SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

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Inside...

Promoting Energy Efficiency in SMEs

SAMEEEKSHA

VISION

SAMEEEKSHA envisages a robust and competitive SME sector built on strong foundations of knowledge and capabilities in the development, application, and promotion of energy-efficient and environment-friendly technologies.

Bureau of Energy Efficiency | SHAKTI SUSTAINABLE ENERGY FOUNDATION | The Energy and Resources Institute | MSME

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

IN THIS ISSUE. . .

The theme of this issue is an innovative model for bilateral technology cooperation titled 'Japan-India Technology Matchmaking Platform' (JITMAP), which has been designed and implemented by Institute for Global Environmental Strategies (IGES), Japan in partnership with TERI to facilitate the transfer of low carbon technologies (LCTs) and best practices from Japan to India.

The theme article describes how, during 2010–14, IGES and TERI developed and successfully implemented a research partnership for application of LCTs under the Japanese grant program titled 'Science and Technology Research Partnership for Sustainable Development (SATREP)'. The key elements of this project were technology and engineering analyses, accompanied by in-field feasibility studies and technology demonstrations of Japanese LCTs with the direct involvement of the businesses (i.e. Japanese LCT suppliers and Indian SME recipients). Drawing on the experiences and insights provided by the project, IGES and TERI designed and launched a multi-stakeholder platform called JITMAP in 2016 to promote engagement and matchmaking of Japanese and Indian stakeholders. JITMAP works in close coordination with a number of relevant public and private sector agencies and organizations in both India and Japan to help bridge the knowledge gaps that act as barriers to direct (B2B) transactions between the Japanese technology providers and Indian end-users. As outlined in the article, JITMAP has made steady progress in facilitating the adoption of Japanese LCTs and best practices by a number of Indian industrial end-users through its campaign of overcoming knowledge barriers, providing R&D and capacity building support for both LCT suppliers and end-users, and policy-level engagements.

The issue also carries a summary of the salient points from a webinar held on 8th February 2022 to discuss the outcomes, lessons learned, and way forward of JITMAP. More information of the platform's activities can be obtained by visiting the JITMAP website https://jitmap.org/.

SAMEEEKSHA Secretariat

JITMAP: A MODEL FRAMEWORK FOR TRANSFERRING LOW CARBON TECHNOLOGIES FROM JAPAN TO INDIA

For the world to succeed in its efforts to combat global climate change, it is vital to enable the transfer of advanced environment-friendly technologies from developed countries to less-developed countries, and to mobilize the necessary finances to support this technology transfer (TT) process. The UN Climate Technology Centre and Network (CTCN) has been established specifically to facilitate TT, and it is encouraging that a number of developed countries including Germany, Japan, Korea, Spain and the US have pledged their financial support to the CTCN during the Conference of Parties (COP26) held in Glasgow in November 2021.[1]

This article is a brief account of the activities, experiences and achievements under an innovative TT model titled 'Japan-India Technology Matchmaking Platform' (JITMAP), which has been designed and implemented by two partner agencies—Institute for Global Environmental Strategies (IGES), Japan and TERI, India—to facilitate the transfer of energy-efficient, environment-friendly technologies from Japan to India.

Foundation

Both Japan and India rely largely on imported oil and natural gas for energy, and hence share the same concerns in regard to energy security. As one of the most advanced nations in the world, Japan has achieved the highest standards for energy and resources efficiency in every sector of its economy, through innovative collaborations between its industry, academia and government. Also, Japanese companies are globally renowned for their expertise in manufacturing energy-efficient low carbon technologies (LCTs) and other cutting-edge products. In India, where energy demands are growing by leaps and bounds to match its rapid and ongoing economic development, there is enormous need and potential to conserve energy through the transfer and adoption of such LCTs—particularly in the Indian industrial sector, which currently accounts for over 50% of the total commercial energy consumption and contributes over 45% of total energy-related carbon emissions.

Clearly, both Japan and India stand to gain huge economic and environmental benefits by promoting Japanese LCTs among Indian industries on a large scale. Recognizing this potential, the Government of Japan along with the Ministry of Environment and Forests, Government of India, launched a four-year project (2010–2014) titled 'Research Partnership for the Application of Low Carbon Technology for Sustainable Development', under which IGES and TERI developed and implemented an innovative 'pilot Technology Transfer (TT)' project during 2013–14. The project was funded by Japan Science and Technology Agency (JST) and Japan International Cooperation Agency (JICA) under the Japanese government program titled 'Science and Technology Research Partnership for Sustainable Development' (SATREP). The key elements of the pilot TT project were technology and engineering analyses, accompanied by in-field feasibility studies, pilot demonstrations of Japanese LCTs, and impact measurements of the application of the technologies with the direct involvement of the businesses concerned (i.e., the Japanese LCT suppliers and Indian end-users).

