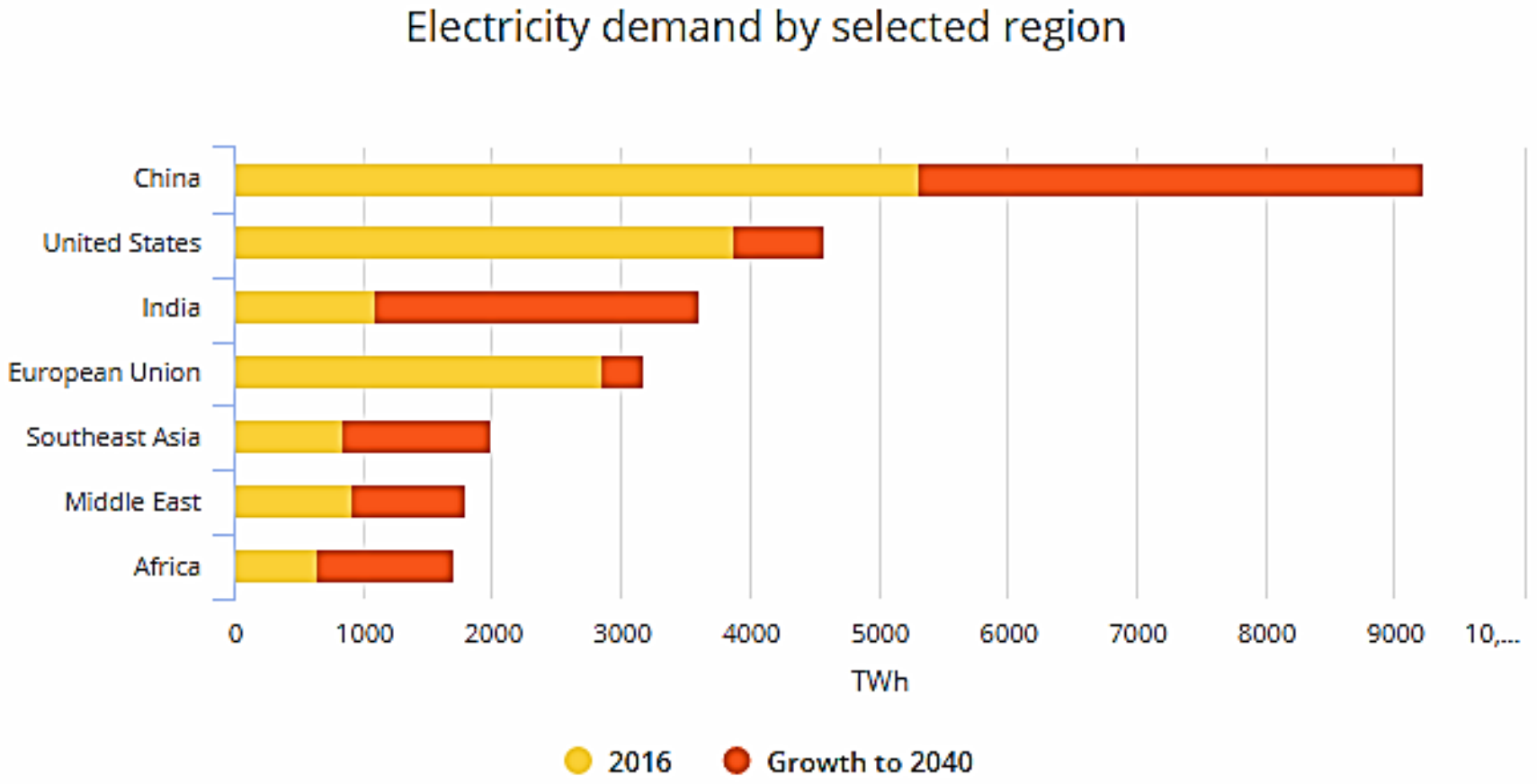
Energy Conservation in Municipalities and Potential Areas for Energy Savings

