



ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power



USAID
FROM THE AMERICAN PEOPLE



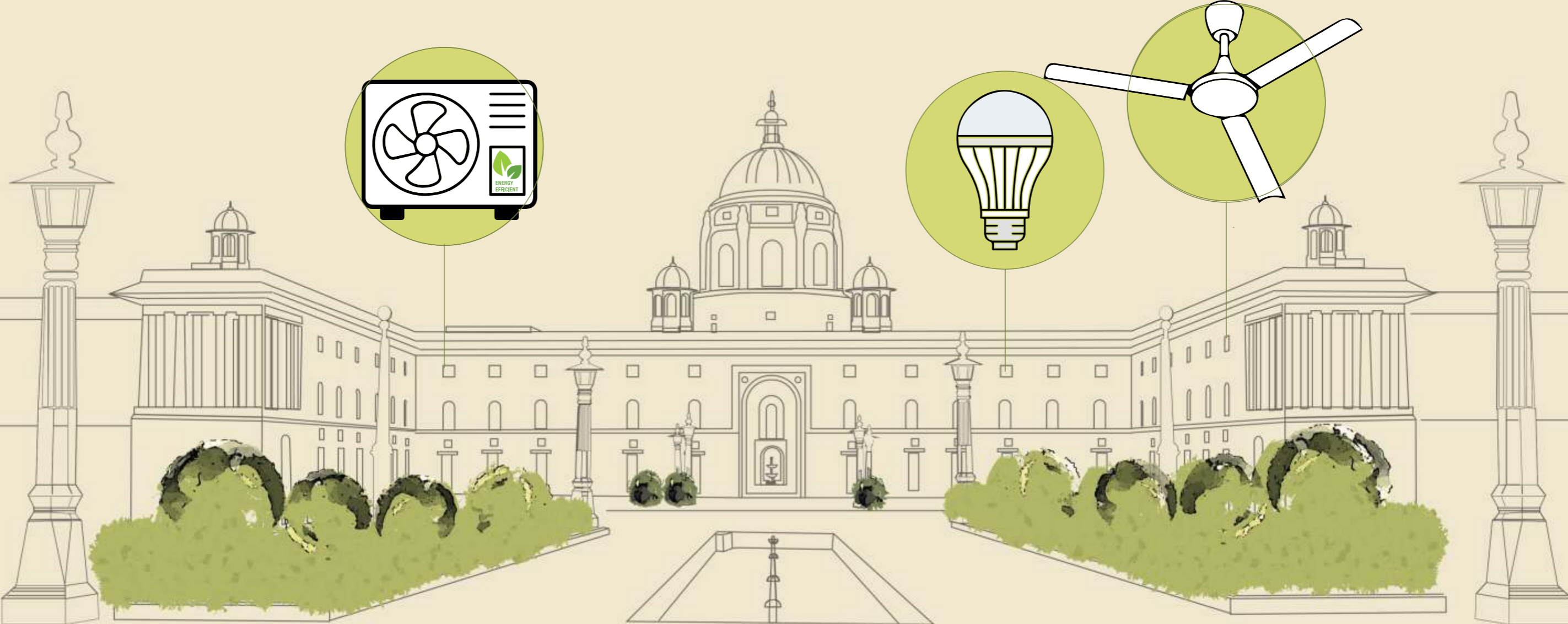
GOVERNMENT OF INDIA
MINISTRY OF POWER



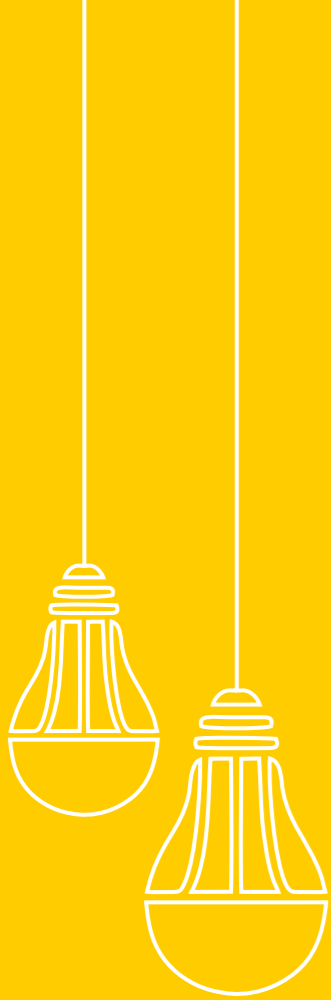
EESL

BUILDING ENERGY EFFICIENCY PROGRAM

BUILDING ENERGY EFFICIENCY PROGRAM | **BEEP**



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Rajeev Sharma

Chairman, Energy Efficiency Services Limited

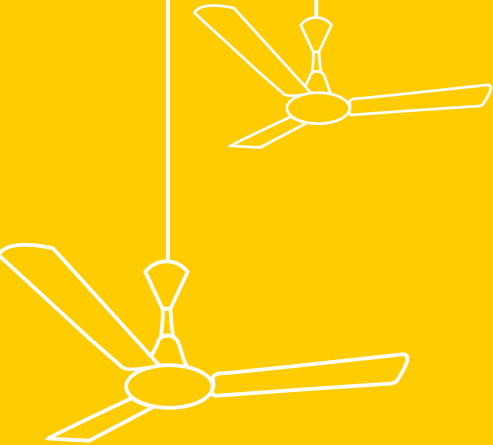


Building Energy Efficiency Programme has emerged as an important initiative for fulfilling Energy Efficiency Services Limited's mandate to facilitate implementation of energy efficiency projects and support markets for energy efficiency technologies and services in the country.

Globally, buildings consume about 20% of the total delivered energy, emitting about 9.6 GtCO₂e of greenhouse gases annually. Tackling energy use in buildings is extremely crucial for tackling climate change. Buildings are equally important players in domestic energy supply and demand dynamics of India. Government of India has set ambitious emission reduction targets through its INDCs and simultaneously set up an aggressive economic growth and development agenda. To achieve these twin targets requires uncoupling emissions from economic growth. Success in achieving Government of India's Intended Nationally Determined Contributions thus rests in part on efficient use of energy and limiting its demand across sectors, including buildings.

Through BEEP, EESL has shown leadership by setting a successful precedent for large scale programs for demand side energy management in buildings. I congratulate BEEP team on the publication of this compendium of projects and services.





Saurabh Kumar

Managing Director, Energy Efficiency Services Limited



Buildings account for about one third of the total annual energy consumption in the country and emit nearly 1000 MtCO_{2e} of greenhouse gases annually. The scenario is as such with emissions from just 30% of built area required by 2030. Energy demand is expected to double by 2030 as the balance 70% of the required building stock is built. Meanwhile Government of India, as a responsible stakeholder, has committed to control GHG emissions to a fraction of 2005 levels in the coming decades. These statistics underline importance of efficient use of energy in buildings to meet India's Intended Nationally Determined Contributions and achieve a low energy, sustainable future.

EESL launched Building Energy Efficiency Programme to raise the baseline energy efficiency in existing buildings and increase market bandwidth for supplying energy efficient building technologies. EESL's approach in implementing BEEP echoes strategies of Government of India to mitigate climate change by working with markets to push cutting-edge, efficient technologies in the supply stream.

Potential for efficiency gains range from 25-50% over conventional buildings. New buildings can bridge this gap as they are regulated by Bureau of Energy Efficiency's energy codes. EESL chose to realize the potential in existing building stock, energy use in which is so far unregulated, through the market-based model of ESCOs.

Over 300 crore investment has been mobilized in low energy building technologies through BEEP. The program has also demonstrated viability of ESCOs and public-private sector partnerships in transforming markets for energy efficiency.

We hope to improve and expand the scope of this unique program in the coming years to introduce new technologies for low emission buildings in India. I compliment the entire BEEP team on their success.

Saurabh Kumar



S P Garnaik

Executive Director, Energy Efficiency Services Limited



Building Energy Efficiency Programme is today the largest, non-regulatory program for energy efficient retrofits in existing buildings globally. It has replaced super-efficient cooling and lighting appliances in more than 10,000 buildings. Our clients save nearly 210 million units of electricity annually. BEEP projects are ready for compliance with building energy codes and star labelling schemes of Bureau of Energy Efficiency.

This stupendous success of BEEP has resulted from strong partnerships with government, public and private sector organizations willing to lead in adopting energy efficiency. BEEP has implemented projects for more than 150 central and state government departments and ministries, and, public and private sector companies. I take this opportunity to convey my appreciation to our clients for reposing trust in our ability to deliver the best solutions for them.

BEEP would not have achieved the milestones it did without the strong leadership and vision of Mr. Saurabh Kumar, Managing Director, EESL. We consider the milestones set by the Ministry of Power for BEEP as a measure of confidence in our ability to build and direct energy efficiency markets for an energy secure nation. We will continue to fulfil the Ministry's mandate in the future.

Our partnership with United States Agency for International Development through its MAITREE program has been instrumental in streamlining BEEP business processes, identify high impact technologies and new market segments.

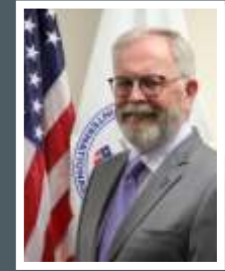
Milestones achieved by BEEP are a culmination of team work. I commend the BEEP team on their hard work and wish them enduring success.





Keith E. Simmons

Acting Mission Director, USAID/India



Growing energy use in buildings, especially for cooling, is a global concern now. Combined efforts of governments, civil society and private sector will be essential in counteracting impact of energy demand in buildings on climate. United States Agency for International Development (USAID) recognizes this and has always fostered strong partnerships with the Government, civil society and private sector in India to bolster markets, enabling investment climate and, innovative and sustainable business models for energy efficiency.