The project studied the LCTs available with leading Japanese companies like Panasonic Corporation, Osaka Gas Co. Ltd., Hitachi Industrial Equipment Systems Co., Ltd., Yanmar Energy System Co., Ltd., Mayekawa Mfg. Co. Ltd., etc., with the focus on identifying 'leapfrog' and 'cross-cutting' LCTs that find use in different kinds of industries/processes (and thereby offer wider replication potential). The LCTs were further assessed based on their emission reduction and energy saving potentials; the availability, if at all, of similar technology in India; the interests of Indian end-users and of the Japanese firms concerned; and the overall costs. Based on the analyses, the project selected four LCTs for implementation as depicted in Figures 1,2,3. Two were 'hard' technologies that included equipment; the remaining two were 'soft' technologies, comprising only knowledge elements such as best operating practices (BOP). Based on its studies, field visits and interactions with industry and policy-level stakeholders, the project identified four sites for demonstration of the two 'hard' LCTs (table 1).

Table 1. Selected LCTs and achievements

LCT		Demonstrated application	Achievements
Hard	Gas heat pump (GHP)	Space cooling (air-conditioning) in investment casting foundry	Energy saving of 31–50%
	Electric heat pump (EHP)	Cooling and heating of water in dairy plants	Reduction in CO_2 emissions by 40–50%.

[1] https://www.energylivenews.com/2021/11/10/cop26-nations-pledge-finance-to-boost-green-tech-in-developing-countries/

LCT		Demonstrated application	Achievements
Soft	BOP in electric induction furnace	Foundry industry	Energy saving of 7–13%
	Compressed air system optimization	Cross-cutting across industrial sectors	Reduction in CO_2 emissions by 20–30%,

Figure 1. (L) EHP system in dairy plant; (R) onsite training in maintenance and trouble-shooting

Figure 2. (L) GHP system in wax room of foundry; (R) performance evaluation

Figure 3. Site investigation: BOP in (L) compressed air system; (R) induction furnace

JITMAP

Drawing on the experiences and insights provided by the successful pilot TT project under the SATREPS program, IGES and TERI designed JITMAP as a framework for the transfer of low carbon, energy-efficient, and environment-friendly technologies (ETs) from Japan to India. JITMAP was formally launched in 2016 by IGES and TERI with the support of Ministry of the Environment, Japan (MOEJ).

Technologies promoted

The Japanese ETs being promoted by JITMAP are outstanding in terms of energy and environmental performance and also highly versatile—that is, they find applications in diverse industrial sectors. The technologies comprise equipment/machinery as well as best operating practices (BOP), and include:

- Compressed air systems
- Steam management systems
- High-efficiency refrigeration system and EHP
- Energy-efficient transmission belts

Activities

JITMAP activities are structured to bridge the knowledge gaps that act as barriers to direct (B2B) transactions between the Japanese technology providers and Indian end-users. In general, the Japanese ET manufacturers/suppliers have limited knowledge regarding the (often-unique) needs and local conditions of the Indian end-users; and hence, they do not view Indian industries—except, perhaps, large-scale enterprises—as potential customers for their ET products. On their part, the Indian end-users too—particularly MSMEs—are generally unaware that Japanese companies can provide them with a range of high-efficiency ET options that offer significant benefits in terms of increased profits with attractive paybacks on investments, reductions in emissions, improved productivity, better working conditions, and so on. They also often lack the technical capacity to absorb new/innovative technology, and face difficulties in accessing formal avenues of finance.

JITMAP identifies and addresses these knowledge barriers in the broad and overlapping domains of awareness generation, technical assistance, and creation of a supportive policy & regulatory environment for TT.