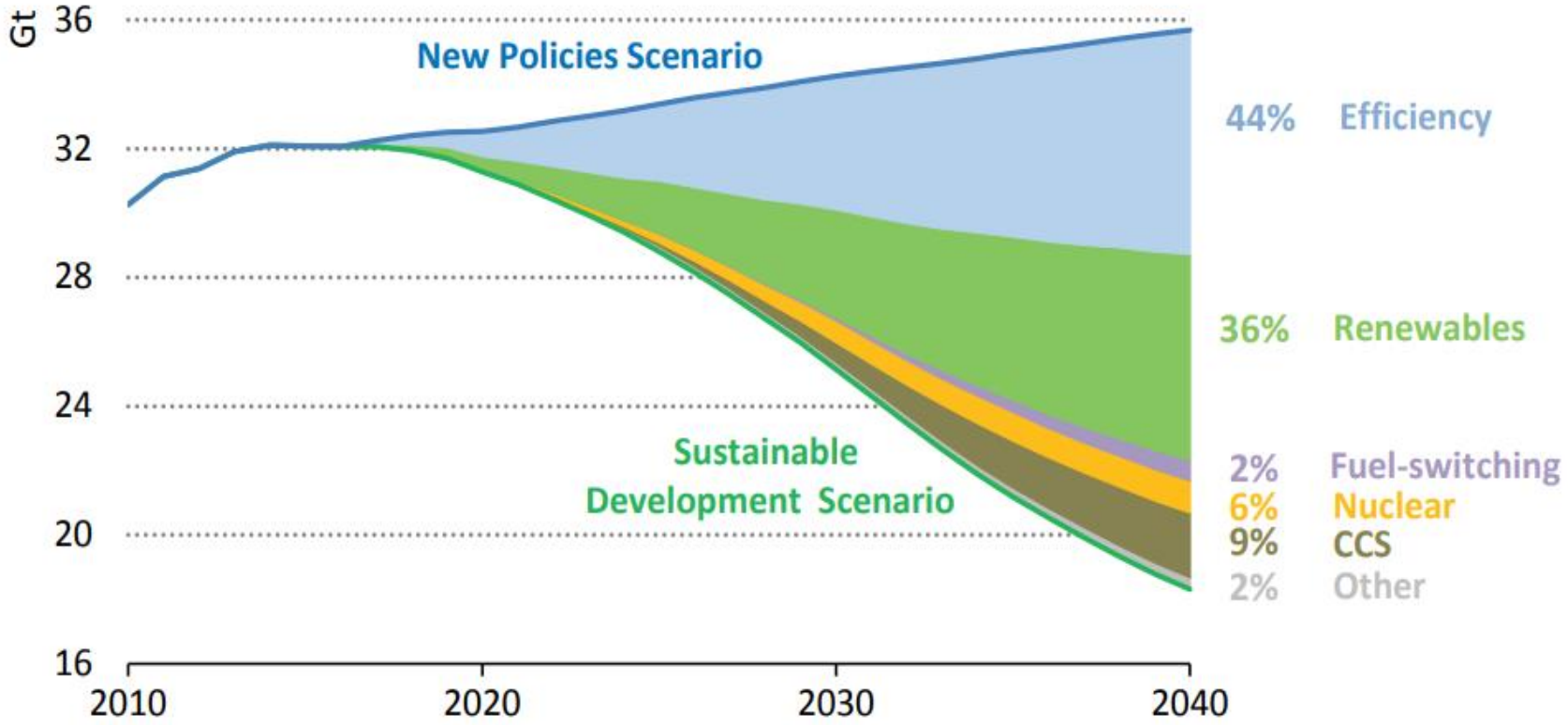
Administrative Staff College of India, Hyderabad

