

ASPIRE Programme

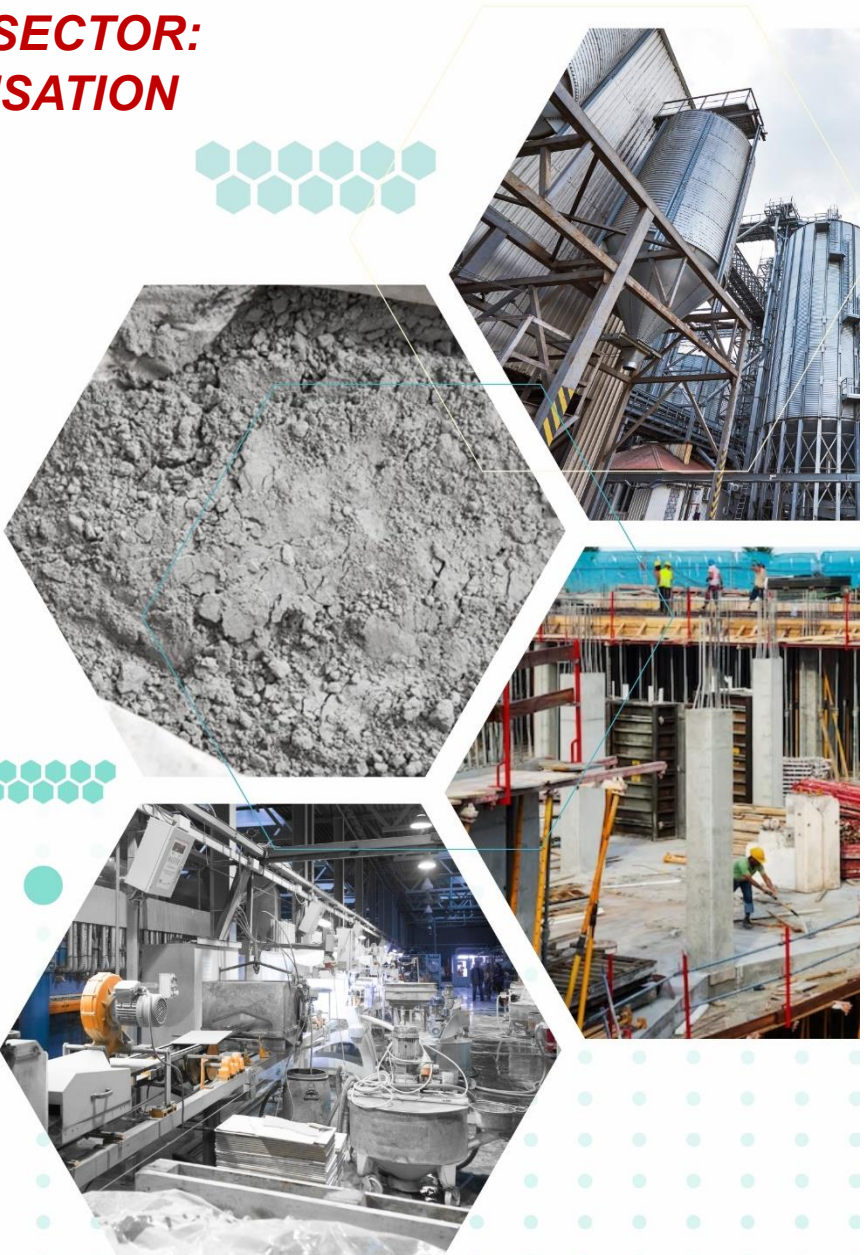
Accelerating Smart Power & Renewable Energy in India

SECTORAL WORKSHOP & STUDY TOUR ON **BEST PRACTICES IN ENERGY EFFICIENCY IN CEMENT SECTOR: A PATH FOR DECARBONISATION**

WORKSHOP: **14 March 2023**
(09:00 – 17:30 IST /
03:30 – 12:00 GMT)

STUDY TOUR: **15 March 2023**
(09:00 – 13:00 IST /
03:30 – 07:30 GMT)

Supported by:
**Udaipur Cement
Works Limited,**
Udaipur, Rajasthan



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1. Background on ASPIRE Programme

