation of the already installed infrastructure.
- Since most new additions will be enabled through carbon-intensive routes, India must target a competitive carbon price.
- A combination of measures, such as electrification options, alternate fuels, use of biomass, energy blending, and a targeted carbon price, must be adopted in large-emitting industries, and building sectors for decarbonisation.
- The sustainability investment revolution is worth more than a trillion, representing the largest reallocation of capital since the industrial revolution. Investment strategies must be devised with a rollback approach over the next 25 to 30 years to achieve decarbonisation.
- Decarbonisation represents a significant value-creation opportunity for businesses, governments, and individuals. One dollar invested in decarbonisation will yield a return of 3x. A steady policy, preferably with a bottom-up approach and certain allowances for technology innovation in every sector, is essential for decarbonisation.
- The cost of decarbonisation is estimated to be between 4.5% and 6.5% of GDP, depending on the scenario. If India reaches net zero by 2050 or 2070, this cost translates to an annual cost of 25-35%, equivalent to 7-12 trillion USD compared to 2050. This cost may be attributed one-third each to mobility, electricity supply, and industries and agriculture.

Quote –

“Decarbonisation journey is the biggest opportunity of our lifetime, and of this century. The investment revolution is the largest capital reallocation that the world has seen since the Second World War and after the industrial revolution.”

“Market to book in sectors that have already moved along the path of decarbonisation is 4x, while in sectors that are yet to embark on decarbonisation, it is 1.5x.”

Noteworthy questions/comments from the audience

- **What should be the approach for digitisation in the supply chain blockchain system and electricity storage?**
Ans: Both supply and demand into the grid are becoming unreliable due to renewable energy and other sources of demand, such as electric vehicles and steam generation. Therefore, storage is crucial as renewables cannot exist without it. Similarly, digitisation is inevitable to manage the upcoming electricity grid effectively. A significant 2-3 trillion dollars investment is needed in electricity generation for the net zero journey. However, about 10% of this capital expenditure can be reduced by market reform and utilising the opportunities for flexibility in the grid. For example, batteries can be used for the last 2-3% of grid stabilisation, saving 250 billion dollars.
-

-
- **Can circular economy principles such as recycling or reusing construction and demolition wastes, be adopted in the building sector?**

Ans: A large part of the circular economy centres on the recycling of materials, including construction, demolition, and agricultural waste. There is a need to focus on recycling batteries and finer materials. A comprehensive approach is needed to address material security, energy security, and environmental security as a circularity mission.

Key Takeaways of the session

- India is a rapidly growing economy, with infrastructure still in the process of being built. This presents a unique opportunity for India to establish a - green and sustainable foundation India must embrace technology and alternative options NOW to ensure investments in decarbonisation and green businesses flow in the next decade and beyond. A systematic approach to design is required to reach net zero.
 - The hard-to-abate cement and steel sectors in India need to adopt more alternatives and electrification solutions to decarbonise. In India, a large portion of buildings' emissions are not in the lifecycle but in the use of steel and cement. Possible solutions include producing steel from hydrogen and scrap, integrating biomass into these sectors, and implementing a biofuel mandate in energy-intensive industries.
 - Policy stability is crucial amidst technological uncertainty. Investments in green businesses and decarbonisation are expected to grow four times faster than non-decarbonisation businesses, making it the greatest opportunity of the century.
-

Way forward

- Simply adopting decarbonisation practices in factories and plants is not sufficient. Businesses must diversify their efforts to decarbonise larger industries and hard-to-abate sectors, such as steel, aviation, etc. The investment opportunity for decarbonisation is one of the most significant value-creation opportunities in the market.
-

Session Video Link:

<https://www.youtube.com/watch?v=vlcKKRuft5Q&t=397s>

11:30 – 12:30 Executive Dialogue 1 – Ensuring a Sustainable Cold Chain by India@100 Powered by Danfoss Industries**Session Brief**

India has emerged as one of the world's second-largest producers of fruits and vegetables. However, with India's growing population, there will be an additional 430 million mouths to feed, hinting that food security and hunger to remain the most pressing concerns in the next few decades. Further, the sector continues to experience significant post-harvest losses, which are a cause of rising distress for India's small-holding farmers. The Indian government recognises the need for developing post-harvest infrastructure and has formulated several schemes, such as the Mission for Integrated Development of Horticulture (MIDH), Mega Food Park Scheme, and Agriculture Infrastructure Fund (AIF). Recent interventions, such as the formation of the Doubling Farmers Income (DFI) committee and the Gati-Shakti Master Plan, will improve farmers' income, increase employment opportunities and strengthen market linkages. This journey of developing a sustainable cold chain will help the country decarbonise its energy system and increase its economy and meet the Net Zero ambitions by mid-century. However, some questions still need answers:

- What hinders the on-ground implementation of government programs for strengthening cold-chain infrastructure? How can these be resolved?
- Is it difficult to develop a sustainable cold chain in India, employing energy-efficient technologies?

Session Moderator & Speaker(s)**Chair**

- **Ravichandran Purushothaman**, President, Danfoss India

Panellist I:

- **Pankaj Mehta**, Managing Director, Carrier Transicold India and South Asia

Panellist II:

- **Nitin Goel**, Founder, Inficold India Pvt. Ltd.

Panellist III:

- **Pragya Nehru**, Director, CII Food and Agriculture Center of Excellence

Panellist IV:

- **Asheesh Fotedar**, Chief Operating Officer, National Center for Cold Chain Development (NCCD)

Session Moderator & Speaker(s)

- **Mr Ravichandran Purushothaman**, President, Danfoss India
 - India is the 3rd largest emitter of food loss globally, indicating a significant need for post-harvest management systems. This could involve implementing technologies, policies, standards, and protocols that help to reduce food waste and improve overall efficiency in the sector.
 - Efficient cold-chain technologies are crucial for reducing emissions and helping the sector achieve net-zero ambitions. By investing in these technologies, it may be possible to reduce energy consumption and greenhouse gas emissions associated with cold-chain logistics.
 - The use of mobile electric vehicles is an essential component of the cold-chain logistics system. Intertwining these vehicles into the supply chain could help to reduce emissions and improve overall efficiency, making it easier to transport food products sustainably.

Panel Discussion

- **Mr Asheesh Fotedar**, Chief Operating Officer, National Center for Cold Chain Development (NCCD)
 - The cold-chain sector in India is facing significant challenges, including policy gaps, outdated standards, and infrastructure gaps. These challenges must be addressed through revisions of policies, standards, and protocols to meet the current requirements of the sector.
 - NCCD's cold-chain infrastructure gap assessment study (2015) is outdated and requires revision to provide a better understanding of existing and upcoming challenges in the cold-chain sector. This assessment can help policymakers and stakeholders to plan and implement appropriate interventions in the sector.
 - Advanced technologies and national-level interventions, such as grid construction, can be pivotal in building sustainable cold-chain logistics. It is essential to focus on the adoption of advanced technologies and to provide support for national-level interventions to enhance the infrastructure and logistics required for the cold-chain sector.
- **Mr Pankaj Mehta**, Managing Director, Carrier Transicold India and South Asia
 - Efficient cold-chain logistics can significantly reduce logistics cost and benefit farmers by providing them with better market prices.
 - Inefficient cold-chain logistics have been hindering the development of the industry, and multimodal logistics can be a big enabler for a sustainable cold-chain.
 - Investing in improving cold-chain logistics can positively impact the overall supply chain by reducing wastage, improving product quality, and increasing profitability for all stakeholders involved.
- **Dr Nitin Goel**, CoFounder, COO, Inficold India Pvt Ltd
 - Cold-chain doesn't have to be expensive: There is a common stereotype that cold-chain logistics are costly. However, breaking this stereotype highlights that it is possible to develop sustainable and cost-effective cold-chain solutions with the right technology and approach. .
 - Hybrid models can be more energy-efficient: A hybrid model cold-chain that combines small compressors and ice batteries can be more energy-efficient than conventional sources. This can lead to cost savings while also being environmentally friendly in the long run.
 - Mobile electric vehicles can be a solution for cold-chain logistics: The usage of mobile electric vehicles can solve some of the challenges faced in cold-chain logistics, such as efficiency and high cost. By using these vehicles, it may be possible to transport goods more efficiently and sustainably.

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- **Ms. Pragma Nehru**, Director, Confederation of Indian Industry (CII)
 - In the journey of cold-chain development, it is essential to ensure that no one is left behind, meaning that there must be a concerted effort to generate awareness about the benefits of cold-chain among all stakeholders, especially farmers.
 - Along with technology and financing, skill development and capacity-building programs are critical for the sustainable development of cold-chain in India. These programs will help build the necessary human resources and technical capabilities to manage the cold chain effectively.
 - The development of cold-chain in India requires a multi-pronged approach that focuses on technology, financing, awareness generation, skill development, and capacity-building programs. By addressing these areas comprehensively, we can build a sustainable and effective cold-chain system that benefits all stakeholders, including farmers and consumers.
-

Noteworthy questions/comments from the audience

- **What are the steps taken by NCCD to encourage cold-chain awareness programs on the state level?**

Ans: NCCD has entered into Memorandums of Understanding (MoUs) with multiple stakeholders and established communication to ensure their comprehension of the policies and initiatives related to the cold-chain industry.