Electricity Demand across the WORLD

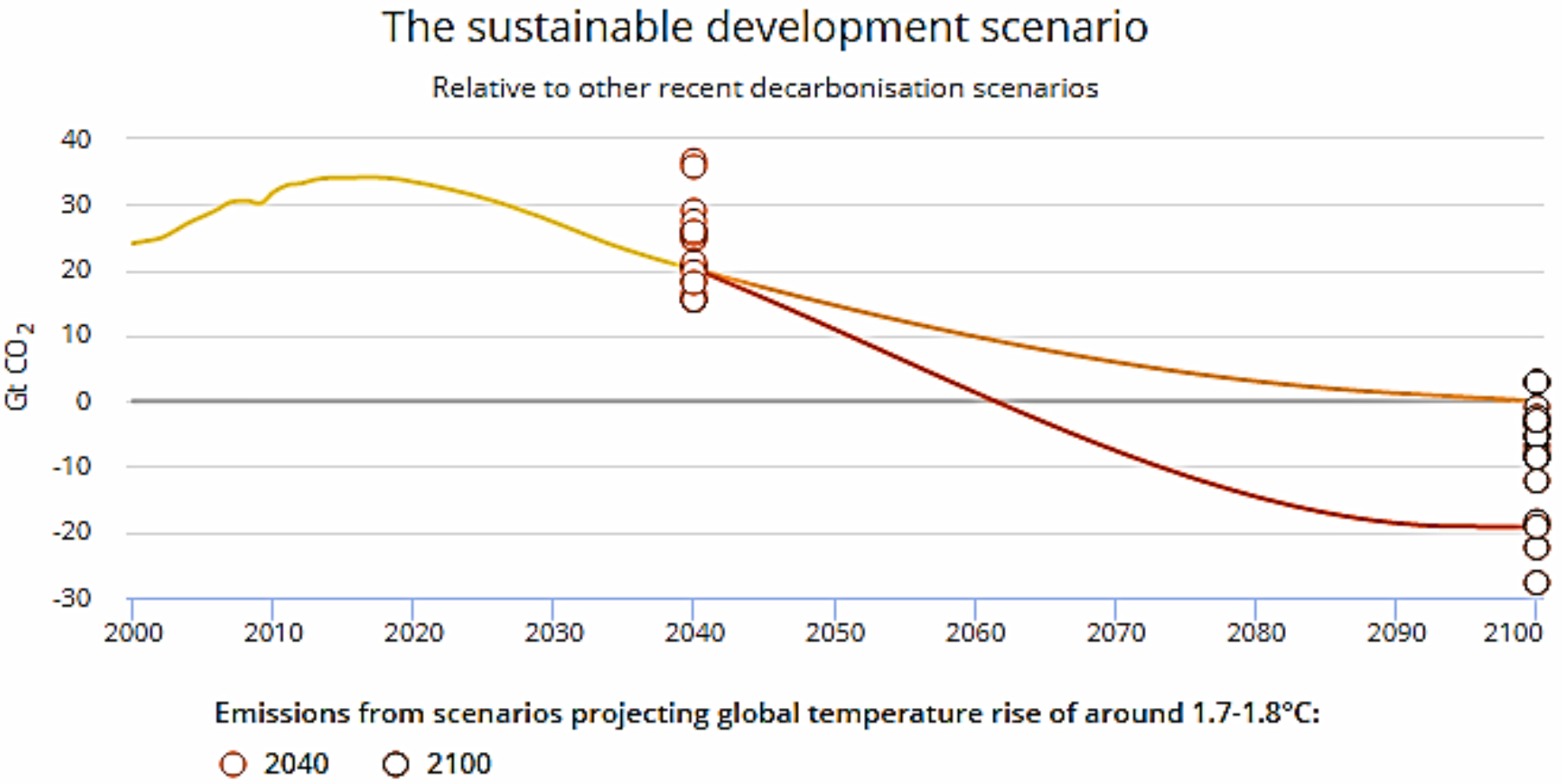


World Energy Outlook 2017, IEA

Global carbon emissions reductions in WEO 2017 New Policies and Sustainable Development Scenarios