India has continued to demonstrate climate leadership and a firm commitment for achieving the clean energy transition. At the COP27 in Egypt, India submitted its Long-Term Low Emissions Growth Strategy indicating low carbon transition pathways in key economic sectors. Earlier, at COP26 in Glasgow, the Prime Minister of India announced the five nectar elements or 'Panchamrit' of India's climate action to achieve net-zero target by 2070. Further, in August 2022, India updated its Nationally Determined Contributions and has embarked on far-reaching new initiatives in renewable energy, e-mobility, ethanol blended fuels, and green hydrogen as an alternate energy source. These targets shall help India reduce its total projected carbon emissions by 1 billion tonnes and lower its emissions intensity by 45% by 2020 (over 2005 levels).

As part of the '*3rd India – UK Energy for Growth Partnership*', an inter-ministerial energy dialogue was held on 8th October 2021 to strengthen collaboration on accelerating the move to global clean energy in the decade ahead. During this, the ministers endorsed '*Roadmap 2030 for India-UK Forward Action Plan*' on clean energy, improving energy efficiency measures, enabling use of green hydrogen, and increasing the switch to electric mobility. One of the actions under the *Forward Action Plan* was to launch the India-UK bilateral programme on Smart Power and Renewable Energy, titled '*Accelerating Smart Power and Renewable Energy in India*' programme (**ASPIRE**). ASPIRE is being implemented by the Foreign Commonwealth and Development Office, Government of UK in association with Ministry of Power and Ministry of New and Renewable Energy, Government of India. KPMG is the lead delivery partner for the ASPIRE programme. Idam Infrastructure Advisory Private Limited (India) and Carbon Trust (UK) are the key consortium members.

One of the thematic areas of ASPIRE is **industrial energy efficiency and decarbonisation (IEED)** with the objective of catalysing increased investment in IEED in India. The programme aims to catalyse increased investment that supports sustained & inclusive economic growth, low carbon and leads to poverty reduction including through the promotion and empowerment of women and other socially weaker groups.

2. Rejuvenation of Knowledge Exchange Platform (KEP)

Under the ASPIRE programme, a rejuvenated Knowledge Exchange Platform (KEP) titled “iDEEKSHA (Industrial Decarbonization and Energy Efficiency Knowledge Sharing Platform)” has been developed in collaboration with the Bureau of Energy Efficiency (BEE). The iDeeksha platform was launched by Shri R.K. Singh, Hon’ble Cabinet Minister for Power, New and Renewable Energy, during the 21st Foundation Day Event of BEE on March 1, 2023 in Delhi.

The iDeeksha platform is a one-stop shop for all energy efficiency needs of large industries covered under BEE's PAT Scheme and would facilitate promotion & sharing of best practices and energy-efficient technologies among large-scale industries. The iDeeksha platform includes new features to facilitate Designated Consumers (DCs) in adopting new and emerging IEED technologies offered by Indian and global technology suppliers.

The iDeeksha platform would comprise database of proven and emerging technologies available in India and globally. Further, the database would also provide details of technology suppliers and financial institutions, updated at regularly intervals.

The iDeeksha platform would thus facilitate:

- Exchange of knowledge and information to enhance peer to peer learning
- Exchange of energy management best practices across sectors
- Access to IEED tools, technologies & technology providers available in India and globally
- Access to data sources and knowledge repositories to support knowledge translation
- Organise sector/ industry specific workshops/ seminars to enhance EE measures
- Enable knowledge and commercial partnerships