Additionally, NCCD has partnered with ISHRAE through an MoU, paving the way for public-private collaborations to enhance the development of the cold chain sector.
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Key Takeaways of the session

- Collaboration between the government and industry is essential for sustainable cold-chain development in India. Both parties must work together to establish effective regulations, implement new technologies, and secure financing for these initiatives.
 - Logistics are crucial in reducing food loss and managing post-harvest losses. The use of multi-modal logistics can significantly improve the cold chain's sustainability, ensuring that perishable goods are transported safely and efficiently.
 - Digitalisation of the cold chain can contribute to the decarbonisation of energy systems and help India achieve its net-zero emissions goals. By embracing technology, the cold-chain can become more energy-efficient, reducing its carbon footprint while improving food security and reducing waste.
-

Way forward

India requires the following to promote the growth of a sustainable cold chain system:

- Technological advancements, particularly for packhouses and ripening chambers.
 - Improved integration of initiatives such as the National Logistics Policy, Gate-Shakti Master Plan and other national & subnational initiatives providing the requisite stimulus.
 - The adoption of digital tools to enhance the tracking and monitoring of perishable goods.
-

Session Video Link:

<https://www.youtube.com/watch?v=1t6GthDq7fU>

12:30- 13:30 Executive Dialogue 2 – Facilitating Green Finance in Energy Efficiency through Public-Private Financing

Session Brief

Indian states have to achieve the national energy savings target of 150 million tonnes of oil equivalent (Mtoe) by 2030, which equals approximately 25% of Total Final Energy Consumption and is equivalent to 1750 TWh (Billion units) of electricity, avoiding 1,400 million tonnes of coal, reducing 1250 million tonnes of CO₂, and will cumulatively avoid 400 GWs of generation capacity. As proclaimed in India's Nationally Determined Commitments, these ambitious targets are critical to ushering in a net zero economy. These cannot be achieved without a funding mandate and budgetary provisions that can easily come from the avoided capital expenditure needed to build supply-side infrastructure. This will allow public investments to be matched by 3-5x by private sector investments, as evidence shows from global case studies and India's own experience from the renewable sector.

Both houses have now passed modifications to the Energy Conservation Bill. The Bill amends the Energy Conservation Act of 2001 to empower the central government to specify a carbon credit trading scheme. For this, the modalities must be worked upon by involving various stakeholders to structure the market. The panellists shared perspectives about how the PPP model can unlock a larger financial base where both the voluntary international and domestic carbon market may aid in the better recovery of EE investments.

Attracting investments and scaling up finances in energy efficiency has been a long-standing challenge. Since energy efficiency-enabled benefits are often realised over a longer time horizon and happen in distributed and smaller quantum, an aggregation and risk-sharing mechanism between the public and private sector parties can help facilitate larger investments. The session's deliberations explored what a successful business model would look like to pave the way for large-scale investments and recovery of those investments to transform the energy efficiency market. The session aimed to discuss the emerging trends and challenges to facilitate green investment to enhance energy efficiency by replicating the successful trends in the renewables sector (e.g., SECI), which used to face similar challenges 10 years ago that the energy efficiency industry has faced over several decades.

The dialogue deliberated on how the launch of a successful business model in the energy efficiency ecosystem where the carbon market could aid in the recovery of investments and help transform the energy efficiency ecosystem.

Keeping this context in mind, some high-level questions were presented for the moderator and panellists to consider to help in a dynamic exchange of ideas and deliberations, which will lead to some compelling options and recommendations on how to move the EE industry forward:

- What can we learn, and how can we replicate the success of the renewables sector in the energy efficiency sector?
- What kind of innovative investments and risk-sharing/mitigating models deliver, scale, and replicate the success that India enjoyed in the LED segment to be extended to other low-hanging fruits (e.g. cooling appliances, especially super-efficient fans and air-conditioners, smart meters, electric vehicles, efficient motors, cooling as a service, etc.)
- How will carbon markets aid in better recovery of EE investments as an additional revenue stream?
- What will the institutional mechanism look like to give all the stakeholders confidence to realise the multi-billion-dollar potential of the energy efficiency industry?

Session Moderator & Speaker(s)

Moderator:

- **Sanjiv Aggarwal**, Partner, Energy Infrastructure with Actis

Panellist I:

- **Vishal Kapoor**, Chief Executive Officer, Energy Efficiency Services Limited (EESL)

Panellist II:

- **Shounak Ray**, Business Development Lead - South Asia, Green Buildings, IFC- World Bank Group

Panellist III:

- **Mayank Bhardwaj**, Lead – Investment and Procurement, USAID's SAREP

Panellist IV:

- **Upendra Bhatt**, Co-founder and Managing Director, cKinetics

Panellist V:

- **Samrat Sengupta**, Vice President- Business Development, EKI Energy Services Ltd.
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Panel Discussion

Sanjiv Aggarwal

- A steady flow of projects require capital from the private sector, but India boasts a promising entrepreneurial skill set that can put it all together. Key changes occurred in 2017, when the Central Government began introducing intermediaries such as SECI (Solar Energy Corporation of India) between bidders and state DISCOMS, paving the way for an energy revolution.
- A robust business model and assured project supply are attracting private capital, with new initiatives such as smart meters and the CNI sector (renewable energy supply to the commercial and industrial sector)

Vishal Kapoor

- Initiatives EESL can take to execute projects and attract private companies include improvements in non-scale procurements and demand aggregations.
- The Government has committed 8 lakh crores for energy efficiency. Unlike green financing, energy efficiency projects are generally not visible, but projects like smart meters have shown a viable market for energy efficiency. The industry has the potential to deliver when there is a clear, large-scale, and consistent project flow. However, there is friction with the availability of finance that EESL is working to reduce.

Upendra Bhatt

The building blocks to establish a vibrant market are:

- Shift the focus of this discourse from implicit resources to explicit resources, particularly when competing with alternative sectors like renewable energy that depends on explicit resources.
 - Provide drivers for end-users by simplifying the technical details and connecting them to sub-sectoral and geographical identities to make them relatable.
 - Determine the types of risk absorption that service providers can manage.
-

Shounak Ray

- Understanding that the Sense of Scale is crucial in determining financing, benefits, and collaborations.
- The urgency shown by stakeholders (government and private) in this decade can bring about political will.
- Regulations help nudge the rights to plan and execute financing and compliance mechanisms that make it easy for end-users.
- Capturing Carbon Data and implementing certification methods are essential for investing companies in measuring the impact of development.

Samrat Sengupta

- 75 percent of India's infrastructure is yet to be built, and it remains an unexplored domain that should prioritise incorporating energy-efficient technology in upcoming infrastructure.
- Carbon credits can provide a decent revenue scheme, but project-specific issues can arise in the carbon market. Transaction costs in the current system are not proportional to the project's size, leading to carbon revenue not justifying transactions for smaller projects.
- Under Article 6.2 of the Paris Agreement, there is immense potential to deliver similar technologies at different ownership levels as a program-level activity.
- For data enclosure, Smart meters, an IoT-based management service for load management, did not have past data available to justify the baseline for reviewers. Markets only agree to government agency-approved or institution-approved research-based data for product review.
- An initiative for data enclosure from the power sector for renewables was the central electricity board officers agreeing to release grid power emission data every six months.

Mayank Bhardwaj

- A dedicated program with clear objectives and investments or grants can have significant impacts, such as the Kusum program focusing on price discovery. To create a robust energy efficiency program, initial capital can be generated through sovereign green bonds and funding available for green buildings, energy transformation, and clean transport.
 - There is ample support available, and policies and acts, like Energy Conservation Act, to provide good support from the government's side. Implementation can be taken care of by launching a program.
 - Eco systems to be developed through a cluster-based approach and EESL has to be amidst these energy efficient initiatives. A programme should have Financing type, business model & EESL's role in it, it's not a one size fits all.
-

Noteworthy questions/comments from the audience

Chirag Baijal

- Can we examine how technology can ensure efficiency, which can unlock value for stakeholders in the value chain? Measurement and verification are crucial for financial projections. What is the path forward?

Comments:

- As data tools become easier to apply, especially in cost transactions, the ability to address any process variation that has held back implementation will change.
- Digital innovation can bring in energy savings insurance and surety models already begun in the country.
- Data analytics holds the key. In smaller projects, MNE costs go beyond the project's cost. However, now there are instruments available that can perform investment-grade audits.

Key Takeaways of the session

- Policies and acts, such as energy conservation acts, are good government support. Implementation needs to be done by launching a robust program consisting of objectives, financing types, business models, and a clear role of ESL.
- Carbon credits and similar technologies must be bundled at different ownership levels. Therean is immense possibility under Article 6.2 of the Paris Agreement to make it a program-level activity for better support.
- Servitisation models will be the low-hanging fruit. The more use cases defined, the better the output. Smart infrastructure projects provide an entry point, as individual owners do not desire to retrofit if it doesn't make a significant difference.

Way Forward

To attract Private capital :

- Robust energy efficient programme from EESL
- Data analytics tool with a large database for projecting cost transactions.
- Servitisation Models as a first step.