Our partnership with EESL under the US-India bilateral MAITREE or Market Integration and Transformation for Energy Efficiency program is focused on developing market-based solutions for energy efficiency. MAITREE program has also worked closely with EESL's Building Energy Efficiency Program (BEEP) team to accelerate adoption of building energy efficiency strategies and technologies at scale through this program.

Market growth strategies, business models and business processes developed by the teams have enabled BEEP to expand nationally. A combination of innovative models like ESCO financing and bulk procurement models has lowered the cost of energy efficiency to end-users.

MAITREE and BEEP are now working together to design and roll out like integrated Energy Efficiency Services Model and Super ESCO models to further increasing access to energy efficient technologies to a larger consumer base in a affordable manner .

USAID is proud of its partnership with EESL which has been at the forefront of transforming markets for energy efficiency. I congratulate EESL in pushing the envelope in a complex sector like buildings.

Keith E. Simmons

EESL ENABLING MORE

More Innovation

Unlock the potential of Indian energy efficiency landscape through innovative market-based interventions.

01

More Transparency

Lead the market related activities of the National Mission for Enhanced Energy Efficiency (NMEEE).

02

03

Drive large scale initiatives to create a market for transformative, future ready solutions.

More Transformation

Energy Efficiency Services Limited

Energy Efficiency Services Limited has been actively engaged since 2009 in bringing cutting edge, energy efficient technologies to the market in a cost-effective manner. A PSU under Ministry of Power, EESL leads the market-related activities of the National Mission for Enhanced Energy Efficiency (NMEEE), one of the eight national missions under the Prime Minister's National Action Plan on Climate Change.

EESL has emerged as the largest Super Energy Service Company globally and has been felicitated for its achievements (Best Public Sector Company - 2018 by Forbes). EESL focuses on solution driven innovation with no subsidy or capital expenditure through the ESCO or Pay-As-You-Save model. This model incentivizes investors, consumers and the market. EESL manages world's largest energy efficiency services portfolio through programs like Unnati Jyoti by Affordable LEDs for All (UJALA) Programme, world's largest zero-subsidy LED bulb programme, Street Lighting National Programme (SLNP), world's largest street light replacement programme and Building Energy Efficiency Programme through these business models.





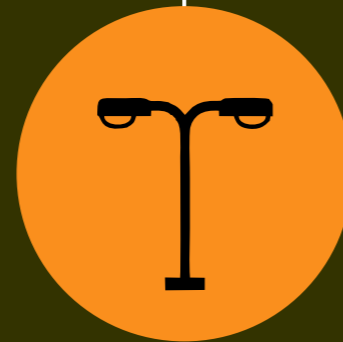
EESL

manages the world's largest portfolio
of zero subsidy energy efficiency
programs



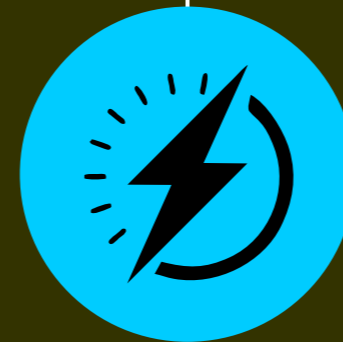
UJALA (Unnat Jyoti by Affordable LEDs for All)

- 361 million LEDs sold and target is to replace 770 million inefficient bulbs.
- 47 billion units annual electricity savings
- 9,400 MW avoided peak demand.
- Annual CO₂ reduction is 38 million tonnes



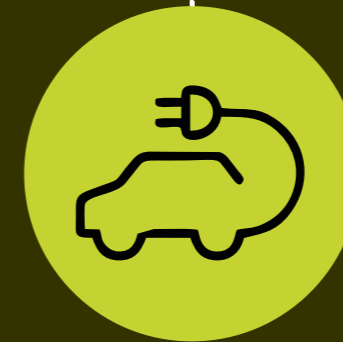
Street Lighting National Programme

- 10 million streetlights sold
- 7 billion units annual electricity savings
- 4.84 million tonnes CO₂ reduction
- 1,170 MW avoided peak demand



Municipal Energy Efficiency Programme

- Target AMRUT cities and Smart Cities.
- 100 million units annual electricity savings potential
- 3.9 million tonnes CO₂ reduction potential



E-Mobility

- Replace 500,000 conventional vehicles with e-vehicles
- 100% e-mobility by 2030
- 830 million liters of annual fuel savings potential
- 2.23 million tonnes of CO₂ reduction potential in tailpipe emissions



Smart Meter National Programme

- Target: replace 250 million conventional meters with smart meters
- Installed over 500,000 smart meters
- Increase billing efficiency by 75 to 100%
- 1,381 billion INR potential increase in revenues to utilities



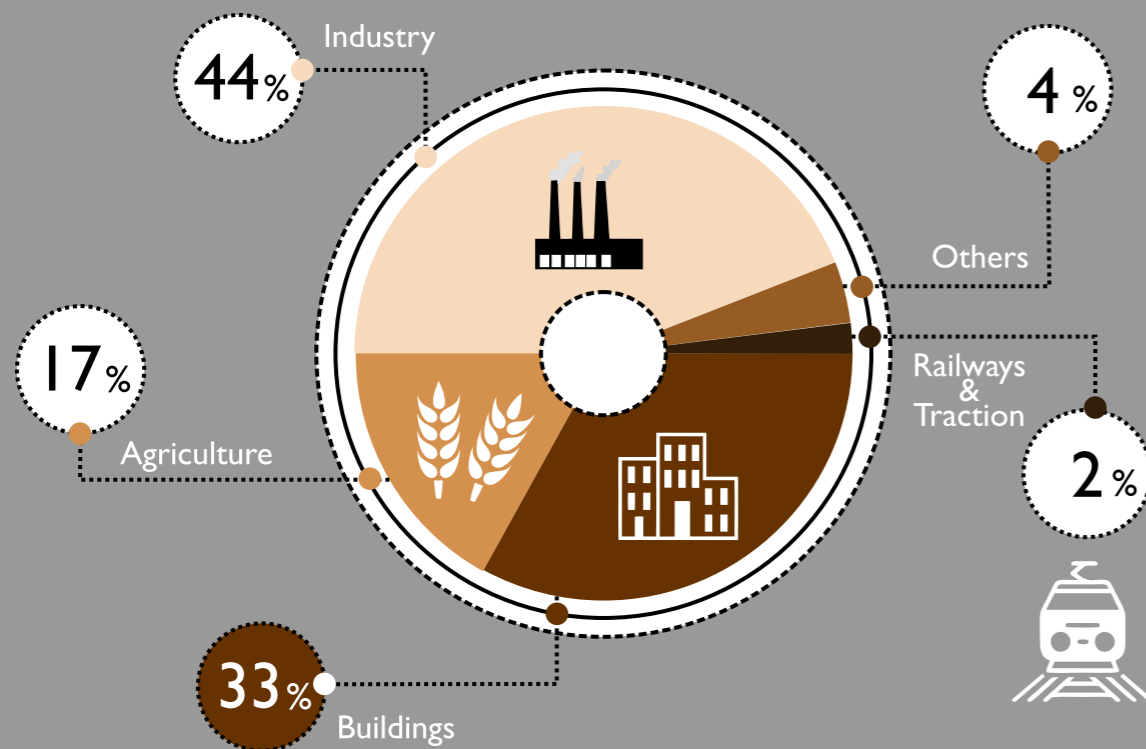
Photo by Atok Sharma on Unsplash

Energy Use in Buildings

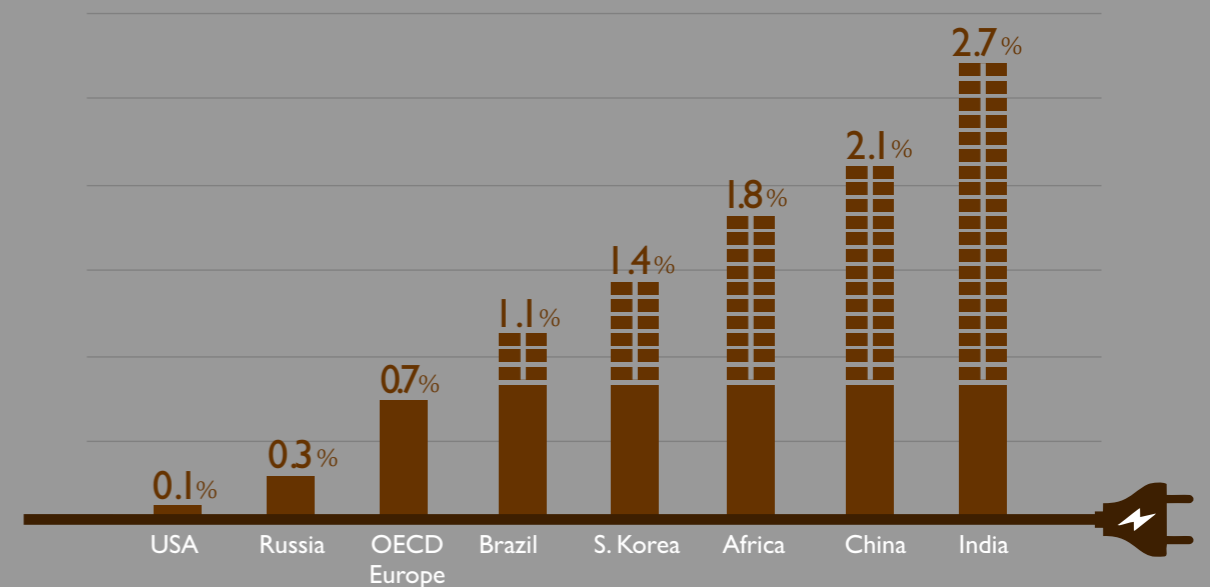
Buildings currently consume nearly 33% of energy in India, and their energy use intensity is growing. Ratio of electricity use in building sector as a percentage of the annual total has increased continuously in the last four decades. Energy footprint of building sector is expected to grow further since 70% of the buildings that will be needed in 2030 are yet to be built.