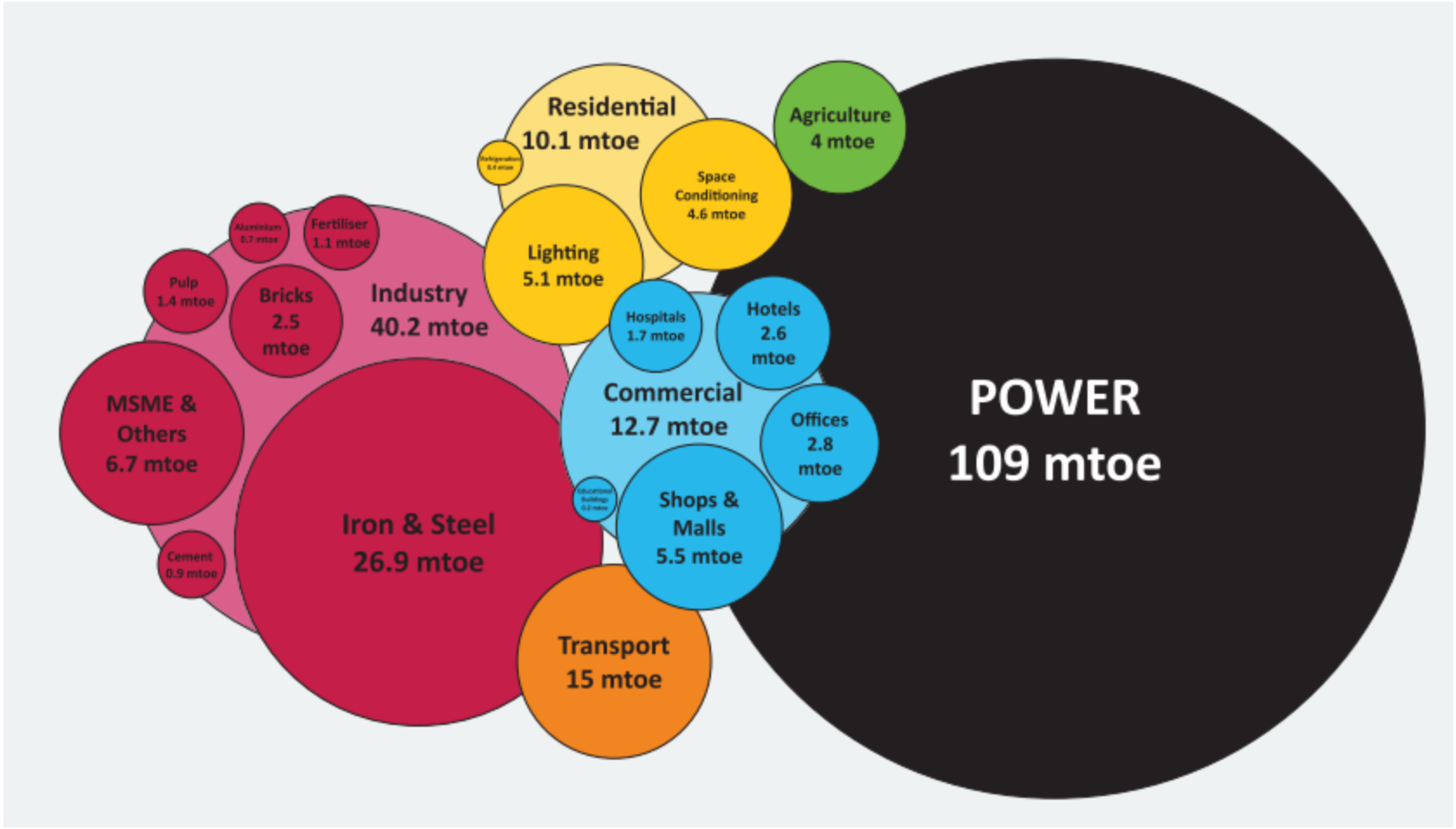


Emissions projecting global temperature rise



World Energy Outlook 2017, IEA

Energy Saving Potential in India by 2031



ENERGY EFFICIENCY