Session Video Link:

<https://www.youtube.com/watch?v=hyfBFQk-PBU>

14:30-15:30 Industry Session 1 – Energy Efficiency from the Boiler-Room to the Boardroom Powered by CLASP

Session Brief

The session brought together industry champions on energy efficiency for a dialogue on integrating energy efficiency in their processes and products. The discussion focussed on:

- Understanding key factors that drive energy efficiency investments
- The process of adopting energy efficiency measures in business processes and products to help them meet domestic and international regulatory requirements
- Impact of energy efficiency adoption on trade and investments and climate objectives

Session Moderator & Speaker(s)

Moderator:

- **Bishal Thapa**, Senior Director, CLASP

Panellist I:

- **Manoj Meena**, CEO and Founder, ATOMBERG Technologies

Panellist II:

- **Srinivasareddy Tiyyagura**, Vice President, R&D, Daikin Air conditioning India

Panellist III:

- **Arti Chopra**, Principal, Amity International School

Panellist IV:

- **Ayaz Kamil**, Business Head-Energy & Performance Services, Siemens Limited

Panel Discussion

Manoj Meena

- The market has been revolutionised by the new BLDC technology, which provides more significant energy savings and could break the monopoly of traditional fans. The primary objective of introducing energy-efficient fans is to enhance 'consumers' overall quality of life.
- In addition to their inherent benefits of energy efficiency and cost savings, energy-efficient fans are being packaged with intelligent features and aesthetic design to facilitate their adoption. The product packaging also helps to persuade investors.
- Continuous innovation, improved performance, and cost-effectiveness drive the availability of energy-efficient products. The focus is on integrating new technologies, decreasing reliance on copper in fan production, and identifying the right investors. The government regulations on energy-efficient fans are also aiding in transforming the fan market, which is currently dominated by conventional fans.

Srinivasareddy Tiyyagura

- The government's efforts to promote energy-efficient appliances can be seen as a key factor driving investment in energy-efficient innovation. Although the transition may be gradual, the regulatory framework and industry attitudes facilitate this shift.
- Various factors influence decisions regarding investment in energy efficiency.
- In modern times, consumers have become more conscious of and interested in energy efficiency. Their demand for less energy appliances is driving the industry to create smart appliances that can be connected to the Internet. This enables consumers to monitor and store data online and receive useful information about their energy usage.

Arti Chopra

- “The groundwork for effective preparation begins in the classroom, as schools strive to cultivate independent thinking.” In recognition of the pressing environmental crisis, schools have embarked on an energy mission and set goals for themselves. To improve their infrastructure, schools have installed solar panels, implemented LED lighting, and begun the transition to a centralised cooling system.
- Energy efficiency awareness is regarded as a student-led initiative, encouraging them to raise awareness about energy conservation in their local communities and conduct energy audits on campus. Students are also motivated to generate practical solutions for energy-related challenges. For example, students at Amity International School have successfully designed an app to track energy usage data on campus.
- It is advisable for the industry to provide opportunities for students to intern with their R&D units to promote a comprehensive understanding of energy efficiency and foster a collaborative spirit between public and private institutions in addressing energy efficiency issues.

Ayaz Kamil

- The qualification and identification of stakeholders play a crucial role in determining investments in energy efficiency, which may require customisations to optimise costs.
- It is advisable to shift from a product-based approach to a solution-based strategy for energy-efficient equipment. This involves standardising energy-efficient technology while customising business models to encourage greater adoption of the technology among consumers.
- Sustainability can be enhanced through digitalisation, which can facilitate the creation of data-gathering and analysis platforms that can visually represent consumer usage data.

Noteworthy questions/comments from the audience

India’s current testing lab infrastructure for benchmarking technology.

Although testing lab infrastructure is expanding gradually in India, Daikin aims to establish testing labs to compare large chillers in the country. The government could facilitate the development of the necessary infrastructure.

Question: What is the status of adopting IE3-level of motors?

Regarding adopting IE3-level motors, Siemens employs the most efficient motors available in terms of motor efficiency. Greenfield projects undertaken by the company employ IE3-plus standard efficiency motors.

Key Takeaways of the Session

- A human-centric leadership approach is required to overcome the challenge of climate change supported by technology. Collaboration between the government, industry and individuals is critical for advancing energy efficiency in India. The regulatory push from the government to promote energy efficiency has made the consumers aware and led to an increased demand for smart and energy-efficient appliances making it a necessity for the industry to innovate and create a market packaged to meet consumer demands that are efficient and smart.
- Standardisation can improve equipment production and performance efficiency and efficacy, while customisation and business models can improve accessibility. Balancing standardisation and customisation can help scale up energy-efficient technologies and take them to the masses.
- Students play a crucial role in driving change and shaping systemic changes in how we use energy and natural resources. Academic institutions can foster energy-efficient practices and behaviours in the upcoming generation of thinkers and leaders by developing a holistic curriculum incorporating energy efficiency nuances. Students can act as agents of change in tackling the climate crisis.

Session Video Link:

<https://www.youtube.com/watch?v=i5BC8WG8jcl>

15:30-16:30 Industry Session 2 – Making Sustainability a Reality: HVAC solutions Powered by Carrier**Session Brief**

The session centred around the current efforts of corporations to actualise sustainability and direct investments toward sustainable development. Additionally, the discussion focused on how the Chiller plant room contributes to enhancing the overall Energy Efficiency of commercial buildings.

Session Moderator & Speaker(s)**Moderator:**

- **Mr Dhiraj Wadhwa**, Director, Commercial HVAC - India, Carrier

Panellist I:

- **Mr Chirag Bajjal**, Managing Director- India Region, Carrier

Panellist II:

- **Mr Srikanth**, Group Head - Procurement DLF Limited

Panellist III:

- **Ms. Richa Chhabra**, Marketing & communication specialist

Panel Discussion**Mr Dhiraj Wadhwa**

- The purpose of buildings is to function, and passive design modelling using digital tools can assist in maintaining their performance. This modelling provides insights into optimal equipment and load management. It is crucial to make these design tools more accessible to enable the creation of more efficient buildings.
- 40% of GHG emissions related to energy are from buildings, with HVAC systems accounting for 58% of these emissions. Carrier views this as a challenge and is committed to developing solutions that benefit both people and the environment.

Mr Chirag Bajjal

- HVAC solutions can achieve sustainability without requiring large capital investment and can be done as brownfield projects.
- By analysing data on load ingress and egress through human usage patterns, it's possible to monitor energy consumption.
- Once a building has obtained green certification, AI and data analytics can be employed to develop sustainable maintenance methods.

Mr Srikanth**Case study of DLF Gateway Tower, Gurgaon**

- DLF collaborated with Carrier HVAC & Chiller Plant to enhance energy efficiency by upgrading the chiller plant system. The scope of the project involved the replacement of 120-ton chillers with 180-ton chillers, an optimiser and the selection of an optimal plant room location.
- As a result of this conscious effort towards energy efficiency, the project yielded a reduction in building energy requirements from 1.46 Kw to 0.7 Kw, saving 2.3 million kWh of energy. With an 8-10 hours operation, the return on investment for this project was 35%.
- DLF predominantly operates under a leasing business model, and as their leasing portfolio consists of multinational clients, there has been a shift in customer demands. Expectations now include safety, energy efficiency, sustainability, and LEED-certified buildings.

Noteworthy questions/comments from the audience

- DLF has engaged with Carrier for retrofitting, what kind of practices is helping DLF to do these sorts of procurements, especially in facilities occupied by tenants & as well as owner-occupied buildings?

Key Takeaways of the Session

- Passive design modelling using digital tools is crucial in maintaining building performance and making these design tools more accessible can lead to the creation of more efficient buildings.
- HVAC systems account for a significant portion of energy energy-related GHG emissions in buildings. However, sustainable HVAC solutions can be achieved without requiring large capital investments and can be implemented as brownfield projects.
- Upgrading HVAC systems can result in significant energy savings and a high return on investment. Additionally, the demand for energy-efficient and sustainable buildings has increased, particularly among multinational clients.

Session Video Link:

<https://www.youtube.com/watch?v=tcLYgA0eK3E>

16:30 – 17:00 Energy Efficiency Market Trends and Implications for India, a presentation by International Energy Agency (IEA)

Session Moderator & Speaker(s)

- **Jayanta Chaudhuri**, Director- Marketing, Alliances and Partnerships AEEE
- **Cornelia Schenk**, Energy Efficiency Policy Analyst, Energy Efficiency, International Energy Agency

Panel Discussion

Jayanta

Governments increasingly turn to energy efficiency (EE) to ensure energy security, particularly following the 2022 crisis. The International Energy Agency (IEA) has identified the crisis as a potential turning point for EE.

Cornelia:

Around the world, people are recognising the benefits of EE, including affordability, security, and climate goals. In 2022, there are signs of a turning point for EE, with a projected 2% improvement in energy intensity after a period of weaker progress. India is among the leading G20 countries in annual energy intensity improvements between 2015 and 2020.

While energy demand growth has slowed in the wake of the Covid-19 crisis, it continues to grow in many emerging and developing economies, though at a decelerated rate. There are significant opportunities for rapid electrification in small industries, particularly through process integration of electrified equipment, digital performance monitoring, and operational controls.

Space cooling is one area where electricity consumption is proliferating in buildings. However, efficient cooling systems do not necessarily have to be expensive. Short-term consumption subsidies can buffer fuel prices, but higher fuel prices can drive inflation and hinder energy access. In the long run, well-targeted public spending can support vulnerable consumer groups and increase energy efficiency.