With a predominant hot and hot-humid climate, cooling is the largest growing energy end-uses in India, representing 42% and 31% of the total energy end-use in residential and commercial buildings, respectively. As on date, only 3-4% of Indian households have air conditioners. This is expected to increase to over 11% by 2020. This increase in cooling energy use, exacerbated by inefficient air conditioners, puts a strain on the energy infrastructure in the country and forces precarious resources to be spent on inefficient use.

India: Energy Use by Sector




Annual Building Energy Use Growth Rate: 2030





620 BU
Energy Savings



500 mtCO₂e
Emissions Reduction



27 GW
Peak Demand Savings

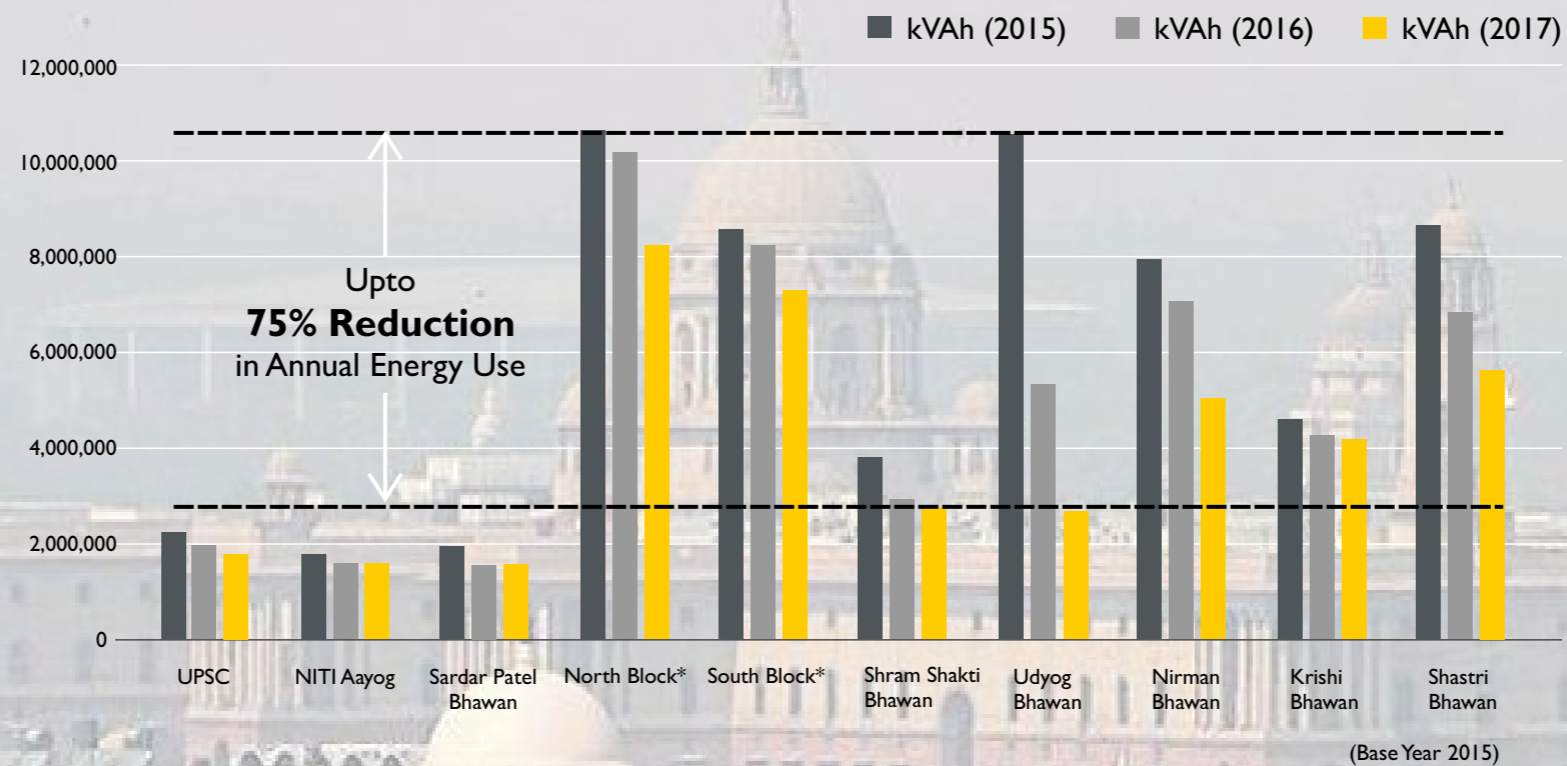


190 BU
Cooling Energy Savings



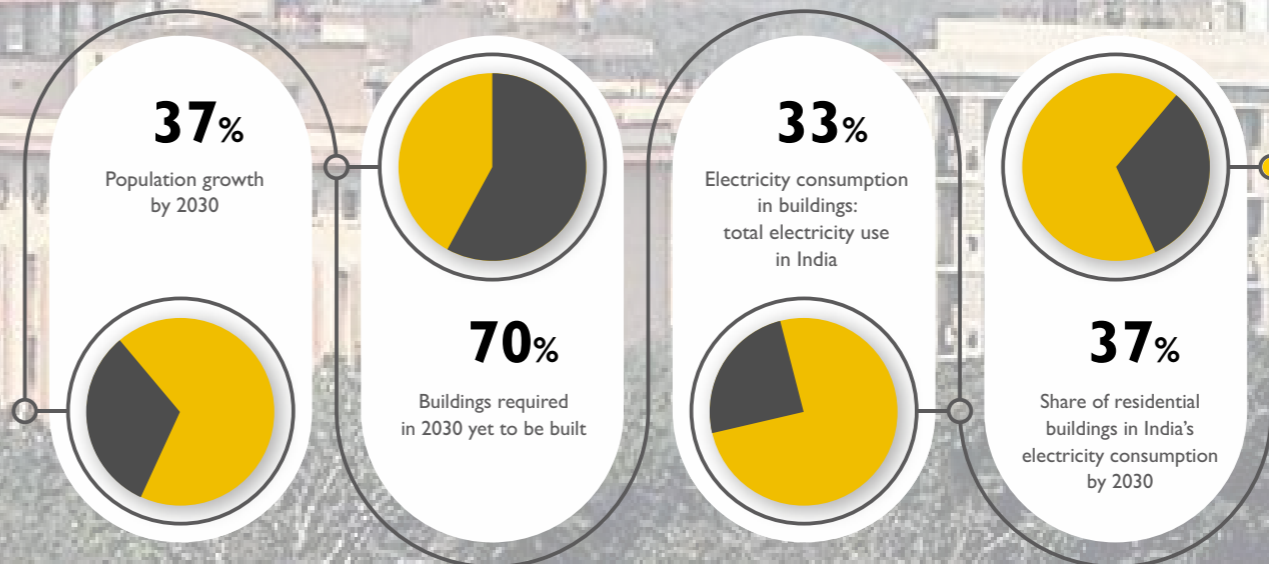
Buildings Energy Use and Savings Potential

EESL Pilot Project: Energy Use Reduction in Key Government Buildings



Building sector electricity consumption was 2,500 TWh in 2017. Lighting and appliances accounted for nearly 37% of the total consumption. Energy use is expected to increase by more than 800% by 2047. With comprehensive policies and technologies for energy efficiency, there is a potential of savings of over 50%.

Energy efficiency is central to India's INDCs, which aim to promote energy efficiency in the economy, notably in industry, transportation, buildings and appliances.





Building Energy Efficiency Programme | BEEP

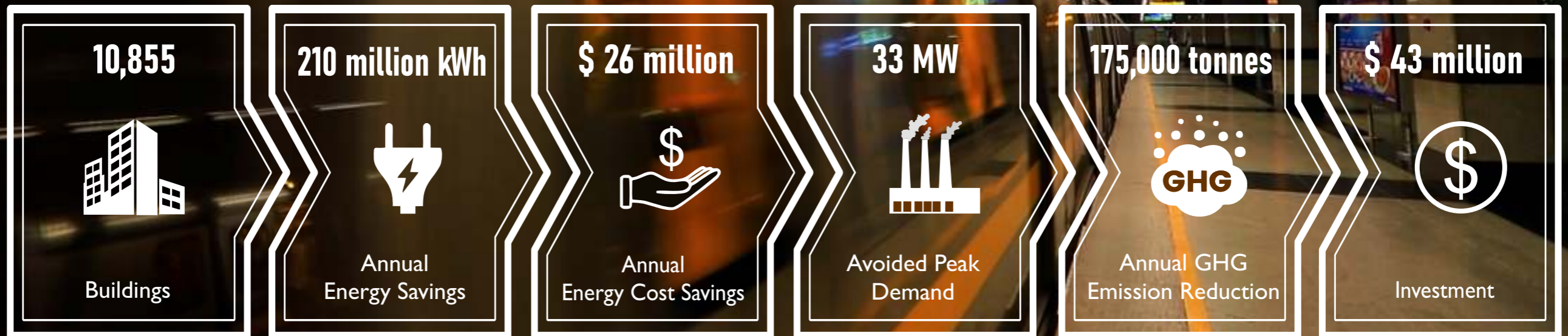
EESL launched the Building Energy Efficiency Programme (BEEP) to catalyze market transformation for cost effective, highly energy efficient buildings. BEEP is now one of the largest building energy efficiency programs in the world. Government of India has designated EESL as the primary implementing agency for mandatory energy efficiency measures in all public buildings. More than 2 million energy efficient lighting and cooling appliances have been replaced across 10,000 plus buildings in less than two years.

BEEP delivers benefits to multiple stakeholders. Building owners are able to access super-efficient appliances at economical prices. Reduction in peak demand helps utilities in power demand management. Technology providers have access to increased consumer base and opportunity to research and deploy innovative low energy technologies.