Feasibility studies, knowledge-sharing seminars and awareness workshops are conducted to enable the Japanese ET suppliers and potential Indian end-users to engage with one another and deepen understanding and trust, thus paving the way for mutually beneficial B2B transactions. Entrepreneurs, operators and local service providers are provided with the required technical support and training during installation and operation. Training-of-trainer (TOT) programs on the Japanese ETs are organized for energy auditors, who are the primary propagators of new/innovative technologies among Indian industries. Follow-up site visits, dissemination workshops, and interactions with industry stakeholders help in the further development and expansion of the Indian market for ETs. JITMAP also engages with the relevant stakeholders at policy, regulatory and institutional levels with the aim of strengthening the framework

for promoting and financing ETs. In essence, JITMAP catalyses and supports the TT process from initiation to implementation in an iterative cycle. Figure 4 summarizes the key activities of JITMAP; figure 5 depicts the flow of technology transfer and diffusion.

Seminars & Workshops	• Conducted for energy managers, industry associations, and energy auditors to deepen their understanding on ETs • Japanese companies present their ET products at these events
Feasibility studies	• Carried out at the Indian end-user plants to identify the best suited Japanese ETs and to confirm their economic viability
Training-of-trainer (TOT) programs	• Organized for energy auditors, technical consultants and others who will be the primary promoters of the ETs
Follow-up site visits	• Carried out among industrial clusters across India to strengthen earlier awareness initiatives • Provide support for ET implementations where required, and assess the results.
Policy-level meetings	• Held with senior officials from the relevant policy and regulatory agencies & intitutions to discuss barriers to the transfer/adoption of ETs • Focus on possible modifications in the existing policies and regulations to help overcome the barriers

Figure 4. Key activities of JITMAP

Figure 5. Flowchart of technology transfer and diffusion

Partners and collaborators

JITMAP conducts its activities in close coordination with a number of relevant public and private sector agencies and organizations in both India and Japan. They include:

Japan

- Ministry of the Environment, Japan
- Hyogo Prefectural Government, Japan
- Japan's Blue Sky Initiatives by Embassy of Japan
- Energy Conservation Center, Japan (ECCJ)
- Japan Environmental Technology Association (JETA)
- A range of Japanese companies that manufacture/ provide ETs

India

- Bureau of Energy Efficiency, Ministry of Power, Government of India
- MSME Development Institutes, Ministry of MSME, Government of India
- Ministry of Environment, Forest and Climate Change, Government of India
- State designated agencies of BEE such as Gujarat Energy Development Agency (GEDA), Maharashtra Energy Development Agency (MEDA), and Andhra Pradesh State Energy Conservation Mission (APSECM)
- Technical consultancy organizations such as Gujarat Industrial and Technical Consultancy Organization Limited (GITCO), Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA) and Andhra Pradesh State Energy Efficiency Development Corporation (APSEEDCO)
- Local industry associations

The Hyogo Prefectural Government supports JITMAP activities specifically in Gujarat under a memorandum of understanding on mutual cooperation including the economic and environmental fields with the state government of Gujarat.

APSECM, APSEEDCO, GEDA, GITCO, MEDA, and MCCIA are official JITMAP partners through memoranda of understanding for cooperation signed with TERI. Local industrial associations, such as the ones in Ankleshwar, Dahej and Vapi in Gujarat, are also important JITMAP partners.

So far, JITMAP's activities have mainly taken place in the vicinity of Delhi and in Gujarat and Maharashtra, where industrialization is advanced; and in Andhra Pradesh, where seafood production and consequent demands for refrigeration equipment are high (figure 6).