The longest-running EE programs have successfully reduced appliance energy consumption by over half, and their prices have also decreased. EE measures are the most effective policy to reduce bills, with consumer running costs often 40% lower for more efficient buildings and as much as 75%. Those most exposed to higher bills are often in poor-quality, low-efficiency housing, highlighting the need to focus on justice, energy efficiency, and access.

EE also plays a crucial role in ensuring energy security, with efficiency gains halving the potential growth in global energy demand over the past six years. Without these gains, current emissions levels would be higher.

Global investment in efficiency and efficiency-related measures is increasing, with the added benefit of potential employment opportunities.

"Efficiency measures are the first-best policy to reduce electricity bills."

Noteworthy questions/comments from the audience

- Does the emergence of EVs mean a shift in focus from fuel efficiency improvements to EV production, improvements, and popularisation?
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Key Takeaways of the session

- The energy crisis of 2022 has refocused the world, particularly Europe, on energy efficiency. People globally are turning to energy efficiency for affordability, energy security, and to meet climate goals.
 - Short-term fuel consumption subsidies can temporarily cushion fuel prices, but higher fuel prices can drive inflation and hinder progress in energy access. In the long term, well-targeted public spending can support vulnerable consumer groups and increase energy efficiency.
 - Electrification is a crucial pathway towards decarbonisation, and the small industries presents an excellent opportunity for electrification. At the same time, space cooling is one of the fastest-growing end-uses of energy.
-

Session Video Link:

<https://www.youtube.com/watch?v=FusPqYC3Ukk>

DAY 02

10:15-11:15 Industry Session 3 – Market Transformation at the Sub-national Level: The Cases from California Powered by Energy Solutions

Session Brief

Decarbonizing Buildings to meet climate goals and States as a test bed: California Case Studies

- Emerging Technology: Accelerate the identification, testing, and demonstration of emerging and underutilised decarbonisation technologies
- CalNEXT Program
- Scalable deployment: Assess and develop program solutions to address barriers to the widespread adoption of technologies to supercharge the transition
- Midstream Programs and TECH Clean California
- Increasing baseline: Lock-in the transformation with the development of policy using new technology as the baseline
- Appliance Standards

Session Moderator & Speaker(s)

Chair:

- **Daniel Cornejo**, Vice President, Business Strategy, Energy Solutions

Panelist I:

- **Dr Bhaskar Natarajan**, Director of Programmes, AEEE

Panelist II:

- **Swatantar Kumar Singal**, Chairman, HAREDA

Panelist III:

- **Bijit Kundu**, Strategy and Policy Fellow, Energy Solutions

Panel Discussion

Daniel Cornejo

- Midstream reforms targeting distributors and suppliers can be a highly effective way of scaling technology. By improving the efficiency of the distribution process, midstream reforms can increase access to new technologies and accelerate their adoption.
- Conducting multiple pilots at the community level can help identify which technology has the greatest potential for state-wide adoption. By analysing pilot data, policymakers can make informed decisions about which technologies to scale.
- When scaling new technologies, retraining the workforce to use them effectively is important. Furthermore, analysing market feedback and making necessary iterations to the product are important steps to ensure the technology's continued success.

Bijit Kundu

- Mandatory requirements, such as MEPS and building codes, are an essential part of the innovation cycle for energy efficiency and market transformation. They work alongside incentive programs to push forward the development and adoption of energy-efficient technologies, with incentives pulling the market and mandatory requirements pushing from behind.
- State standards significantly impact national standards, as demonstrated by the adoption of MEPS in the US. States like California have included additional appliances on the nationwide list, prompting the central government to adopt these standards for the benefit of all.
- Demonstration projects are crucial in scaling up energy efficiency programs, as seen in California's LED accelerator program. Through data collection and stakeholder consultations, these projects provide the necessary evidence and support to implement mandatory codes and lock in energy savings.

Dr Bhaskar Natarajan

- For India to advance on the sub-national level, it is essential that states adopt a leadership mindset and design their programs instead of just implementing central schemes. Additionally, states need to provide an enabling framework for different agencies to upscale innovations on the state level.
- The state energy efficiency index for 2022, undertaken by BEE in association with AEEE, shows that states in India have made progress in understanding energy efficiency over the last five years. States are now better prepared with data and documentation and are progressing in the sphere of energy efficiency.
- While India's central government and ministries have set targets and frameworks to reduce fossil fuel emissions, there is still a need to shift the focus from reducing energy intensity to holistic decarbonisation. This requires a change in mindset and approach to achieve sustainable and long-term results.
- Builders, architects, and designers are the main stakeholders must be targeted to mainstream energy-efficient materials in the Indian building construction sector.

Swatantar Kumar Singal

- Haryana's target to convert 4% of its electricity consumption to renewable energy by 2030 through solar panels and other devices shows a strong commitment to reducing the state's carbon footprint and promoting sustainable development.
 - Haryana's plan to promote the use of solar devices like cookers and heaters, and incentivise the adoption of solar panels, demonstrates a proactive approach to encouraging the adoption of renewable energy sources in everyday life. It is also incentivising solar panels and providing them at a lower cost to consumers to ensure widespread adoption.
 - Haryana's focus on implementing building codes throughout the state to reduce carbon emissions indicates a long-term strategy to achieve sustainable development. The fact that 330 buildings in the state are now ECBC compliant shows progress in this area and could serve as a model for other states to follow.
-

Noteworthy questions/comments from the audience

- In what way do energy service contracts contribute to reducing electricity consumption?
- What is the nature of the state government's collaboration with the private sector, specifically ESCOs, regarding energy efficiency initiatives in California?

Key Takeaways of the session

- An enabling framework is crucial for successful sub-national market transformation. States must take on leadership roles in designing and implementing programs that enable market transformation, including creating policy frameworks, developing infrastructure, and fostering partnerships with private stakeholders.
- In India, where geography and community are diverse, selecting appropriate technology for deployment at sub-national levels is critical. To ensure success, it is necessary to thoroughly assess available technology options before making a final decision.
- While many states in India focus on energy efficiency, there is a need to shift from reducing energy intensity alone to pursuing a holistic decarbonisation approach.

Session Video Link:

<https://www.youtube.com/watch?v=CJ8CkUJ4asE>

11:30-12:30 Industry Session 4 – Decarbonizing India's Cooling Sector through Adoption of District Cooling and other Cooling Technologies Powered by TABREED India

Session Brief

In light of India's burgeoning cooling requirements and its commitments under the Paris Agreement, this session aimed to discuss the most suitable and sustainable strategy that can be adopted to decarbonise Indian cities while meeting the cooling demand.

The session was structured in an Oxford Union Style Debate format to engage the audience. The proposition team will be speaking in favour of district cooling (DC) as well as other cooling technologies as the best possible solution; and how its deployment on a large scale (real estate, smart cities, and urban planning) will be facilitated through the right policies and investments can yield economic and ecological dividends for all stakeholders through significantly reduced power load on the grid (as well as the potential for load shifting through the integration of renewable and thermal energy storage), energy consumption savings, etc. On the other hand, those representing the opposition will focus on challenges to the deployment and adoption of DC, relevance and feasibility of DC for India, especially in the context of affordable housing, the residential sector, and Tier II, III, and IV cities, as well as the larger role passive cooling measures and nature-based solutions, can play in providing thermal comfort.

The event was moderated by Tabreed India, an industry leader in district cooling, and will feature dignitaries from the cooling and allied industries and government organisations. Through its structure and focused conversation, the session helped provide a holistic and systemic view, integrating seemingly isolated aspects of the argument cohesively together for formulating and implementing India's Cooling Roadmap.

Session Moderator & Speaker(s)

Moderator:

- **Sudheer Perla**, Country Manager, India, Tabreed

Panellist I:

- **Markus Lattner**, International Director, Eurovent

Panellist I:

- **Dushyant Ahuja**, VP- Asset Management, Tata Realty & Infrastructure Ltd

Panellist I:

- **Dr Satish Kumar**, President and ED, AEEE

Panellist I:

- **Sandeep Kachhawa**, Energy Efficiency Researcher & Independent Consultant
-

Panel Discussion

Sudheer Perla (Moderator):

- Cooling has become a necessity in India today and is no longer a luxury.
- District Cooling will be necessary for decarbonising India's cooling sector and achieving India's emission targets under various international agreements and protocols.

Sandeep Kachhawa (Proposition):

- District cooling would significantly benefit DISCOMS by reducing peak hours, power demand, and distribution infrastructure.
 - With the upcoming technology of high-efficiency chillers and the ability to run DCSs on natural refrigerants, they will contribute towards India's emission targets.
 - DCS will be an excellent boon for greenfield development and high-density mixed-use areas.
-

Dushyant Ahuja (Opposition):

- India has a diverse climate throughout the country, and in multiple regions, passive and natural cooling solutions are sufficient to achieve thermal comfort. TATA Realty has already achieved this in its Ramanujan Intellion Park without the need for technological advancements.
 - There are several developers in a small part of the cities, and getting them to agree on adopting DCS as the cooling solution would be tedious. A detailed framework and a feasible business model must be developed .
 - Rather than exploring new technology for cooling solutions, we should enhance our research on traditional cooling methods that have existed in India for ages.
-

Satish Kumar (Proposition):

- DCS will not be a universal cooling solution for the country. Instead, it should be installed where feasible. Considering the projected cooling demand in ICAP, demand for cooling systems will increase significantly, and DCS would be a sustainable solution.
 - Operation and maintenance for a DCS is much more convenient than for a conventional cooling system and is done by specialised professionals.
 - Conventional cooling systems negatively impact an area's architectural and urban design aesthetics, which can be eliminated by installing DCS.
-

Markus Lattner (Opposition):

- DCS cannot consider the different cooling needs of various people on the developed site, making the end-user the weakest link in the chain and making them bear financial losses in case of system failure.
- The existing framework for DCS in the Middle East was not beneficial for all stakeholders, and exploring DCS as a cooling solution in India would be exhausting.
- Behavioural change in people to lead towards a sustainable future is much more necessary than exploring new technologies. Furthermore, DCS is not precisely a new technology but rather similar to centralised cooling systems, with a change in the business model and scale of the application.