BEEP has developed a pan-India network to deliver building energy efficiency solutions. Attractive buy-back and environmentally safe disposal options are available for all replaced appliances. This minimizes negative environmental impact, from cradle to grave, of inefficient appliances removed from buildings.

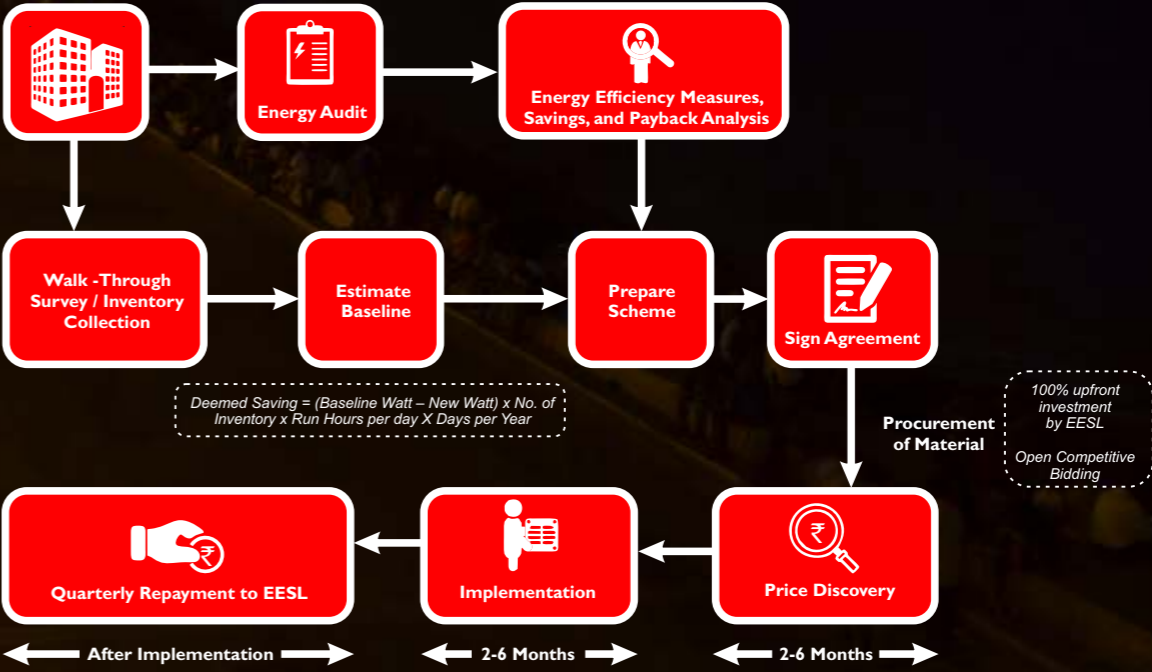
BEEP has continuously expanded to include a multiplicity of demand side energy efficiency solutions. It now offers an Integrated Energy Efficiency Services (IEESM) model which is a blend of advanced diagnostic services, energy efficient appliances, and performance monitoring systems. With IEESM, building owners will have the benefit of comprehensive assessment of energy efficiency potential and post retrofit measurement of the value of their investment.

BEEP: Status and Impact till date





Project Approach & Methodology



BEEP Business Model

EESL's clients enjoy the advantage of innovative financing models, high quality technologies, guaranteed energy savings and project management skills to reduce energy costs and carbon footprint while increasing comfort and productivity.

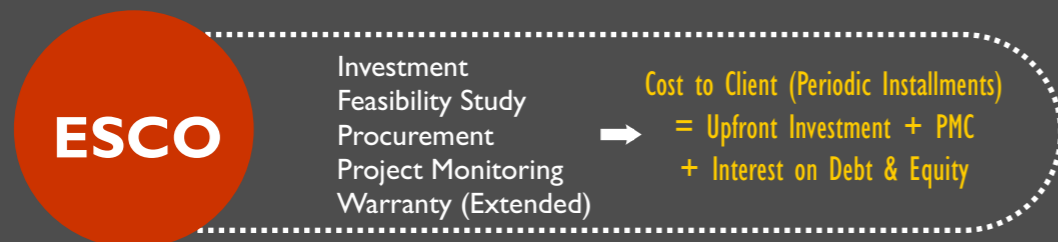
EESL business model is a win-win situation for consumers. EESL uses demand aggregation and bulk procurement models to get a price advantage. This enables EESL to bring the most advanced technologies to our clients at the most competitive prices. Products are backed by comprehensive warranties and maintenance.

Efficiency projects can be funded through the ESCO mode, wherein EESL pays upfront costs. Clients can repay the upfront investment through Pay As You Save model. Clients can also choose the alternative model of Project Management Consultant (PMC); upfront costs are borne by client and EESL designs and implements projects for a predetermined consultancy fee. EESL guarantees minimum energy savings for its projects, default on which is adjusted in repayments.

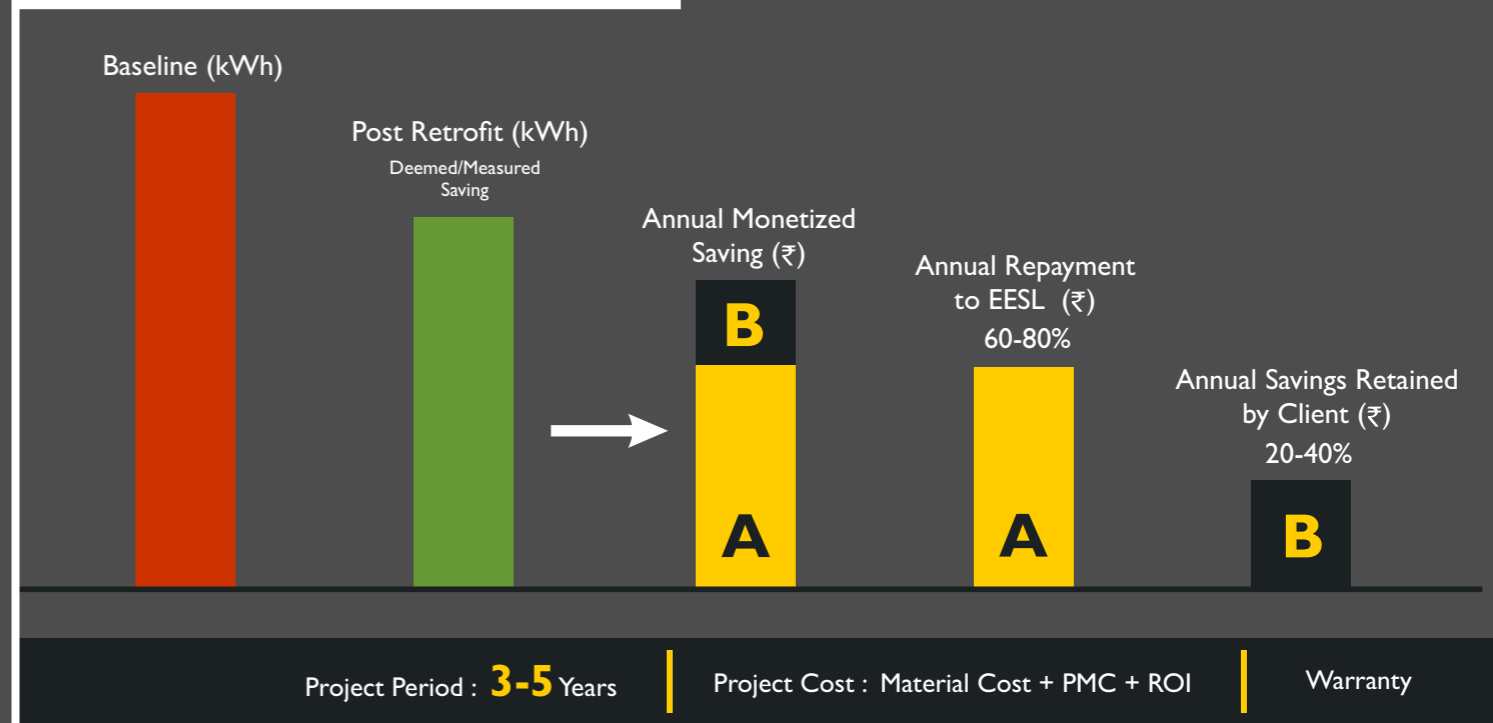
Model 1: 100% upfront investment by the client