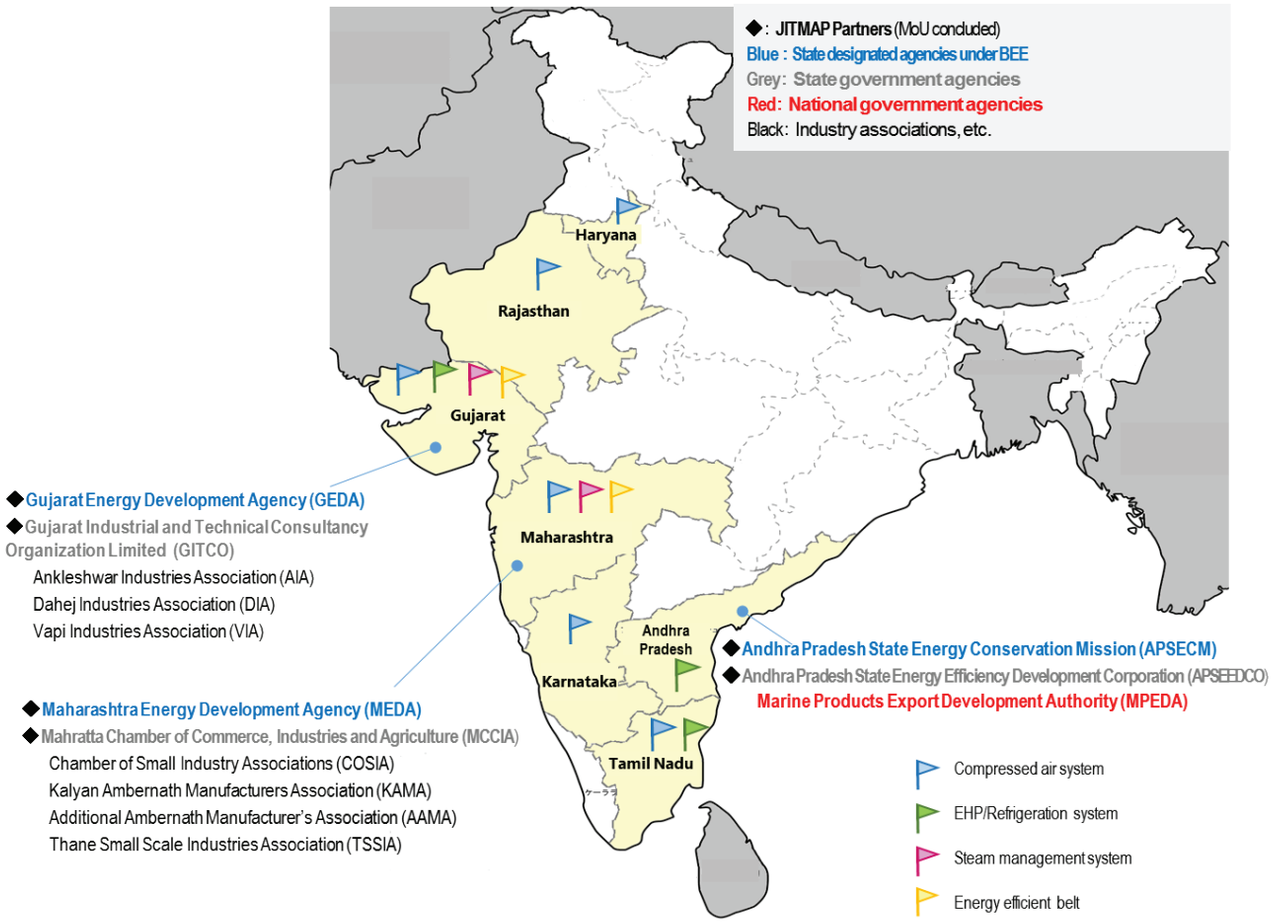

Figure 6. Locations of JITMAP activities and partners

Achievements

JITMAP has made sure progress in facilitating the adoption of Japanese ETs by a number of Indian industrial end-users through its activities of overcoming knowledge barriers, providing R&D and capacity building support for both ET suppliers and end-users, and policy-level engagements. The adoption of ETs in B2B mode is expected to gain momentum, driven by the cadre of energy auditors who have been familiarized with the ETs through TOT programs, as well as the increasing levels of trust and confidence in the ETs seeded among end-users through knowledge-sharing initiatives. The boxes highlight the opportunities for energy saving and other benefits through the implementation of ETs (figure 7).

End-user industry: forging

Energy efficiency measures implemented

- Optimizing the layout of the compressed air pipelines in the plant
- Detecting and arresting air leakages in the entire compressed air network
- Replacing buried air pipes with overhead pipes to help inspection, detection and sealing of leakages

Benefits

- Annual electricity saving: 810,000 kWh
- Annual monetary saving: INR 7.3 million
- Avoided CO_2 emissions: 664 tonnes/year

End-user industry: automobile plant

Energy efficiency measures under implementation

- Regular compressed air leakage inspections being conducted; 893 leakage points identified, representing a total annual leakage of 32.1 million Nm^3.
- Started using Vacuum Ejectors in assembly shops (in glass fitment line) to reduce compressed air consumption in suction cups.
- Installation of Intelligent Flow Controller is planned for individual shop

Benefits

- Annual electricity saving: 125 million kWh
- Annual monetary saving: INR 1.125 billion
- Avoided CO_2 emissions: 102,500 tonnes/year

Steam system improvements: vast potential

The Indian industrial sector presents huge opportunities for promoting energy-efficient steam management systems, which not only save energy costs but also lower carbon emissions, avoid plant shutdowns, and most importantly, conserve water.