Noteworthy questions/comments from the audience**Questions:**

- Are district cooling systems feasible for brownfields or old cities?
- Can a district cooling system alone effectively decarbonise India's cooling sector, or must passive and natural cooling solutions be incorporated as well?

Comments:

- In Delhi, there is not enough land available for new large-scale developments. On the other hand, there is a surge in installations of individual AC units at an exponential rate leading to a significant increase in power demand. Thus, district cooling systems appear to be a viable solution for cities like Delhi; however, extensive efforts must be made to develop frameworks and business models. The land-intensive nature of this technology can be addressed by investigating the underground potential of the city, similar to how it was approached in GIFT City.

Key Takeaways of the session

- Considering the number of hot days in India today, cooling has become a necessity and is no longer a luxury. From the debate and audience responses, it can be concluded that district cooling is among the solutions that would be needed, along with a reduction in cooling demand through natural and passive cooling solutions, and behavioural changes in people to lead towards a sustainable future.
- To introduce DCS in the Indian market, we must learn from the mistakes observed in foreign regions such as the Middle East. Developing a regulatory framework and a business model that benefits all stakeholders in DCS is crucial.
- While DCS seems to be a viable long-term solution, natural and passive cooling solutions should be explored for the short term.

Way forward

- While district cooling is a sustainable solution for meeting cooling demands in greenfield developments, its feasibility and development framework in brownfield areas still needs work. In addition to district cooling, reducing cooling demands, implementing passive and natural cooling solutions, and promoting behavioural change are all essential for decarbonising India's cooling sector

Session Video Link:

<https://www.youtube.com/watch?v=AA1HA6su-G4>

12:30-13:30 Executive Dialogue 3 – E-mobility Landscape: A Strategy to Decarbonise the Road Transport Sector

Session Brief

In India, road transport contributes 90% of the total transportation-induced carbon emissions. India has committed to reducing the emissions intensity of its gross domestic product (GDP) to 45% below 2005 levels by 2030. E-mobility is among the key strategy being adopted to achieve this goal. The important categories of vehicles for e-mobility include the two-wheelers and three-wheelers (accounting for 80% of the total sales of vehicles), public transport (inter-city and intra-city) and private vehicles. EVs higher upfront cost, range anxiety and potential safety issues are some of the significant challenges in accelerating EV adoption in India. Battery swapping is among the options being considered as a potential solution that could accelerate EV adoption. This session discussed the challenges and barriers to EV transformation, battery swapping and the potential for retrofitting of the existing fleet. It will also shed some light on the government's and industry's efforts in terms of policies and demand aggregation to accelerate the market transformation.

Session Moderator & Speaker(s)

Moderator:

Amit Bhatt, India Managing Director, ICCT

Panellist I:

Deb Mukherji, Managing Director, Omega Seiki Mobility

Panellist II:

Manish Gupta, Executive Director, Electrical Energy and Management (EEM), Railway Board, Indian Railways

Panellist III:

Ms. Pramoda Gode, Senior Advisor, Moving India, World Economic Forum

Panellist IV:

N Mohan, CEO (Delhi EV Cell), Transport Department, Govt of NCT of Delhi

Panel Discussion

Mr Amit Bhatt

- Decarbonising road transport is a crucial step towards reducing emissions, given that it contributes significantly to the increase in emissions in the transport sector. Strategies for decarbonising road transport need to be explored and implemented urgently to mitigate the impact of these emissions.
- The transformation of the electric vehicle market faces several challenges, such as high costs, limited driving range, and lack of charging infrastructure, which need to be addressed for the market to grow. Collaboration between governments, manufacturers, and other stakeholders is necessary to increase affordability, improve infrastructure, and educate the public about the benefits of electric vehicles.
- Governments must take proactive measures to support the transition to electric vehicles and decarbonisation of road transport. Such measures include investing in research and development of new technologies, incentivising the adoption of electric vehicles, and creating policies that promote sustainable transportation.

Mr Deb Mukherji

- Diverse charging options are needed to cater to user preferences based on service type.
- Upcoming technologies will address range anxiety for electric vehicles.
- A stage-wise approach is necessary for scaling up charging infrastructure, including specifying charging types, standardisation, and identifying user preference.

Mr Manish Gupta

- One of the primary reasons for Indian Railways to adopt electrification is the cost savings it offers. With a large traffic of freight and people, electric engines are more efficient and cost-effective than their diesel counterparts.
- As part of its commitment to sustainability, Indian Railways has set a target of achieving net zero emissions by 2030. To achieve this ambitious goal, the organisation is planning to generate electricity through renewable sources.
- Indian Railways has adopted a two-pronged approach to promote the adoption of electric vehicles (EVs) in the country. The first prong involves the development of EV infrastructure on rails, while the second prong involves setting up EV charging stations at railway stations for vehicles like taxis. Already executed in some railway stations like Bombay CST, Kurla and Dadar, this approach will help to promote the use of EVs in India and reduce the country's dependence on fossil fuels.

Ms. Pramoda Gode

- User preference plays a critical role in determining the best charging type for EVs, and businesses should provide customers a positive charging experience to encourage adoption.
- The transition to electric vehicles presents an opportunity to diversify the automobile sector by attracting more women into the workforce. To achieve this, upskilling the workforce to meet the technical requirements of the new technology is crucial. This will not only broaden the talent pool in the industry but also help bridge the gender gap.
- While demand-supply-purchase subsidies may incentivise EV adoption in the short run, business models are preferred for long-term sustainability.
- Delhi has emerged as a leader in EV adoption, thanks to its travel trends and the popularity of overnight slow charging at home. This trend emphasises the importance of designing charging solutions that are convenient and accessible to users to encourage EV adoption and enable the widespread transition to electric mobility.

N Mohan

- Delhi is making significant efforts to increase the adoption of electric vehicles, with a target of achieving 25% of registered vehicles being EVs by 2024.
 - The Delhi EV policy provides demand purchase incentives for the two-wheeler and three-wheeler segments, in addition to the FAME 2 policy. The digitised process from application to end simplifies the process and encourages more people to switch to EVs. This shows that the government is taking proactive measures to make EVs accessible and affordable for people.
 - The implementation plan for charging infrastructure at the district level is strategically planned to map high-utilisation areas to ensure business viability. The type of charging opted by people will be determined by a successful business model in the segment. Additionally, opening feeder bus depots for other vehicles to charge could be a creative solution to ensure EV users have access to charging points.
-

Noteworthy questions/comments from the audience

- What alternate technologies is e-mobility looking to as part of decarbonisation efforts?
 - How can we break the mold and scale up the supply chain based on other countries' successes?
 - Would it be feasible to have charging stations powered by distributed renewable energy to boost supply?
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Key Takeaways of the session

- The challenges that impeded the shift towards electric vehicles were examined, particularly on potential remedies such as battery swapping and retrofitting. Additionally, attention was given to the endeavours undertaken by both the government and industry to create policies and stimulate demand for EVs, with the goal to propel the market towards greater electrification.
 - The Indian Railways have introduced a new policy as part of the government's commitment to promoting electric mobility. The railway authorities are actively working on setting up charging stations at railway stations, making it more convenient for travellers to recharge their electric vehicles.
 - Delhi government is taking a proactive approach to promoting electric mobility by providing incentives for purchasing both passenger and cargo e-cycles and subsidies for other categories of electric vehicles. This puts Delhi at the forefront of the race to adopt electric vehicles.
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Session Video Link:

<https://www.youtube.com/watch?v=5X-EurFedxM>

12:30 - 13:30 Executive Dialogue 4 – Creating 10GW market for Demand Flexibility by 2030**Session Brief****Launch of the whitepaper titled "Customer Engagement – A tool for Utility Utility Demand Side Management."**

The increasing share of renewables in India's grid power and proliferation of decentralised power generation has created the need for demand flexibility, amongst other solutions for cost-effective renewable grid integration. While demand-side management is not a new concept for India, demand flexibility to support renewable integration and decarbonisation is relatively new and is limited to small-scale pilots in a few states. Distribution utilities must also purchase expensive electricity to meet critical peak demand. The Central Electricity Authority projects the country's peak demand to grow from 203 GW to 366 GW between 2021-22 and 2031-32. The reforms in the wholesale power market, bringing ancillary services into the market, increasing proliferation of smart meters, and smart grid technologies make demand flexibility feasible in important demand sectors such as buildings that have a share of more than 30% of India's electricity consumption. Buildings with new energy technologies have the potential to interact with the grid rather than only passively drawing power from the grid. Grid-Interactive Efficient Buildings (GEB) have a holistically optimised blend of energy efficiency, energy storage, renewable energy, and load flexibility technologies enabled through smart controls and building occupants' behaviour.