Model 2: 100% upfront investment by EESL



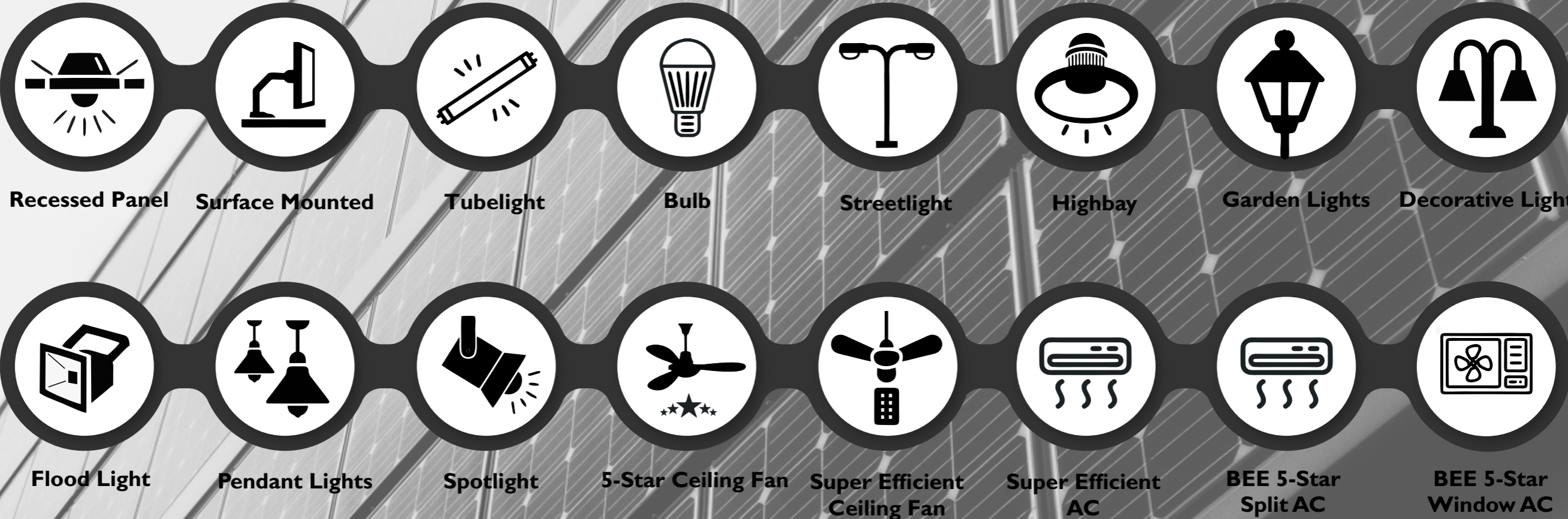
Shared Savings Approach





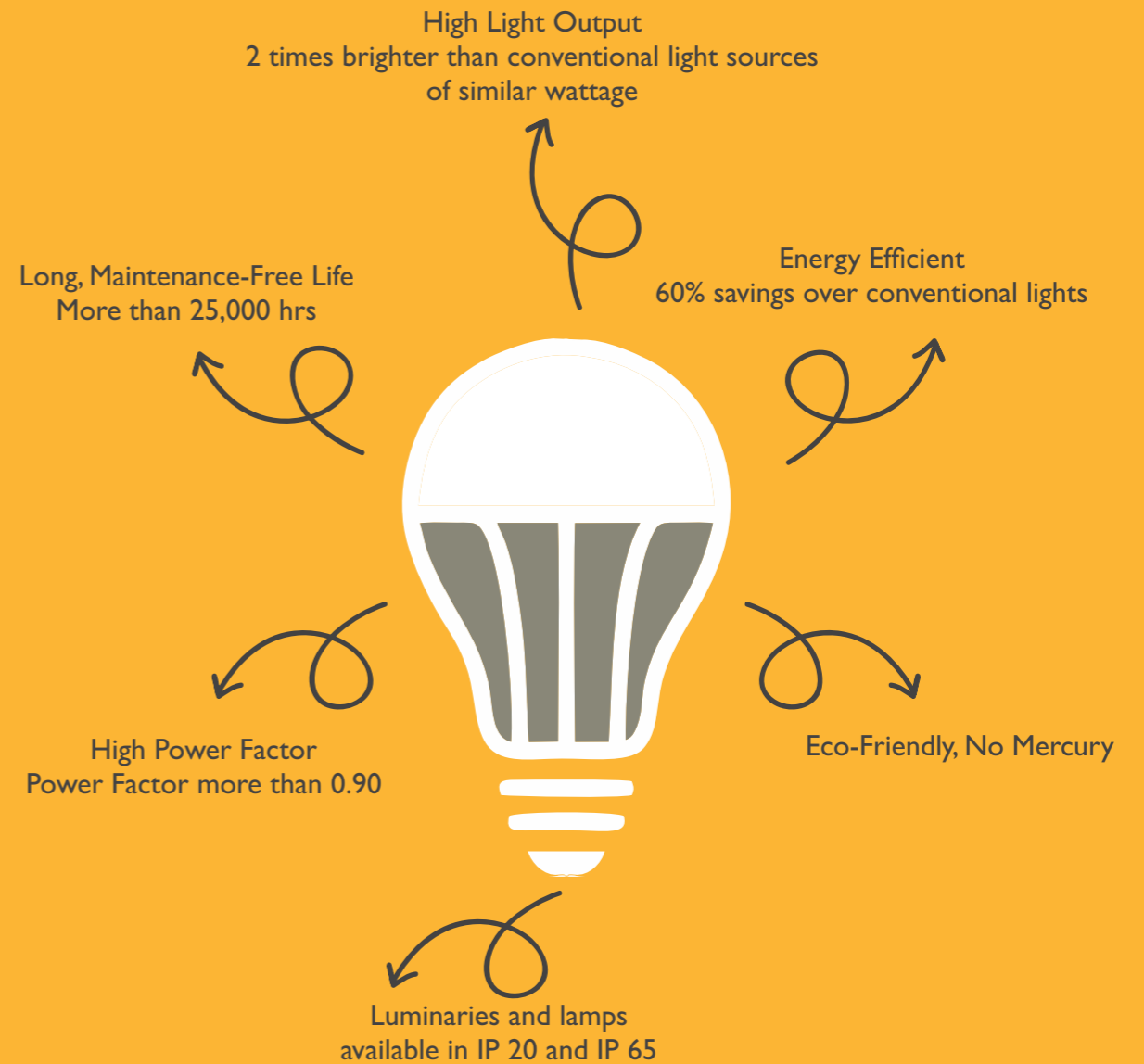
EESL: Energy Efficient Products and Technologies

EESL's has a pan-India network to deliver state of the art building energy efficiency solutions. A wide array of products and technologies are available, based on project requirements. EESL also provides attractive buy-back and environmentally safe disposal options for replaced appliances.





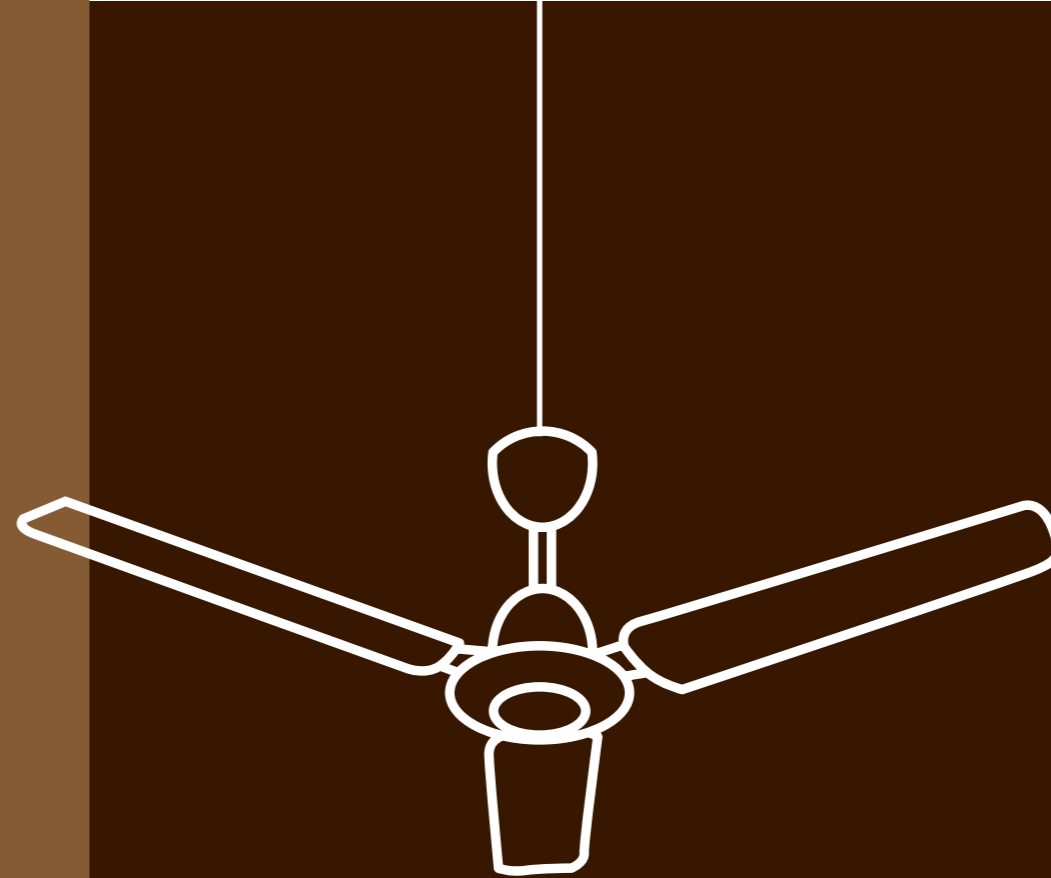
LED FIXTURES



LED Efficacy at the chip level > 135 lumens/watt
System luminous efficacy of LED luminaire more than 100 Lumens per watts (+/- 5%)
Colour rendering index (CRI) ≥ 80 for indoor luminaires and ≥ 70 for outdoor luminaires
Correlated Colour Temperature in the range of 2700K-6500 K