A leading Japanese supplier of steam management systems studied condensate discharge locations in about 100 Indian MSMEs, and found failure rate of about 17% in condensate discharge recovery (CDR) of which leakages accounted for 40%. The CDR failures result in huge wastages of energy and water; annual monetary losses are estimated at INR one billion!

Figure 7. Optimizing compressed air system: (L-R): arresting leakages; use of air guns; monitoring air pressure

Looking ahead

As Indian industries—particularly, MSMEs—strive to resume and sustain operations following the extended crisis caused by the Covid-19 pandemic, the time is ripe for them to adopt ETs that will enable them to reduce energy costs and increase profits, and also help them meet emission norms and save on consumption of raw materials. In adopting Japanese ETs, MSMEs can access and avail of working capital, term loans, and other financial packages provided to them under the Indian government's 'Atmanirbhar Bharat Abhiyan' scheme.

The JITMAP experience has shown that adoption of 'soft' ETs in the form of best operating practices (BOPs) can bring significant savings in energy consumption and energy costs at low or even zero investments, and can be implemented quickly and easily through hands-on training of operators and local service providers. Soft ETs have particular relevance for MSMEs, which generally operate on thin profit margins, face difficulties in raising capital resources, and depend on low-efficiency technologies and practices.

At the COP-26 climate change summit in Glasgow, 2021, India declared its aim of becoming a net-zero economy by 2070, and has set itself goals such as: increasing non-fossil fuel energy capacity to 500 GW by 2030; meeting 50% of energy requirements from renewable energy by 2030; reducing the total projected carbon emissions by one billion tonnes from the present to 2030; and reducing the carbon intensity of the economy by 45% (from the previous target of 35%) by 2030. Japan, too, has declared its aim of becoming net- zero, by 2050. In September 2021, the First India–Japan High Level Policy Dialogue saw both Japan and India reaffirm their intent to strengthen bilateral cooperation in climate, environment and energy.

For both Japan and India, therefore, this is an opportune time to scale up their collaborations in high-efficiency environment-friendly technologies. IGES and TERI will seize this opportunity by strengthening and expanding initiatives under JITMAP to facilitate the adoption of Japanese ETs by Indian industries.

JITMAP will identify and include more Japanese technologies in its 'basket of ETs', and simultaneously expand its activities to cover new industrial sub-sectors/clusters in India. In order to maximize the impacts of JITMAP activities, they will be synergized with other initiatives aimed at bringing about clean, energy efficient production in the Indian MSME sector—such as those being conducted under the SAMEEEKSHA platform.

This article is based on various research reports and other documents published by IGES and TERI under the SATREP and JITMAP projects, and contributions from researchers at IGES Kansai Research Centre, including Dr Satoshi Kojima, Mr Toshinori Hamaguchi and Ms Mika Tachibana.

JAPAN–INDIA PARTNERSHIP TOWARDS NET ZERO SOCIETY – OUTCOMES, LESSONS LEARNED AND WAY FORWARD OF JITMAP

TERI and IGES Japan organized a webinar on 'Japan-India Partnership towards Net Zero Society - Outcomes, Lessons Learned and Way forward of the Japan-India Technology Matchmaking Platform (JITMAP)' on 8th February 2022. The event was attended by about 100 participants from Japan and India including representatives from Ministry of the Environment, Japan (MOEJ), Embassy of Japan in India, Bureau of Energy Efficiency, Ministry of Environment, Forest and Climate Change (MoEFCC), Andhra Pradesh State Energy Conservation Mission (APSECM), industry executives, energy experts, and researchers.

Mr Girish Sethi, Senior Director, TERI, remarked that JITMAP could serve as an important mechanism for both India and Japan to achieve their bold 'net-zero' targets announced during COP-26. Mr Nobutoshi Miyoshi, Managing Director, IGES, cited the success of JITMAP in enabling adoption of energy-efficient, environment-friendly Japanese technologies (ETs) by Indian industries, and expressed the hope that the discussions would help further strengthen cooperation between India and Japan in ETs. Mr Subrata Bose, Scientist-F, MoEFCC, underlined the close alignment between India and Japan on issues related to environment and climate change negotiations. Mr Milind Deore, Director, BEE, described how the Japan-India energy dialogue is led by BEE from India and Energy Conservation Center, Japan (ECCJ) from Japan, and has resulted in many joint activities across areas of energy transition, energy generation, energy efficiency and clean energy systems. He said BEE could support initiatives like JITMAP which will be important in helping India achieve its net-zero targets. Mr Ryuzo Sugimoto, Director, International Cooperation and Sustainable Infrastructure Office, MOEJ, emphasized that business opportunities and mutual economic benefits are now major driving forces in promoting ETs. He added that technological innovation and public–private partnerships in R&D will be important aspects of future Japan–India collaborations in ETs; JITMAP is expected to play a key role in this regard.