The session deliberated on the strategies and way forward for the Indian grid to scale up demand flexibility measures and create an ecosystem for demand flexibility. The session also focussed on the technology and infrastructure needed for demand flexibility which also has the potential to enhance grid resilience, regulatory reforms and business models to establish and accelerate the market for demand flexibility in India.

Session Moderator & Speaker(s)**Moderator:**

- **Mr Pramod Kumar Singh**, Senior Director – Research & Programmes, AEEE

Panelists I:

- **Meenal Sutaria**, Associate Partner, MP Ensystems Advisory Private Ltd.

Panelists II:

- **Matt O'Keefe**, Head of Opower and Group Vice President, Oracle Energy & Water

Panelists III:

- **Gopal Nariya**, Vice President, BSES Rajdhani Power Limited

Panelists IV:

- **Himanshu Chawla**, Joint Director (T-E), Delhi Electricity Regulatory Commission

Panel Discussion

Ms. Meenal Sutaria

- Integration of renewable energy with the grid for demand response or demand flexibility presents both challenges and opportunities. The emphasis on renewable energy in the budget makes it necessary to explore the potential for demand flexibility, which could be achieved through load management rather than the conventional understanding of demand response.
- Energy efficiency and conservation play a crucial role in reducing overall electricity demand. As such, it is important to prioritize these factors in the development of policies and regulations that support technological approaches and behavioural changes across different sectors, including residential and agriculture.
- There is a clear need for regulatory frameworks that support the scaling up of demand response programs in India. This includes the implementation of more sustainable financial mechanisms, a greater focus on long-term power purchase agreements, and increasing the liquidity available for these initiatives. Additionally, the willingness of utilities to adopt demand response measures will be a critical factor in achieving success.

Mr Matt O'Keefe

- International experience has shown that engaging with customers at a mass level and nudging them for behaviour change in electricity consumption can significantly reduce power demand. This highlights the importance of educating and encouraging customers to adopt energy-efficient practices and technologies.
 - Informing consumers about the timing of the Demand Response (DR) event can lead to significant energy savings and create space for further demand flexibility. This emphasises the need for effective communication and coordination between utilities and customers to ensure that DR events are timed to maximise demand reduction benefits.
 - Learnings from Behavioural Demand Response (BDR) suggest that utilities must offer DR incentives and have energy efficiency programs to promote behaviour change. Additionally, utilities must also care about how much consumers spend on their energy bills, which can motivate them to adopt energy-saving measures. This highlights the importance of a customer-centric approach to energy management and the need for ongoing education and incentives to promote energy-efficient behaviour.
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Mr Gopal Nariya

- Smart meters are essential for measuring and verifying the impact of demand response programs, but they are not the only way to make it happen. They are a crucial first step in informing consumers about their energy consumption patterns, which can help encourage participation in demand response initiatives.
- From an economic perspective, demand-side management is becoming increasingly critical for all energy planning and regulation stakeholders. Investing in consumer-owned battery storage systems, rather than relying solely on grid-scale storage, can be a cost-effective way to manage demand and balance the grid.
- The shift towards electric vehicles and other forms of electrical energy demand means that rooftop solar and battery storage, may become a significant option for meeting future energy demands. Planning for this transition and investing in the necessary infrastructure will ensure a smooth transition to a more sustainable energy future.
- To successfully scale up pilot projects to commercial initiatives, working collaboratively with all stakeholders, including consumers, DISCOMS, regulators, and government bodies is essential. An open-minded approach and a willingness to work together will be critical to successfully transitioning to a more sustainable and resilient energy system.

Mr Himanshu Chawala

- Before implementing new regulatory measures, piloting them to understand their feasibility and potential benefits is essential.
 - Integrating renewable energy with the grid is a priority in ensuring a sustainable energy future. This will require investments in infrastructure, storage, and smart grid technologies.
 - Electric vehicle charging stations can act as grid stabilisers by using their battery storage capacity during peak demand. This can help reduce the costs of buying electricity from the grid and enable the adoption of demand response and energy efficiency programs.
 - Implementing innovative technologies such as Time of use tariffs, automated demand response (ADR), and Peer-to-peer transactions through blockchain technology can significantly support the net-metering initiative of Delhi. These technologies can help to reduce energy consumption during peak hours, encourage the use of renewable energy, and enable consumers to sell excess energy back to the grid, ultimately supporting sustainable energy practices.
 - To scale up demand response (DR) pilot projects, regulators must encourage all utilities to participate in DR and energy efficiency-related programs, emphasising the avoided CAPEX and short-term power purchase cost benefits. By incentivising utilities to participate in these programs, regulators can drive the adoption of DR and energy-efficient technologies, ultimately promoting a more sustainable and efficient energy grid.
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Key Takeaways of the session

- Behavioural nudge can be a powerful tool for promoting demand flexibility, and it doesn't always require financial incentives to be effective. By designing interventions that influence people's behaviour and decision-making processes, it's possible to achieve significant changes in energy consumption patterns that benefit both consumers and the grid.
- While smart meters play an important role in monitoring and verifying the effectiveness of demand response programs, they are not the only factor determining their success. Other factors, such as communication networks, customer engagement strategies, and the availability of real-time data analytics tools, also play a critical role in delivering effective demand responses.
- Adequate and innovative financial mechanisms are essential for scaling demand response projects from pilot to commercial scale. Regulators and policymakers must develop strategies that incentivise utilities, customers, and other stakeholders to invest in demand response technologies and infrastructure. This may involve developing new financing models, such as performance-based incentives, those reward successful outcomes rather than simply paying for inputs.
- Conducting a robust cost-benefit analysis is critical for the success of demand response pilot projects.
- Regulators must prioritise the short-term financial benefits of demand response programs to gain the support of key stakeholders. By highlighting the avoided CAPEX and power purchase costs associated with demand response, regulators can demonstrate the immediate benefits of these programs to utilities and customers alike. This will help to build momentum for further investments in demand response infrastructure and technology.

Session Video Link:

<https://www.youtube.com/watch?v=4c3p3w8NAUE>

14:30 – 14:45 Structured Presentation: AAI's Efforts to Benchmark Energy Consumption and Enhance Energy Efficiency at Airports

Speaker

- **Reena Rai**, Executive Director (Technical), Airport Authority of India

Key Takeaways of the session

- The Airport Authority of India (AAI) is actively implementing measures to reduce the carbon intensity of airports in a phased manner, with the goal of achieving carbon neutrality and net zero emissions.
- AAI's roadmap for renewable energy aims to make 96 of its airports self-reliant through the use of renewable energy sources, and increase the onsite solar capacity to 100 MWp by 2024.
- AAI's airports are performing at a comparable level with India's Joint Venture/PPP airports in terms of energy intensity of passenger traffic, aircraft movement, and area

Session Video Link:

<https://www.youtube.com/watch?v=a1-IICQh9YU>

14:45 - 15:45 Executive Dialogue 5 – Intensifying Private Sector Climate Action through Datadriven Enterprise-level Energy Management Powered by Schneider

Session Brief

As of December 2022, 4,237 companies globally and 107 Indian companies have signed up for Science-Based Targets, which helps corporations set and meet emissions reduction targets from their operations to align with the 1.5°C, well below 2°C, or net-zero goals. These include companies that have committed to developing targets or have already set targets. Through this session, medium and large-scale enterprises and organisations shared the realised benefits of the adoption of data-driven techniques for energy management. They further elaborated on how external and internal challenges have affected the uptake of measures for end-use energy management and how these were overcome. Organisations highlighted how their evolving energy strategy ties in with ESG compliance and broader

Session Moderator & Speaker(s)

Chair:

- **Dr Saket Sarraf**, Principal, ps Collective

Panelist I:

- **Rohit Chashta**, Deputy General Manager - Energy Efficiency & Sustainability, Schneider Electric

Panelist I:

- **Umit Bhatia**, Director, Sustainability Strategy West Asia, JLL

Panelist III:

- **Dr Muthukrishnan M**, Airport Sector- Head of Environment, Health, and Safety and Sustainability-GMR Group

Panel Discussion

Saket Sarraf

- What is the role of data and enterprise-level energy management in translating talk into action and determining the benefits that can be achieved?
- How can data and energy management systems be used to establish meaningful climate goals? What kind of infrastructure does your organisation or clients use?
- How do we gather data? How readily available are data capture technologies?
- How do we communicate the importance of collecting and managing data?

Umit Bhatia:

"The ESG goals are key drivers for adopting energy management, in addition to cost benefits.

- Although data tracking for ESG can be complex, it is essential to achieving enterprise ESG goals. Advanced systems need to be in place to streamline capturing energy data.
- With the increasing adoption of data capturing techniques, it is important to address client information security.
- Managing energy, realizing savings, and meeting the company's ESG goals give the company a competitive edge in the market, setting it apart.

Rohit Chashta:

"Data is abundant, but it's crucial to comprehend its significance."

- Visualising energy-saving impact, such as energy consumption trends per person, is essential.
- Clients are keen to learn the financial impact of energy management on their EBITDA.
- Tracking and measuring energy consumption is necessary to determine the progress towards the target and to hold people accountable for its success.

Dr Muthu Krishnan:

"Budgeting energy use across different end-uses is crucial for achieving optimal energy management in large enterprises."