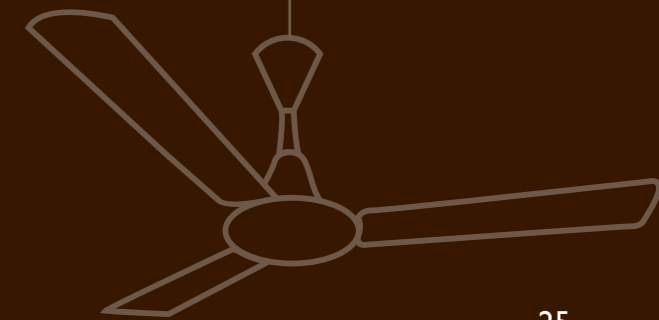


CEILING FANS



ceiling fans account for **30-40%** of total electricity use in buildings

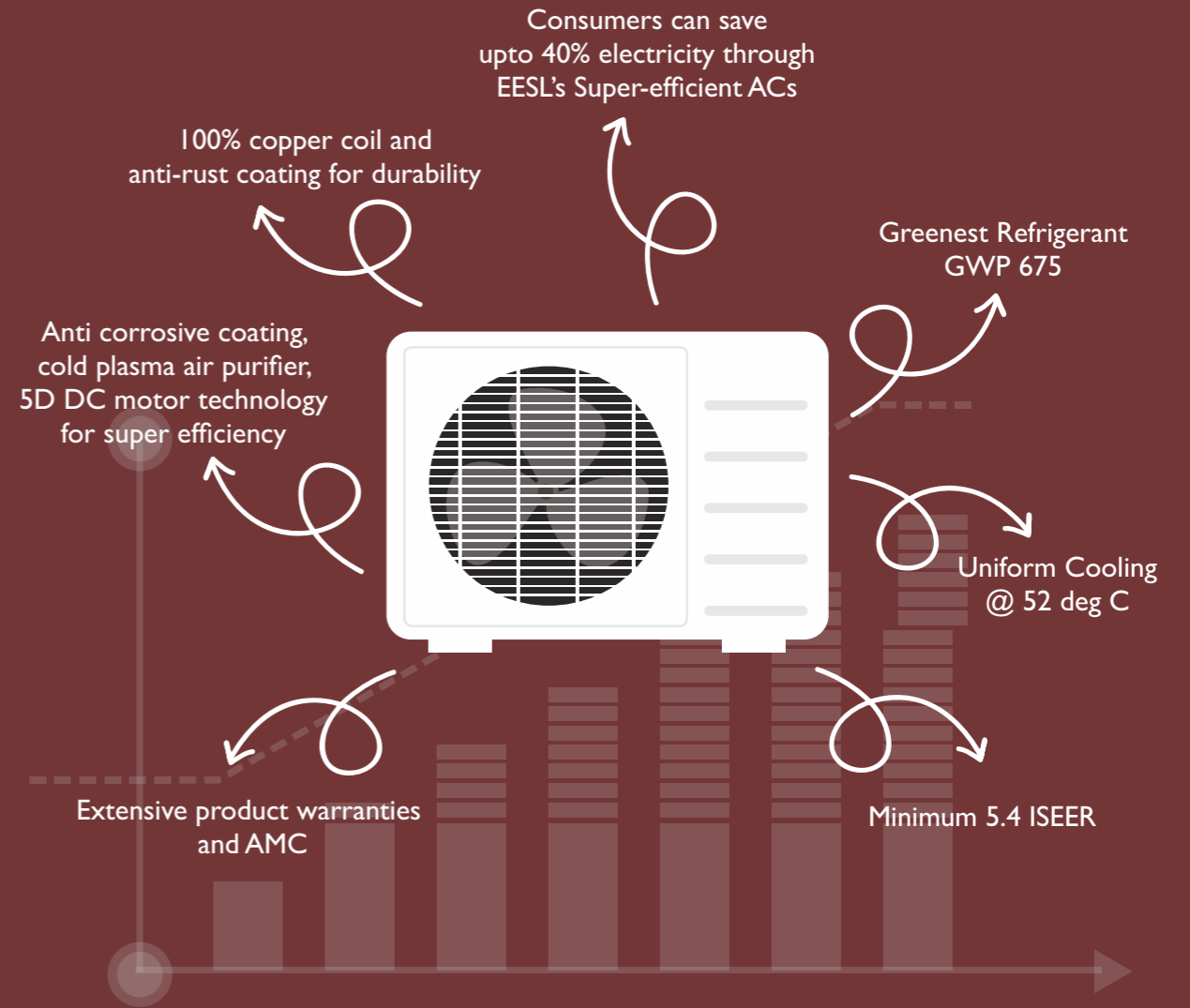
5 star rated ceiling fans are **30-50%** more energy efficient and can save upto **1,000 /-** annually in electricity bills





AIR-CONDITIONERS

India's Most Energy Efficient AC

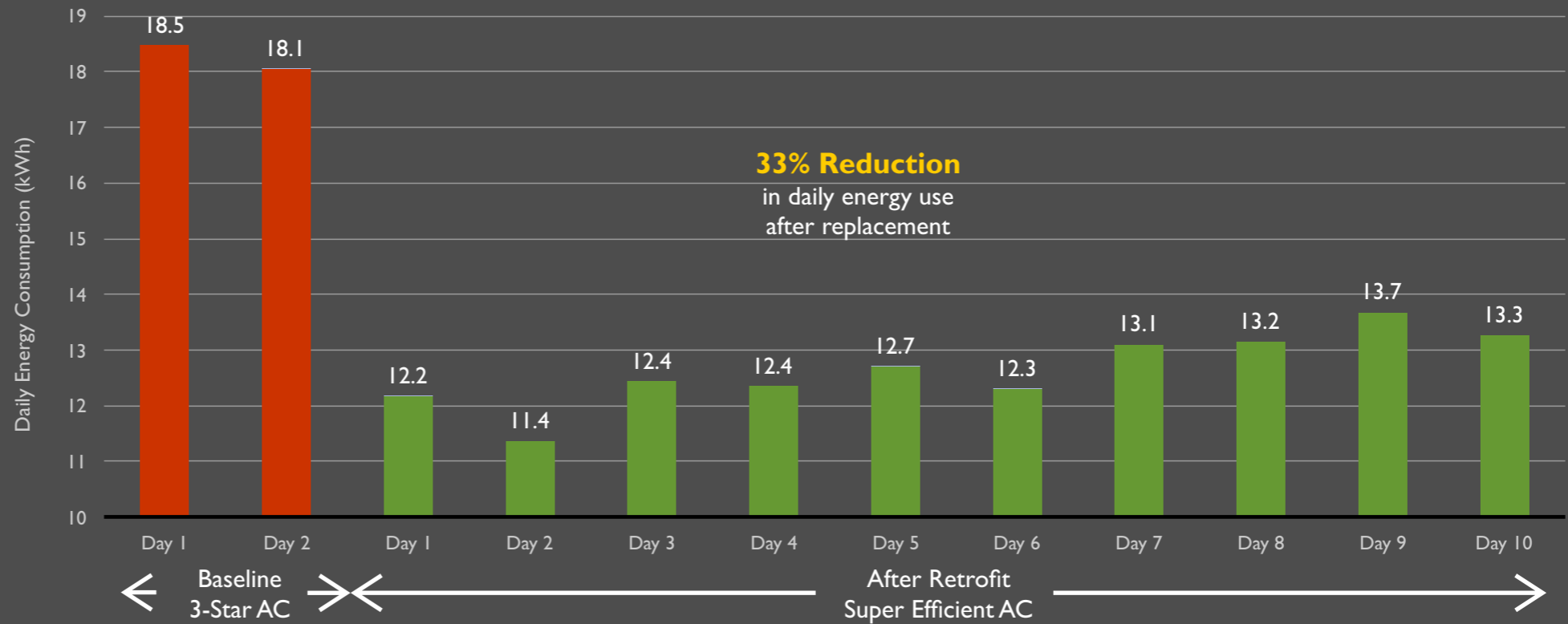


EESL Super Efficient AC: Measured Impact

Bank ATM

Monitored energy use after replacing a 3-Star fixed-speed split AC with a 5.2 ISEER split AC in a Bank ATM in Mumbai.

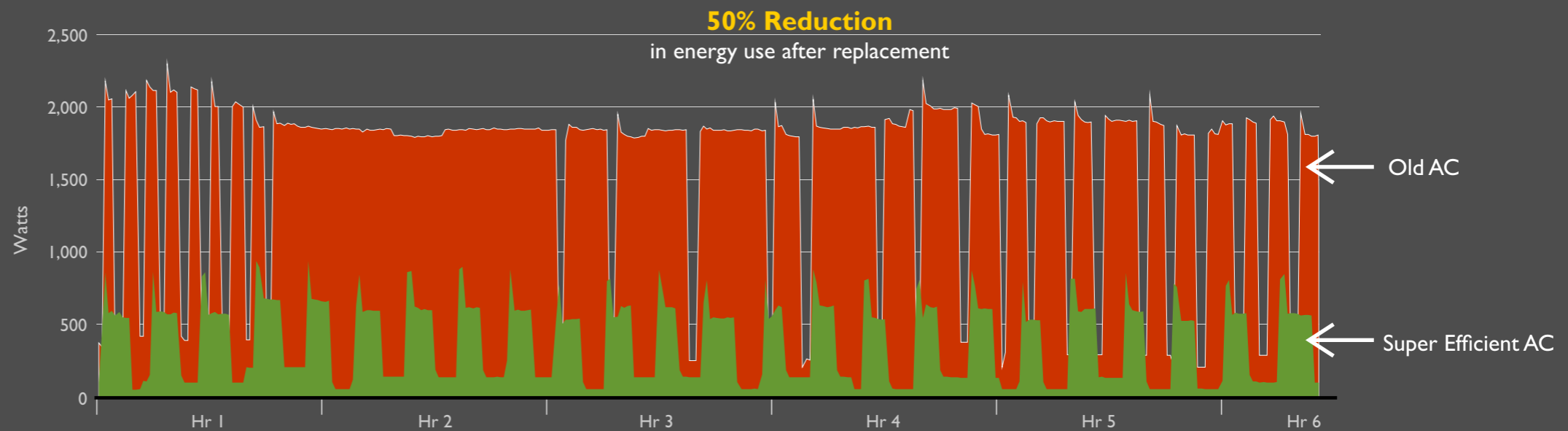
The replacement resulted in 33% reduction in energy use and 3.5% reduction in peak demand. The payback period for this replacement was less than 2 years.



Private Residence

Monitored energy use after replacing a seven year old AC with a 5.4 ISEER split AC in a private residence in Delhi.

The replacement resulted in over 50% reduction in energy use.







BEEP Success Stories

EESL has partnered with numerous socially and environmentally responsible public and private sector agencies to enhance energy efficiency of their assets and operations. Indian Railways, Maharashtra PWD, Mahindra & Mahindra, Delhi Metro Rail Corporation, Airport Authority of India, NITI Aayog, Coal India Limited, Bank of Baroda, among others, have leveraged EESL's expertise and resources to moderate energy use related costs. Energy efficient appliances and equipment have been replaced in 10,000 public buildings. BEEP is also integrating innovative, energy efficient technologies and measures in MSME clusters across the country.