The following participants made presentations to share the outcomes and lessons from JITMAP Initiatives:

- Mr Prosanto Pal, Associate Director, Industrial Energy Efficiency, TERI and Ms Mika Tachibana, Policy Researcher, IGES Kansai Research Centre
- Mr Tsukasa Saito, Former Hitachi Industrial Equipment Systems, IGES Fellow
- Mr Peush Jaitly, General Manager-Country Head (India Operations), TLV PTE LTD. India Liaison Office
- Mr Arun Ghugri, Director; Mr Dinesh Raskar, Assistant Manager Maintenance; Mr Pravin Narsale, Senior Engineer Maintenance, Trinity Engineers Pvt. Ltd., Pune

The presentations were followed by a moderated discussion on how JITMAP could be strengthened to promote the application of Japanese ETs. Some of the key points and suggestions made during the presentations and discussions are summarized below.

Key points and suggestions

- Article 6 (which was agreed on and adopted at COP 26) paves the way for utilizing market mechanisms to reduce global emissions. In this context, Japan's Joint Crediting Mechanism (JCM) provides significant scope for supporting the diffusion of ETs to India and other countries.
- Successful ET implementations hinge on continuity of engagement between both Japanese and Indian stakeholders. A mechanism that could support sustained engagement between IGES, TERI, and industries would help oversee implementation of ETs and assess the results.
- High up-front costs pose a major barrier for industries in technology adoption, not only in India but also in Japan. Japan was able to overcome this barrier through initiatives like 'Top Runner' and subsidy schemes. However, it is noteworthy that these schemes require strict monitoring and reporting protocols, along with suitably trained energy auditors.
- JITMAP could focus on promoting low-cost technologies like energy-efficient transmission belts, where the end-user industries might not require loans.

- APSECM and TERI have identified significant energy saving potential—and hence, scope for promoting ETs— in Andhra Pradesh among fisheries, foundries, refractory units, dal processing units, spinning mills, and cold storage units.
- In regard to high-efficiency steam systems, the existing IBR Rules & Regulations in India make the manufacture of energy-efficient boilers unnecessarily expensive, and consequently discourage industries from adopting such boilers. Through suitable policy-level initiatives, India should adopt internationally accepted standards such as the American Society of Mechanical Engineers (ASME) standards for boilers.
- Looking ahead, JITMAP could strengthen its efforts and increase its ambit through the following measures:
  - Expand the ET basket to include niche technologies
  - Evolve a flexible marketing & sales strategy that can be tailored to suit individual technologies
  - In cases where finance is required for technology adoption, engage with providers of supportive finance schemes to help the end-user get the technology at discounted price
  - Explore collaborations with more agencies/ organizations such as Japan Platform for Redesign: Sustainable Infrastructure (JPRSI); Blue Sky Initiatives; Japan Environmental Technology Association (JETA); and The Energy Conservation Center, Japan (ECCJ)
- Suggested policy-level measures in India to facilitate smooth transfers and adoption of Japanese ETs include:
  - A gradual reduction in import tariffs, particularly for high-efficiency products like ETs
  - A scheme akin to Japan's 'Top Runner' program for establishing EE standards in industrial equipment, which will help in the large-scale production and adoption of high-efficiency products like IE3 motors.
  - Strong and sustained interactions between stakeholders from industry, local government, ministries and other relevant policy-level entities.

ABOUT SAMEEEKSHA

SAMEEEKSHA is a collaborative platform aimed at pooling the knowledge and synergizing the efforts of various organizations and institutions—Indian and international, public and private—that are working towards the common goal of facilitating the development of the Small and Medium Enterprise (SME) sector in India, through the promotion and adoption of clean, energy-efficient technologies and practices.

SAMEEEKSHA provides a unique forum where industry may interface with funding agencies, research and development (R&D) institutions, technology development specialists, government bodies, training institutes, and academia to facilitate this process.

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