- Moving from qualitative parameters to quantitative data is necessary for monitoring performance. Once the quantitative data is collected, it becomes possible to identify how operations can be optimised for energy use.
- In India, all airports have taken green initiatives and are working towards operational excellence.
- Energy benchmarking will play a significant role in improving overall performance across enterprises. Adopting international standards and benchmarks will enable enterprises to learn from each other.

Noteworthy questions/comments from the audience

- What affordable energy management options are currently available, and what scale are they suitable for?

Key Takeaways of the session

- It is essential to align the company's strategic roadmap with its ESG goals, in addition to realising financial benefits. Effective energy management can help achieve both.
- Setting budgets for energy use at the end-use level is vital for managing data in large organisations and achieving overall energy efficiency.
- A variety of energy management tools are available in the market to cater to data monitoring needs, and they are becoming increasingly accessible. However, there are some concerns about data security and quality, especially in the commercial segment.

Way forward

- As energy management technologies continue to evolve and companies increasingly prioritise aligning with both business and sustainability goals, the industry is moving towards better management of energy data. This will enable effective interventions to optimise energy use in operations.

Session Video Link:

<https://www.youtube.com/watch?v=d4yiUrfDnac>

14:45 - 15:45 Executive Dialogue 6 – Advancing Construction Sector- Decarbonising through Alternate Materials and Demand Optimisation Techniques

Session Brief

The construction sector is highly fragmented with different stages, processes and different stakeholders, and each stakeholder has an impact on the GHG emissions in the entire building life cycle. Therefore, to effectively de-risk the sector from climate risks while continuing to innovate and provide a sustainable habitat, greater participation and coordinated action is required from all the key players in the entire value chain. Population and economic growth have fostered urbanisation in India, and the number of urban towns and cities is increasing drastically. This increasing urbanisation is leading to a rampant rise in the construction of buildings and housing projects. According to AEEE's estimates, India's total building floor area will be around 30 billion m² by 2038 from 15.8 billion in 2015. This growth would also spur the demand for conventional construction materials like cement, steel, bricks, glass, etc. Yet, these construction materials are highly energy and emissions-intensive and are responsible for the embodied carbon from the building and construction sectors. They must change in the decade of climate action even more so because the embodied carbon content in India's buildings, especially in residential construction, is much higher; the way we used and still are building needs to change as our PM has pledged to decarbonise its economy by 2070 at COP 26. To fulfil these targets and commitments, it requires a clear and focused strategy with a holistic approach covering all phases of building construction, from the extraction of building raw materials to the disposal and recycling of demolition waste.

This session endeavoured to address the embodied carbon from the construction sector through discussions around the material efficiency methods in this sector.

Session Moderator & Speaker(s)

Chair:

- **Ar. Ashok Behari Lall**, Design and Technology Chair, KRVI, Mumbai

Panelist I:

- **Gurneet Singh**, Director, Environmental Design Solutions

Panelist II:

- **Dr Soumen Maity**, Chief Technical Officer, TARA and Vice President at Development Alternatives

Panelist III:

- **Aneesh Jain**, Manager, Xynteo

Panelist IV:

- **Prasad Vaidya**, Director, Solar Decathlon India
-

Panel Discussion

Ar Ashok B Lall

- Embodied carbon in construction is becoming increasingly important. With the growing number of buildings to be constructed in the next two decades, there is a pressing need to address the embodied carbon emissions associated with construction. As operational energy efficiency improves, embodied carbon is set to become the sector's most significant contributor to CO₂ emissions.
- Disclosure of embodied energy/carbon of materials is necessary. To tackle the issue of embodied carbon emissions, there is a need to establish a regime/methodology that requires the disclosure of embodied energy/carbon in building materials. This will enable the identification of low-carbon alternatives and facilitate informed decision-making by architects, builders, and policymakers.
- It is essential to develop a baseline of target embodied energy/carbon intensity for different building types. This will help set standards for construction projects and provide guidance on the materials and methods to achieve the desired outcomes. Such standards will encourage the use of low-carbon building materials and help reduce overall embodied carbon emissions in the sector.

Dr Soumen Maity

- The use of clay-based alternate materials such as LC3 and geopolymers can significantly reduce carbon emissions resulting from cement use in India.
- To promote the adoption of low-carbon cement in India, there is a need for expedited development of standards and guidelines for these materials. This can ensure their wider adoption across the construction industry and help reduce the sector's carbon footprint.
- The abundance of clay reserves in India provides a promising opportunity for the sustainable production of low-carbon clay-based cement in the country.

Aneesh Jain:

- Education and awareness about the embodied carbon of buildings should be a priority for builders, designers, and architects. Many professionals in the building industry are not currently aware of embodied carbon's impact on the environment.
- By prioritising embodied carbon from the outset, designers and architects can make more informed decisions about the materials and construction methods used in a building, resulting in a lower embodied carbon footprint.
- Green building rating systems should give greater weightage to embodied energy/carbon intensity. Currently, many green building rating systems focus primarily on operational carbon emissions, such as those from heating and cooling systems. This would incentivise builders, designers, and architects to prioritise embodied carbon reduction in their projects.

Prasad Vaidya

- Transparency in the disclosure of environmental product declarations (EPDs) for building materials is crucial in informing consumers of buildings' embodied carbon and overall environmental impact.
 - The Council of Architecture should consider revising their B.Arch syllabus to include education on the causal relationship between climate change and building design, construction, and operation, including embodied energy and carbon. This will ensure that future architects have the knowledge and skills necessary to create sustainable buildings that minimise environmental impact.
 - The development and promoting directories of green building materials that report the embodied energy and carbon of products, such as those being prepared by BEE and TERI/ GRIHA, can help consumers make more sustainable choices. By providing transparent and accessible information about the environmental impact of building materials, these directories can facilitate the transition towards more sustainable construction practices.
-

Gurneet Singh

- To speed up the adoption of low-carbon building materials, developing incentive structures that appeal to consumers is important. This can help create demand for low-carbon materials, which in turn can encourage manufacturers to produce them at scale.
- The government can play a pivotal role in promoting low-carbon materials in building and infrastructure projects. This can be achieved by setting minimum limits for the mandatory use of low-carbon cement and other materials in government-led projects. The private sector can also be encouraged to adopt low carbon materials by setting targets.
- Procurement policies can encourage the adoption of low-carbon materials in building and infrastructure projects. For instance, directives can be proposed to procure low-carbon cement for government-led projects.

Noteworthy questions/comments from the audience

- What is the general opinion among the builder fraternity on reducing carbon footprint in buildings and the construction sector, both embodied and operational carbon?
- What could be the enabling measures that would influence strategic investments in low-carbon construction?

Key Takeaways of the session

- It is important to define a baseline for embodied energy/carbon intensity for different building types. This will help in identifying the energy/carbon intensive components of different types of buildings and will facilitate in setting targets to reduce the carbon footprint of new buildings. Building professionals can use this baseline as a benchmark to compare the energy/carbon intensity of their building projects.
- The government can be crucial in promoting low-carbon alternate cement by drafting appropriate procurement guidelines for upcoming projects. This will create a demand for low-carbon cement in the market, encouraging cement manufacturers to produce such products. This will also help in reducing the embodied carbon of new buildings and, ultimately, contribute to achieving the climate change goals.
- It is important to publicly declare data about Environmental Product Declarations (EPDs) of building materials like cement and steel. This will help consumers to make informed decisions about the materials they use for their buildings. Consumers must be made aware of the embodied carbon that goes into the building materials they use, and this can be achieved through public disclosure of EPD data. This will also encourage manufacturers to produce more sustainable and low-carbon building materials, as there will be a demand for such products in the market.

Session Video Link:

<https://www.youtube.com/watch?v=abOJjpfVrQ>

15:45 - 16:45 Industry Session 5 – Scaling up Financing for Energy-Efficient Products using Independent Measurement and Verification Powered by Eurovent

Session Brief

According to studies and research conducted by IEA and McKinsey, floor area in the buildings sector worldwide is expected to increase 75% between 2020 and 2050, of which 80% would be in emerging markets and developing economies. In this regard, India is uniquely placed, with three-quarters of the buildings, infrastructure and industrial capacity of India in 2050 yet to be built. Despite this demand growth the total CO2 emissions from the buildings sector need to decline by more than 95% by 2050. This would translate to more than 85% of buildings complying with zero-carbon-ready building energy codes by 2050. In addition, HVAC energy use constitutes the largest single category of building energy load. Under this scenario, an efficient airside in the HVAC sector becomes ever-more important to ensure meeting these net-zero requirements while maintaining a high level of IAQ.

Session Moderator & Speaker(s)

Moderator:

- **Dr Satish Kumar**, President and Executive Director, AEEE

Panelists I:

- **Prof. Jyotirmay Mathur**, Professor, Centre for Energy and Environment, MNIT Jaipur

Panelists II:

- **Prof. Vishal Garg**, University Chair Professor and Director, Indorama Ventures Center for Clean Energy

Panelists III:

- **Devraj Singh**, MD, FLAKT GROUP INDIA

Panelists IV:

- **PK Goel**, Industry and Technical Advisor, Eurovent Certita Certification

Panel Discussion

Prof. Jyotirmay Mathur

The demand for certification is a market push-pull game”

- Product certification is required to test the reliability and performance of a product. Otherwise, consumers have to rely on the claims made by manufacturers about their respective products.
- In addition to product certification, it is essential to consider professional certification. This includes design certification for design professionals and certification for professionals working on the installation.
- While there is a scope for a 0.5 to 0.6 improvement in efficiency on the chiller side when looking at the entire system, there is a scope for a 0.9 to 1 improvement in efficiency. This showcases that the air side is as important as the chiller. Ironically, many standards are available for the airside unit, but very few certified products are available in the Indian market.