3. Cement Sector in India¹

India is the second largest producer of cement in the world, with an installed capacity of **500+** million metric tons per annum (MTPA), i.e., **7+**% of the global installed capacity. In 2022, India produced **370+** million metric tons (MT) of cement (~**9%** of global production). Demand for cement in India is estimated to touch ~**420 MT** by FY 2027 and the industry promises huge potential for growth as India has a high quantity and quality of limestone deposits through-out the country. Cement production in India grew at a CAGR of ~**6%** between FY2016-22, driven by demands in roads, urban infrastructure and commercial real estate. Private sector companies account for ~**98%** of India's total cement production capacity. The cement industry accounts for ~**8%** of the **total national emissions in India**, making it critical to decarbonise the sector to aid in achieving India's goal of **net-zero by 2070**. As per the Energy Conservation Act, 2001, a cement plant with an annual consumption of over 30,000 MT of oil equivalent (MTOE) is notified as a designated consumer (DC). Out of the 206 large cement plants, 175 plants/ DCs, accounting for **65%** (~**325 MTPA**) of India's total cement production capacity, are covered under The Perform Achieve Trade (PAT) scheme of Bureau of Energy Efficiency (BEE). Majority of the DCs from the states of Rajasthan, Andhra Pradesh, Tamil Nadu, Telangana, and Madhya Pradesh have already been notified under PAT.

The energy efficiency and decarbonization potential of the cement sector under the PAT scheme are presented in Table 1 below.

Table 1: Energy efficiency & decarbonization potential of Cement sector under PAT Scheme (Cycle I to VI)

Total Number of notified DCs	Energy Efficiency Potential (MTOE)	Decarbonization Potential (MTCO ₂)
175	2.12	7.24

Cement manufacturing processes is generally categorised into two types - wet process and dry process. The wet process type involves mixing the raw materials with water to provide better homogeneity, which improves the quality of the clinker. The slurry's moisture content during the entire process ranges from 35 to 50%. This causes a greater need for heat, which in turn necessitates a large amount of fuel. As a result, this process uses greater thermal energy in terms of energy consumption. When using a dry process, heat from the raw mill is used to keep the raw materials dry, which causes poor homogeneity and lower-quality clinker. The slurry's moisture content is 12% throughout the entire operation. Thus, lower fuel consumption to produce the same quantity of heat. As a result, this procedure uses less thermal energy in terms of energy consumption.

Indian cement manufacturers are amongst the top performing global cement manufacturers in terms of production facilities, technology, and energy efficiency. The specific energy consumption of Indian cement manufacturers stands at **670 kcal/kg of clinker** and **~68 kWh per tonne** (t) of cement, which is at par with global standards. Further, the current clinker factor of cement plants in India stands at **0.77** i.e., 770 kg of clinker required to produce 1t of cement with the addition of additives. The Indian cement sector aims to reduce the clinker factor by **~17%** to **0.64** by the end of **2030** which would enable reduction in CO₂ emissions. According to the Reserve Bank of India (RBI)², India's domestic cement industry would require an investment of INR 2.4 - 4.1 Lakh Crores (GBP 24-41 billion) to achieve the target of **0.35 tCO₂/t of cement by 2050**. Between 1996 and 2017, the cement industry achieved **~36% reduction in CO₂ emission** levels from 1.12 tCO₂/t to 0.719 tCO₂/t of cement produced.

² Source: <https://india.mongabay.com/2022/04/rbi-recommends-technology-for-indias-cement-industry-to-reduce-carbon-emissions/>

4. Decarbonisation of Indian Cement Industry

Cement is one of the most important building materials, but it also contributes significantly to climate change, accounting for **6% to 9% of global CO₂ emissions**. The goal of the 2016 Paris Agreement was to limit the rise in global temperature to 2°C or less. To accomplish this goal, global CO₂ emissions must decrease by 80% to 90% by 2050.

The cement industry in India is in the process of preparing a roadmap for reducing its emission intensity and carbon dioxide emissions by 2030, in line with India's sustainability commitments. Leading cement industries in India have announced several initiatives as part of their decarbonisation commitments. Some of the initiatives/ commitments announced by leading cement industries in India to decarbonise its operations and to enhancing energy efficiency are discussed below:

- Dalmia Cement – signed an MoU with Carbon Clean Solution Limited (CCSL), UK to build the cement industry's largest carbon capture plant, to support India's commitment to achieving net-zero emissions by 2070. Dalmia Cement is committed to becoming a carbon-negative cement group by 2040. It has also launched an e-truck initiative in India.
- ACC Cement – launched 'ECOPact', a ready-to-use green concrete mix that involves 30-50% lower embodied carbon content as compared to conventional Ordinary Portland Cement. In 2021, ACC Limited, announced 2030 carbon emission reduction targets committing to reduce its CO₂ intensity in cement operations from "511 kg in 2018 to 409 kg CO₂ per ton of cementitious material by 2030". It signed the "Business Ambition for 1.5°C pledge and joined the 'Race to Zero' campaign of the United Nations Framework Convention on Climate Change (UNFCCC)".