कालकाजी मंदिर
KALKAJI MANDIR

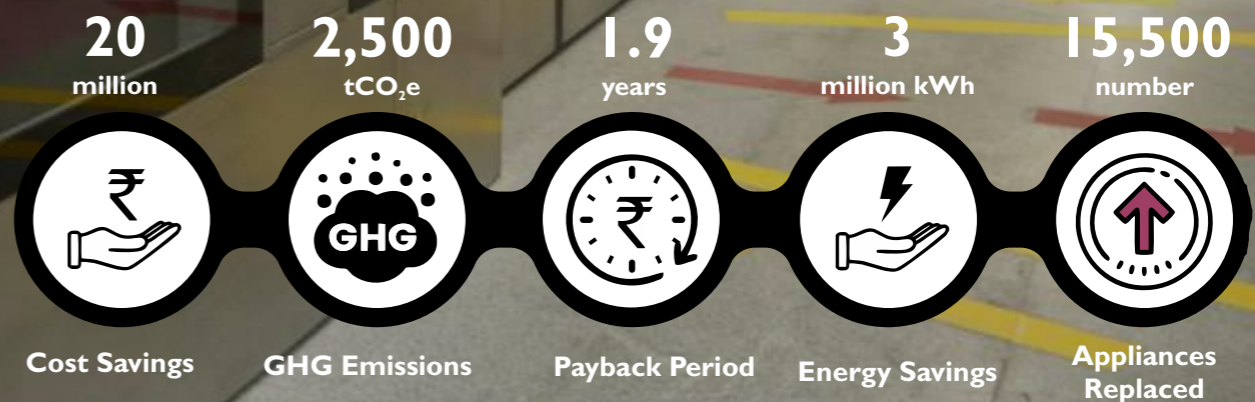
4
Towards Jamtpur West

4

Emergency Stop Only

Delhi Metro Rail Corporation

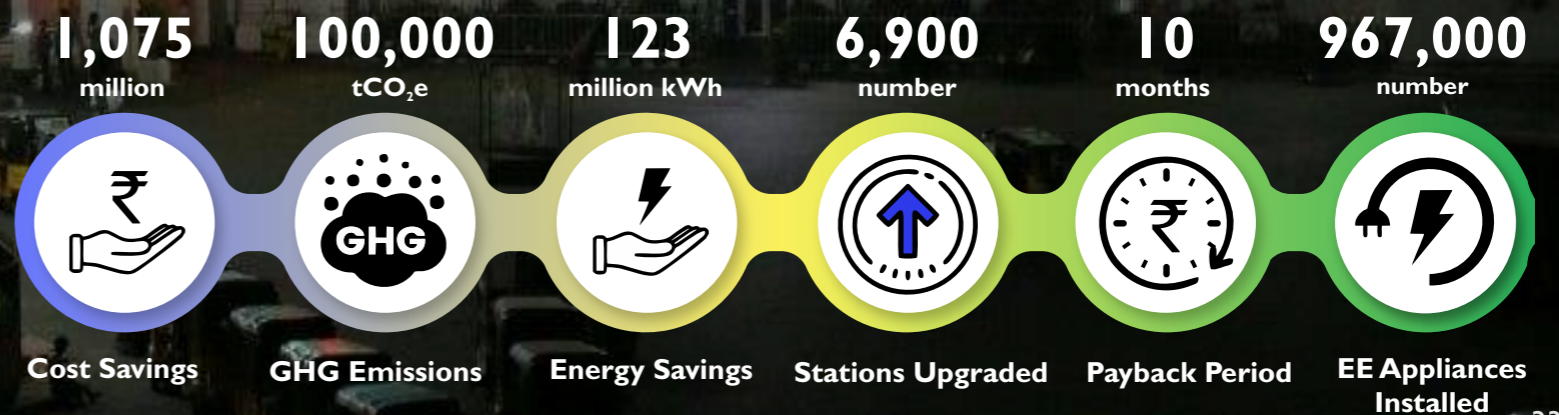
BEEP has retrofitted 17 metro stations for Delhi Metro Rail Corporation. Baseline energy consumption in these stations was estimated to be nearly 6 million units annually. More than 15,000 light fixtures, meeting DMRCs stringent specifications, were replaced across that stations. Investment for upgrades was about 39 crores. 3 million units of electricity are saved annually from the replacements.





Indian Railways

BEEP upgraded 6,900 stations and facilities in 19 states for the Indian Railways. The retrofits resulted in 50% energy savings over the baseline with a payback period of 10 months. Indian Railways was also one of the first to install super-efficient ceiling fans through BEEP.





हमें नित्य स्नान करना चाहिए।

डॉ. अरवि ठाकुर 25 जुलाई 2007
डॉ. अरवि ठाकुर 25 जुलाई 2007 से 25 जुलाई 2007
डॉ. ए. पी. जे. अकबर कलाम 25 जुलाई 2007
श्रीमती प्रियंका इन्ड्रीसिंह पाटील 25 जुलाई 2007

वृक्ष हमें छाया एवं गर्मी से राहत प्रदान करते हैं।

वृक्ष कार्बन डाइऑक्साइड लेकर हमें जीवन दायनी ऑक्सीजन प्रदान करते हैं।

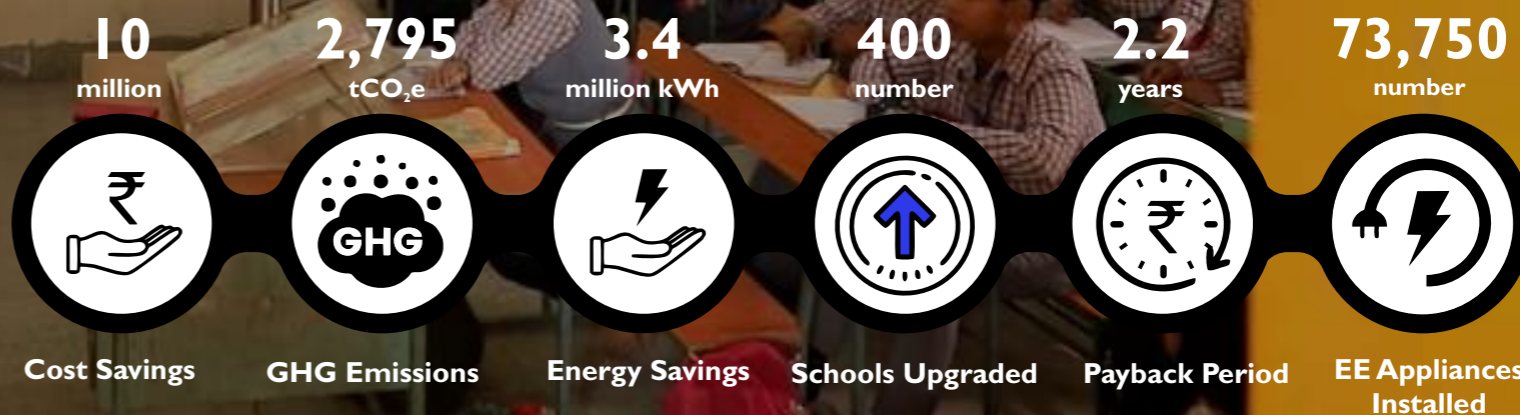
हमारे घर के नाले जल को कहां तक ले जाते हैं?

वृक्ष हमें छाया एवं गर्मी से राहत प्रदान करते हैं।

वृक्षों से हमें फल व औषधियां प्राप्त होती हैं।

South Delhi Municipal Corporation Schools

BEEP installed energy efficient lights, fans and air conditioners in 400 South Delhi Municipal Corporation schools under its ESCO model at a total cost of 66 million INR. This upgrade resulted in savings of about 40%. Improved lighting levels also render classrooms more comfortable for the 2.6 lakh students enrolled in SDMC schools. Over time, SDMC will be able invest monetary savings accrued from this retrofit for improving infrastructure and resources for its students.

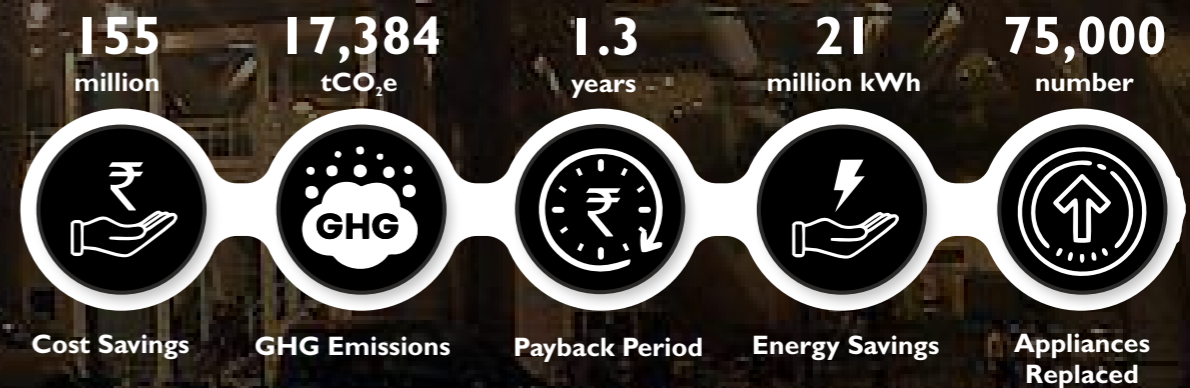






Airport Authority of India

EESL and Airport Authority of India partnered to implement energy efficiency measures in more than 75 airports across the country. More than 75,000 interior and exterior lighting fixtures were replaced with energy efficient LED fixtures. These measures are estimated to more than halve the energy consumption from 41.3 million units to 20 million units of electricity at a cost of 202 million INR.