Dr Vishal Garg

“The need is to focus on IAQ (Indoor Air Quality) not just Energy Efficiency.”

- IAQ has a variety of parameters which include not only temperature and humidity but also parameters such as operating temperature, CO2 level, and bacterial presence in the environment. These parameters can be measured by third-party certification.
- While conducting certification, it is customary to carry out product certification, whereas the need is to shift towards operational certification.
- Virtual sensors are the latest technological intervention. Instead of using physical sensors, a site simulation is performed to calculate the values, and based on these values, the site is operated remotely.

Dr Vishal Garg

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PK Goel

“The focus should be on existing buildings with superior performance.”

- The focus should be on reliable, energy-efficient equipment, and third-party certification can provide the necessary product certification to ensure reliability.
- While professionals have the necessary skills to calculate a building's performance during the design stage, there is a lack of such professionals during the execution phase.
- Energy performance contracting is becoming more relevant in the international market, where a company provides certified equipment that guarantees performance when operating in buildings.

Mr Devraj Singh

“The 3rd party certification can build trust between a supplier and manufacturers.”

- A major game-changer would be a PLI scheme for HVAC manufacturers in alliance with a third-party certifying body that can provide confidence to buyers.
 - In the European market, over 80% of products are certified. If a product is manufactured in India to export, it must comply with international certifications and standards.
 - Third-party certifications help build trust between suppliers and manufacturers. Nowadays, an exported product must comply with third-party certifications and other independent certifications to access its respective market internationally.
-

Noteworthy questions/comments from the audience

How can 3rd-party certification play a role in bridging the gap of actual performance vis-à-vis claimed energy performance of the HVAC appliances?

There is no shortage of professionals with the necessary skillset to calculate a building's intended performance during the design phase. However, during the execution phase, there is a lack of professionals who can accurately define the kilowatt-hour consumption per square meter per year. To attain this level of competence, rather than examining the entire building system, we should concentrate on the energy efficiency of dependable equipment. This is where third-party certification comes in, providing reliable equipment with product certification.

Most of the buildings in India are design-certified rather than certified based on actual performance. India must bridge this gap to become net-zero. While it will take time, India should focus on these aspects and also work on people certification to create energy-rated buildings similar to those in the US. The construction of significant infrastructure in India is yet to come, making this even more crucial.

Can we sell an internationally certified product in the Indian market?

Yes! Many products are internationally certified and sold in the Indian market; a suggestion is to conduct a pilot demonstration program before selling in the Indian market.

Key Takeaways of the session

- Product certification is crucial for ensuring the reliability and performance of a product. Without it, consumers are left to rely solely on the claims made by manufacturers, which may not always be accurate or trustworthy.
- In addition to product certification, it is important to consider professional certification when selecting products related to HVAC systems. This includes certifications for both designing professionals and professionals responsible for installation. Ensuring these individuals are properly certified can help ensure that the system is installed correctly and operates as intended.
- The airside unit is just as important as the chiller side in HVAC systems, yet few certified products are available in the Indian market. This highlights the need for increased focus on certifying airside units to ensure their quality and reliability. When selecting HVAC products, it is important to consider both the chiller and airside units and seek certified products.

Way forward

- The focus should be on the quality of products. Only when consumers have faith in the quality will there be demand for third-party certification.
- To achieve India's commitment to net-zero emissions, it is necessary to break down targets into smaller goals and ensure energy efficiency in each one.
- Airside represents a significant portion of a building's energy consumption and requires multiple certifications, with third-party certification playing a significant role.
- It is time to shift codes and standards from design efficiency to performance efficiency.
- The demand for clean air exists, and people are purchasing air purifiers. Therefore, certification is critical, not only for components or products but also for performance and controller certification.

Session Video Link:

https://www.youtube.com/watch?v=Olm_YRlhmpU

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EVENT GALLERY

FEED DAY 1



Figure 1: Opening - Welcome Address by Chirag Bajjal, Chairman, AEEE



Figure 2: Keynote Address by Dr Ajay Mathur, Director General, International Solar Alliance (ISA)



Figure 3: Fireside Chat on Investments and Financing required for India to Achieve Decarbonisation Goals with Rajat Gupta, Senior Partner, McKinsey & Company



Figure 4: Executive Dialogue 1 – Ensuring a Sustainable Cold Chain by India@100 Powered by Danfoss Industries



Figure 5: Executive Dialogue 2 – Facilitating Green Finance in Energy Efficiency through Public-Private Financing



Figure 6: Industry Session 1 – Energy Efficiency from the Boiler-Room to the Boardroom Powered by CLASP



Figure 7: Industry Session 2 – Making Sustainability a Reality: HVAC solutions Powered by Carrier

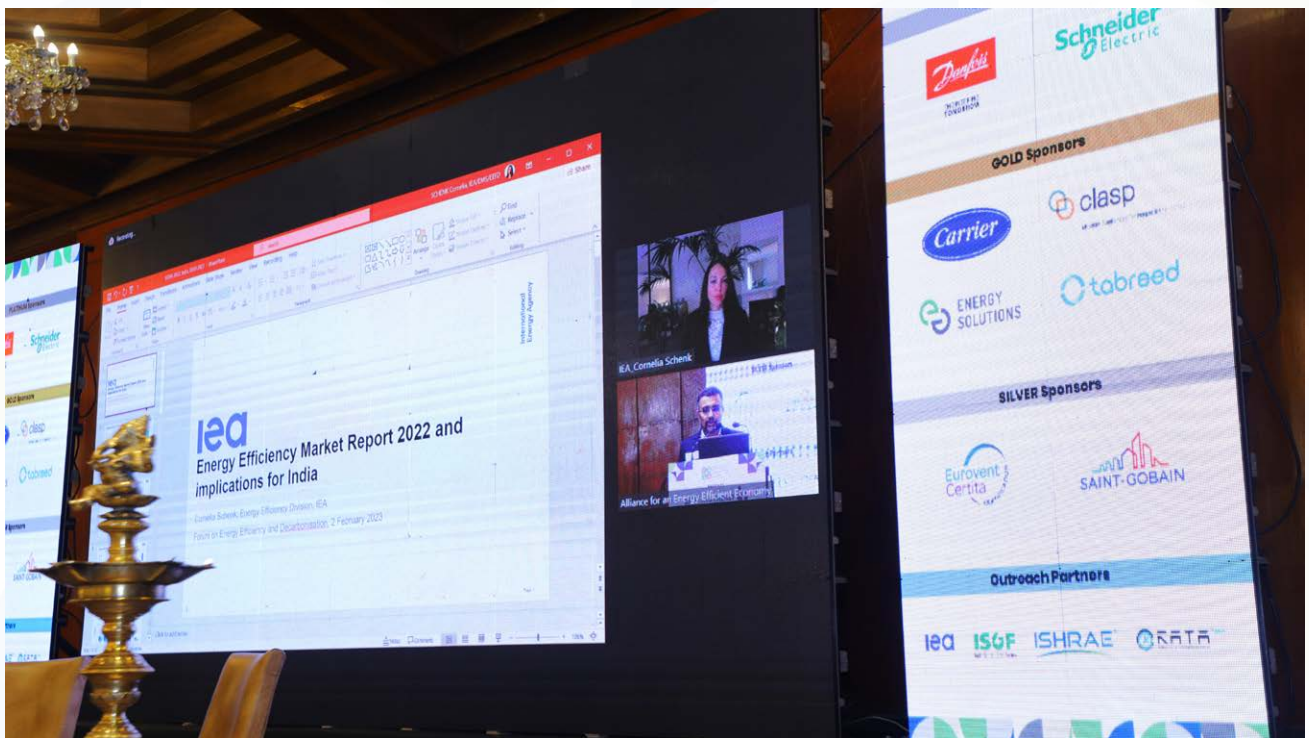


Figure 8: Energy Efficiency Market Trends and Implications for India, a presentation by International Energy Agency (IEA)

FEED DAY 2



Figure 9: Industry Session 3 – Market Transformation at the Sub-national Level: The Cases from California Powered by Energy Solutions



Figure 10: Industry Session 4 – Decarbonizing India's Cooling Sector through Adoption of District Cooling and other Cooling Technologies Powered by TABREED India



Figure 11: Executive Dialogue 3 – E-mobility Landscape: A Strategy to Decarbonise the Road Transport Sector



Figure 12: Executive Dialogue 4 – Creating 10GW market for Demand Flexibility by 2030



Figure 13: Structured Presentation: AAI's Efforts to Benchmark Energy Consumption and Enhance Energy Efficiency at Airports



Figure 14: Executive Dialogue 5 – Intensifying Private Sector Climate Action through Datadriven Enterprise-level Energy Management Powered by Schneider



Figure 15: Executive Dialogue 6 – Advancing Construction Sector- Decarbonising through Alternate Materials and Demand Optimisation Techniques



Figure 16: Industry Session 5 – Scaling up Financing for Energy-Efficient Products using Independent Measurement and Verification Powered by Eurovent



Figure 16: FEED Registration Desk



Figure 17: FEED 2023



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