In addition to the above, cement industries in India have adopted the following key operational best practices and technologies as part of their IEED measures:

- Waste Heat Recovery from pre-heater outlet
- Adopting Renewable Energy
- Calcium looping as Carbon Capture technology
- Installation of Kiln Shell radiation recovery system in Kiln for CPP makes up the water heating
- Reduction of Clinker Factor in Pozzolana Portland Cement

5. Potential technology interventions for enhancing energy efficiency/ decarbonisation in Indian Cement Sector

Some of the potential areas for technology intervention in the Indian cement sector to reduce carbon intensity & facilitate a rapid transition to net-zero have been identified below:

- Increase in usage of alternate fuels (AF) from 2% to 10%
- Fuel switching or electrification of cement kiln operation (e.g., plasma burners), hydrogen/ biomass)
- Deployment of new-age technologies such as carbon capture and sequestration (CCS)
- Waste heat recovery from cooler and preheater outlet (especially at low temperatures of ~ 80 - 90°C)
- Adoption of vertical roller mill for grinding
- Installation of Kiln Shell radiation recovery system
- Reduction in clinker factor in Pozollana Portland Cement
- Cooler Hot Air Recirculation (HAR) to increase Waste Heat Power
- Installation of Vortex rectifier in Mill
- Reprocessing and reuse of construction and demolition waste
- Identifying and optimizing the use of sustainable Supplementary Cementitious Materials
- Installation of Soft Starter and Squirrel Cage Induction Motor (SQIM) in place of Slip ring Motor with Electrolytic starter (Liquid Resistance Starter (LRS))

Leverage UK Cement Sector's strengths and capabilities

The cement sector contributes GBP ~1 billion to the UK economy each year. About 10 million tonnes of Portland cement (90% of the cement market in the UK), are produced annually at 12 production facilities across the UK including two grinding, and two blending facilities. UK's cement sector offers some key technologies, solutions, and best practices in the areas of:

- Carbon, Capture and Storage
- Low energy drying technology
- Novel low carbon cement raw materials
- IT & IoT based digital technologies/ solutions

Strengths and capabilities of UK cement sector can be leveraged to facilitate rapid transition of Indian cement sectors' journey to net-zero, through adoption of best practices, technologies, and solutions. In order to facilitate access to leading best practices and technologies of UK cement sector, some key UK organisations such as **Carbon Clean, Coomtech, Carbon Upcycling, Concerete4change, CarbonRE, Centrica**, are participating in the below mentioned sectoral workshop on **14th March 2023**.

6. Cement Sectoral Workshop

A one-day workshop on “**Best Practices in Energy Efficiency in Cement Sector: A Path for Decarbonisation**” is being organised on **14th March 2023** at **Radisson Hotel, Udaipur, Rajasthan**. The workshop will cover various aspects of the cement sector such as the PAT scheme, best practices and new & emerging low-carbon technologies to enhance industrial energy efficiency and decarbonisation (IEED) measures. The workshop is designed to provide national and international organisations with a platform to present their best practices and technologies in the above areas. The workshop would provide an opportunity for stakeholders to understand the cement sector in India and connect with key stakeholders for potential partnerships. The workshop would thus enable in capacity building of cement sector stakeholders.

ASPIRE programme promotes gender equality, and the sectoral workshop is expected to deliver GESI (Gender Equality and Social Inclusion) through the participation of women and stakeholders from marginalised groups from large energy-intensive industries.

The detailed agenda for the cement sectoral workshop has been provided in [Annexure](#).