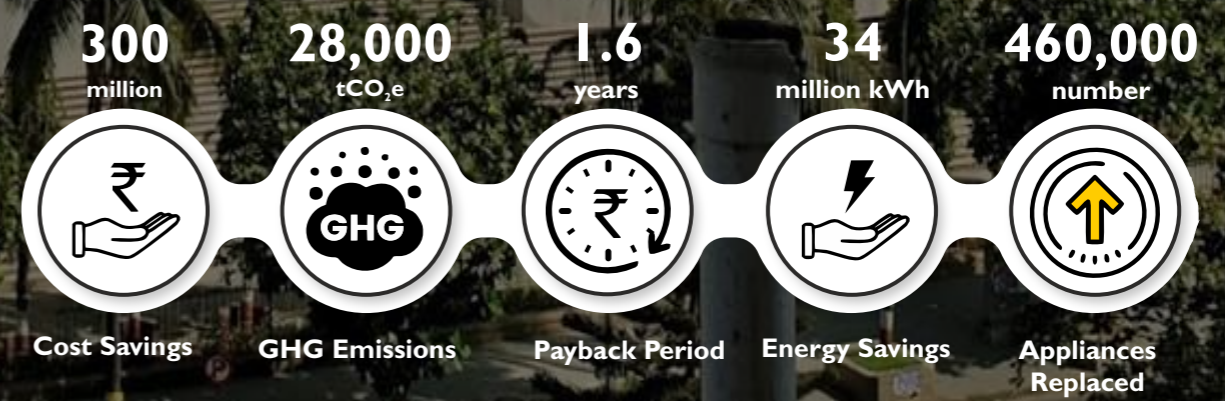






Maharashtra PWD

EESL and Maharashtra Public Works Department entered into an agreement in 2016 to replace lighting and cooling appliances in buildings owned and managed by the agency. More than 2,000 buildings in Amravati, Aurangabad, Kolhapur, Mumbai, Nagpur, Nashik, Osmanabad, Pune, and Thane divisions of Maharashtra PWD were upgraded at a cost of Rs. 485 million. EESL is now assessing power generation potential for solar rooftop photovoltaic systems in Maharashtra PWD buildings. With addition of rooftop photo voltaic systems, these buildings are poised to be amongst the first few net zero energy public buildings in the country.





3061 LED Lighting Fixtures



591 BEE 5-Star ceiling fans



87 BEE 5-Star ACs



328 Super-efficient ACs



2 (120 TR) energy efficient chillers



Other EE products
Efficient water pump, solar window films, APFC controls, etc.

STAR RATING FOR BUILDINGS

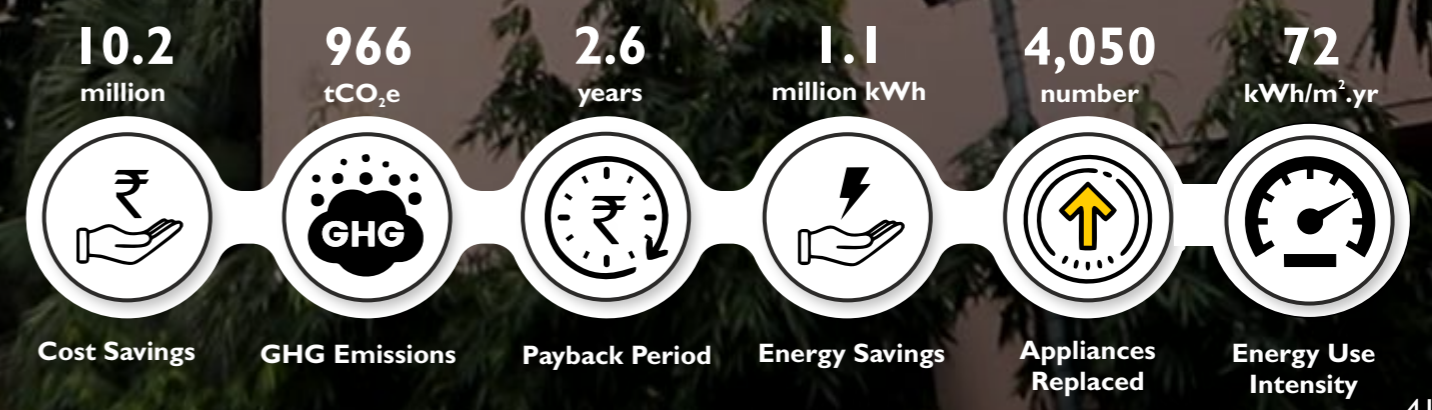
Energy Performance Index
72.72 kWh/sq m/year

Name of the Building	NITI Aayog Bhavan New Delhi
Category of Building	Office
Type	>50% Air Conditioned Area
Climatic Zone	Composite
Contract Demand	881 kVA
Built up Area	23118 sq m
Valid upto	January, 2020

नीति आयोग
NITI AAYOG

NITI Aayog

EESL collaborated with NITI Aayog and Central Public Works Department (CPWD) to implement energy efficient retrofits that led to savings of 11.4 lakh kVAh annually, amounting to INR 1.02 crore per annum in energy bills to NITI Aayog. Post occupancy monitoring and verification has confirmed the savings. As a result of these retrofits, NITI Aayog building has been awarded a 5-Star rating by BEE, with an Energy Performance Index of 72 (kWh/m²/year).





65,000 LED Lighting Fixtures



940 Super-efficient ACs

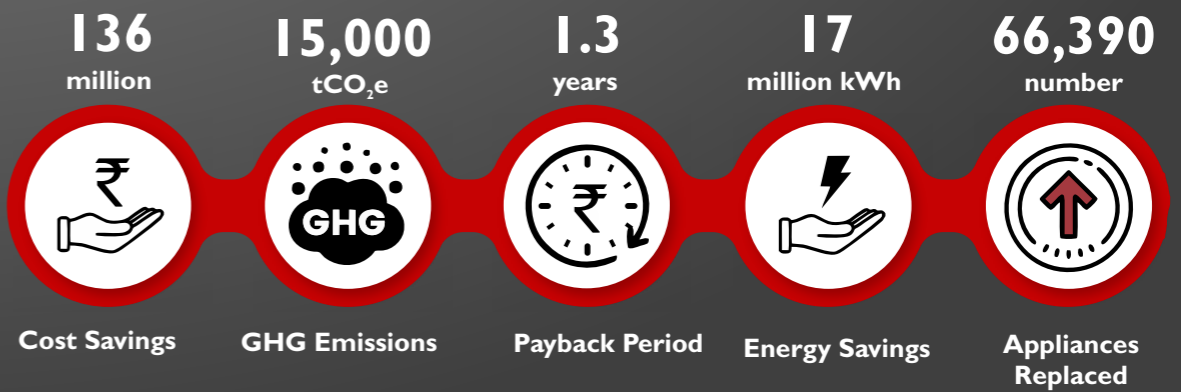


450 Energy efficient Motors



Mahindra & Mahindra

Mahindra and Mahindra Limited was the first project under EESL's corporate Energy Efficiency Program using portfolio approach. Energy efficiency retrofits were done in 18 facilities. The project started in early 2017 with lighting retrofits, followed by replacement of motors and air conditioners 2018 onwards. Retrofits were based on detailed energy audits done by EESL. EESL also conducted training programs on energy conservation for Mahindra and Mahindra employees in the plants. Nearly 30,000 LEDs were distributed to the employees as a part of the scheme.



EESL Building Energy Efficiency Partners

Ministry of Agriculture and Farmers Welfare
Ministry of AYUSH
Ministry of Chemicals and Fertilizers
Ministry of Civil Aviation
Ministry of Coal
Ministry of Commerce and Industry
Ministry of Communications
Ministry of Consumer Affairs, Food and Public Distribution
Ministry of Corporate Affairs
Ministry of Culture
Ministry of Defence
Ministry for Development of North Eastern Region
Ministry of Earth Sciences
Ministry of Electronics and Information Technology
Ministry of Environment, Forests and Climate Change
Ministry of External Affairs
Ministry of Finance
Ministry of Food Processing Industries
Ministry of Health and Family Welfare
Ministry of Heavy Industries and Public Enterprises
Ministry of Home Affairs
AP and Telangana District Court

Ministry of Housing and Urban Poverty Alleviation
Ministry of Human Resource Development
Ministry of Information and Broadcasting
Ministry of Jal Shakti (Water)
Ministry of Labour and Employment
Ministry of Law and Justice
Ministry of Micro, Small and Medium Enterprises
Ministry of Mines
Ministry of Minority Affairs
Ministry of New and Renewable Energy
Ministry of Panchayati Raj
Ministry of Parliamentary Affairs
Ministry of Personnel, Public Grievances and Pensions
Ministry of Petroleum and Natural Gas
Ministry of Planning
Ministry of Power
Ministry of Rural Development
Ministry of Railways
Ministry of Road Transport and Highways
Ministry of Science and Technology
Ministry of Shipping

Ministry of Social Justice and Empowerment
Ministry of Women and Child Development
Ministry of Youth Affairs and Sports
Andaman and Nicobar Islands Govt
Andhra Pradesh Govt
Arunachal Pradesh Govt
Assam Govt
Bihar Govt
Chandigarh Govt
Ministry of Statistics and Programme Implementation
Ministry of Skill Development and Entrepreneurship
Ministry of Steel
Ministry of Textiles
Ministry of Tourism
Ministry of Tribal Affairs
Ministry of Urban Development
Ministry of Water Resources, River Development and Ganga Rejuvenation

EESL Network

International Operations

- United Kingdom (UK)
- Saudi Arabia
- Malaysia
- Bangladesh
- Maldives
- Thailand





ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

www.eeslindia.org

Registered and Corporate Office

Energy Efficiency Services Limited
NFL Building, 5th, 6th & 7th Floor, Core – III,
SCOPE Complex, Lodhi Road,
New Delhi – 110003
Tel: +91 (011) 4580 1260

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Energy Efficiency Services Limited

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MEEP: meep.eeslindia.org/dashboard/