- **Definition**

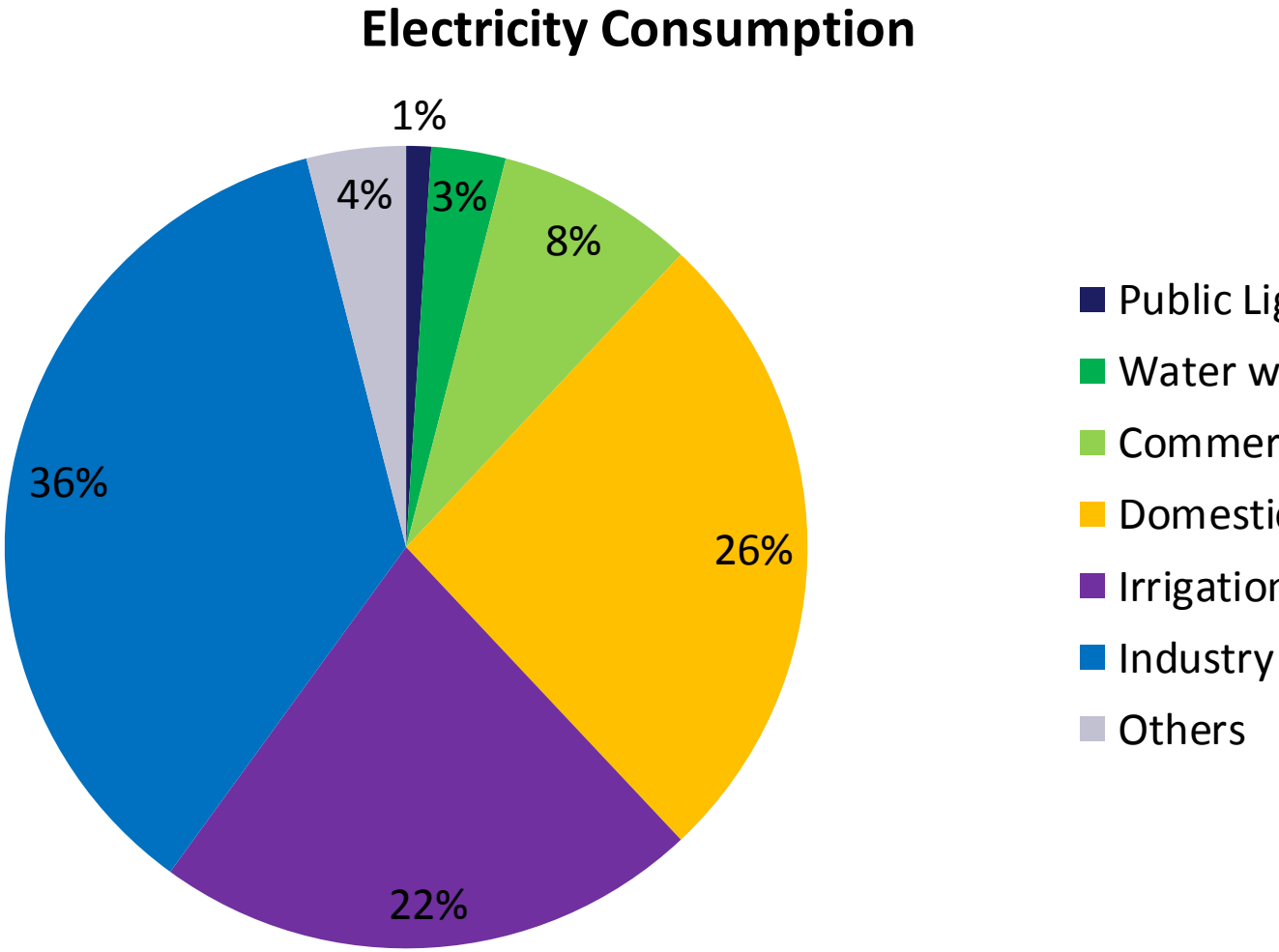
  'Energy Efficiency' *means the ratio of output of performance, service, goods or energy, to input of energy*