7. Study Tour of Udaipur Cement Works Limited (UCWL), Rajasthan



A study tour/ visit of Udaipur Cement Works Limited (UCWL), has been planned on 15th March 2023. UCWL is a subsidiary company of JK Lakshmi Cement Limited that embodies the legacy and prestige of its parent organization, JK Organisation. Situated in the beautiful city of Lakes, Udaipur (Rajasthan), the company operates an integrated Cement Manufacturing unit with an installed production capacity of **2.2** million tons per annum (MTPA) and has ingrained "Sustainable Development" as a key ethos in its daily business activities, led by its Integrated Sustainable Development Policy. UCWL meets more than **48%** of its total electricity requirement from **green renewable sources**, i.e., solar and waste heat recovery systems (WHRS). UCWL has installed the first-ever **floating solar plant** in the cement industry, with a capacity of **1 MW** by utilising an abandoned pit in mines area. This innovative solution sets a new standard for sustainable energy practices in the cement sector and UCWL's commitment to reducing its carbon footprint and leading the charge toward a more sustainable future. The total installed capacity of solar power at UCWL is **15.45 MW** including the floating solar plant. During the last 2 fiscal years i.e., FY 2020-21 and FY 2021-22, UCWL has consumed more than 100 GWh of green energy that has mitigated around 85,000 tons of CO₂ emissions, equivalent to 34 Lakh trees.



The UCWL has taken several initiatives to conserve energy, including the design of an operational philosophy that maximizes the utilization of solar power across various units of the plant and an AI-based "Advanced Process Control Suite" for kiln & mills optimization, to optimize energy consumption by improving production efficiency and predictive quality analysis system for limestone piles. Furthermore, the company aims to achieve **net-zero emissions by 2040**.

The study tour/ visit of the plant would foster dialogue and knowledge exchange among diverse industry players and developing an understanding of AI-based optimization. The study tour would offer participants an opportunity to learn about cutting-edge sustainable development initiatives implemented by Udaipur Cement Works Limited (UCWL) as well as the best IEED technology and procedures currently adopted by the plant. This study tour/ plant visit would enable in sharing of best practices and technologies between industries and ensure an ambitious, mutually beneficial and outcome-focused relationship.

Annexure – Agenda for Cement Sectoral Workshop

Theme: Best Practices in Energy Efficiency in Cement Sector: A path for decarbonisation

Date: Tuesday, 14 March 2023

Time: 09:00 – 17:30 IST / 03:30 – 12:00 GMT

Venue: Radisson Limited, Udaipur, Rajasthan, India

Time (IST)	Name of Session	Presenter
Inaugural Session		
08:45 - 09:20	Registration	
09:30 – 09:35	Lighting of Lamp	
09:35 – 09:40	Welcome Address	Mr. Anurag Singh Sirola, Manager, KPMG (ASPIRE Team)
09:40 – 09:50	Introduction of ASPIRE Programme	Ms. Radhika Tomar, Head - Energy Sector Reform, British High Commission
09:45 – 09:50	Brief overview of industrial energy efficiency (IEE) theme of ASPIRE Programme	Mr. Balawant Joshi, MD, Idam Infra (ASPIRE Team)
09:50 – 10:00	Special Address by BEE	Mr. Sunil K. Khandare, Director, BEE*
10:00 – 10:15	Inaugural Address by the Chief Guest	Mr. Naveen Kumar Sharma, Whole Time Director, Udaipur Cement Works Ltd. (UCWL)
10:15 – 10:20	Vote of Thanks	Mr. K. K. Chakarvarti, Sr. Advisor, IDEEKSHA (ASPIRE Team)
10:20 – 10:30	Group Photograph	
10:30 – 10:45	Tea Break and Networking	
Technical Session I: Perform Achieve and Trade Scheme for Cement Sector		
10:45 – 10:50	Moderator	Mr. Rajiv Shukla, Executive Director, Idam Infra (ASPIRE Team)
10:50 – 11:05	Perform Achieve and Trade (PAT) Scheme for the Cement Sector	Mr. Vivek Negi, Joint Director, BEE
11:05 – 11:15	Q&A	
Technical Session II: Sharing of best practices by Indian Cement Units		
11:15 – 11:20	Moderator	Mr. K. K. Chakarvarti, Sr. Advisor, IDEEKSHA (ASPIRE Team)
11:20 – 11:35	'Journey towards net-zero emissions' of Udaipur Cement Works Limited (UCWL)	Mr. Vikas Garg, Manager, Mr. Ronit Anil Singh, Asst. Manager, Mr. Nitin Jangid, Asst. Manager and Ms. Shikha Trivedi, Asst. Manager
11:35 – 11:50	Energy & Carbon Efficiency	Aditya Cement, UltraTech Cement, Chittorgarh, Rajasthan
11:50 – 12:05	Innovative methods/ practices to enhance energy efficiency (EE) and increasing productivity in cement plants	Mr. Rajnikant Manawat, Process Expert Services
12:05– 12:20	Presentation by Vikram Cement, a unit of Ultratech Cement	Representative(s) of Vikram Cement, Ultratech Cement

Time (IST)	Name of Session	Presenter
12:20 – 12:35	Best practices in energy efficiency in cement grinding units	Mr. Chandan Kumar Parasar, Manager-Production, Orient Cement
12:35 – 12:50	Best Practices to reduce Energy consumption & GHG emissions.	Mr. Neerav Panchal, Mr. Pankaj Tiwari, Mr. Tikam Chand, Mr. Manoj Ubana J.K. Lakshmi Cement Ltd. Sirohi,
12:50 – 13:10	Q&A	
13:10 – 14:00	Lunch Break and Networking	
Technical Session III: Low Carbon & Digital Technologies for Cement Sector – by UK Technology Suppliers		
14:00 – 14:05	Moderator	Mr. Iain Meager, Associate Director, Carbon Trust (ASPIRE Team) *
14:05 – 14:20	Unlocking the Next Frontier of Circular Materials: CUT-Pozz CO ₂ -enhanced SCMs	Mr. Aaron Lucid, Development and Partnership Manager, Carbon Upcycling, UK*
14:20 – 14:35	Carbon Capture Technology application for Cement Sector to achieve net-zero	Mr. Niraj Singh, Carbon Clean, UK
14:35 – 14:50	Low energy drying for cement and mineral products	Mr. Chris Every, Chief Commercial Officer and Founder, Coomtech, UK*
14:50 – 15:05	Improve operating margins & drive sustainability with Centrica's IoT 4.0 real-time machine-level energy management solution	Mr. Anand, Authorised Partner of Centrica, UK
15:05 – 15:20	Delta Zero Cement, IoT/AI based platform for cement production	Mr. Daniel Summerbell, Chief Solutions Officer and Co-founder, CarbonRE, Delta Zero Cement, UK*
15:20 – 15:35	Concrete4Change – developing novel technology for carbon sequestration within concrete, helping concrete manufacturers achieve net-zero	Mr. Dalraj Nijjar, Co-founder and Chief Commercial Officer, Concrete4change, UK*
15:35 – 15:50	Q&A	
15:50 – 16:00	Tea Break and Networking	
Technical Session IV: Sharing of EE best practices & technologies by Indian Technology Suppliers		
16:00 – 16:15	Innovative and sustainable technology for Cement Sector	Mr. Madhusudan, IKN India
16:15 – 16:30	Energy saving initiatives & methods for reducing carbon footprint in cement plants	Mr. Ketan Goel, Sr. Manager, Invotech Industrial Solutions Private Limited
16:30 – 16:45	Low pressure compressors for energy efficiency in bulker unloading/ flyash conveying process	Mr. Jayraj Thakar, Kaishan Machinery India Pvt. Ltd.
16:45 – 17:00	Q&A	
Discussions, Feedback and Concluding Remarks		
17:00 – 17:30	Mr. Naveen Kumar Sharma, Whole Time Director, Udaipur Cement Works Ltd. Mr. Vivek Negi, Joint Director, BEE Mr. Balawant Joshi, MD, Idam Infra, ASPIRE Team Mr. K. K. Chakarvarti, Senior Advisor, Idam Infra (ASPIRE Team) Mr. Anurag Singh Sirola, Manager, KPMG (ASPIRE Team)	
17:30 Onwards	Tea and Networking	

*Virtual presentation