Reasons for Energy efficiency in Municipalities

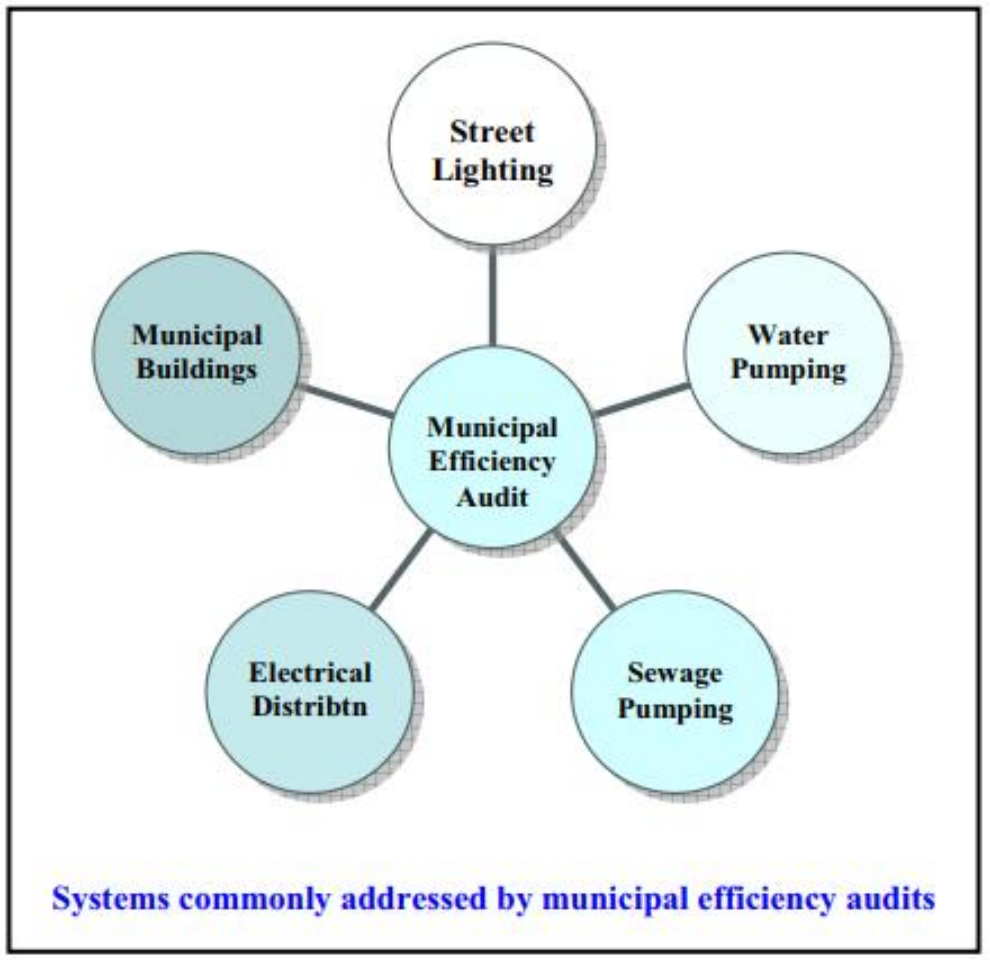
- Average 4% of total electricity consumption is from Municipal Sector
- Municipalities are spending large amount of their revenue on purchasing energy for providing local public services like Street lighting, water supply, sewage pumping, Municipal buildings and Electrical distribution.
- 25 % of savings can be done through cost effective actions.

Through energy efficiency more than 100 GW additional coal capacity can be avoided until 2047

Electricity Consumption in Different divisions



Municipal Efficiency Opportunities



Systems commonly addressed by municipal efficiency audits

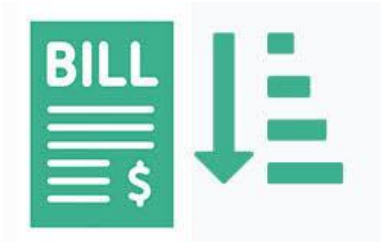
The major energy loads are typically from the following:

1. Street lighting
2. Water pumping
3. Sewage pumping
4. Electrical distribution
5. Municipal buildings

Reasons for EE Projects in Municipalities

- **Reasons for prioritizing energy efficiency projects**
  - India is plagued by high operating expenses in the supply of water. Anywhere between 40% to 60 % of energy costs arise only from supplying water, and an estimated 4800 million units in electricity is wasted every year due to inefficient water pumps
  - 66% of the building stock in 2030 yet to be constructed according to 2010 data – Most of the buildings are energy inefficient
  - Street Lighting – critical area for every municipality as per Energy Bill is concerned

- **Major targets for the Energy Efficiency Projects in India**
  - Energy savings of 20% to 40%
  - Approximately 4800 MUs of energy savings per annum
  - Avoid the need for an additional capacity of more than 3300 MW
  - Reduction of 3.9 million tonnes of CO2 emissions per annum
  - Monetary savings of approximately Rs 3200 Crores per annuum



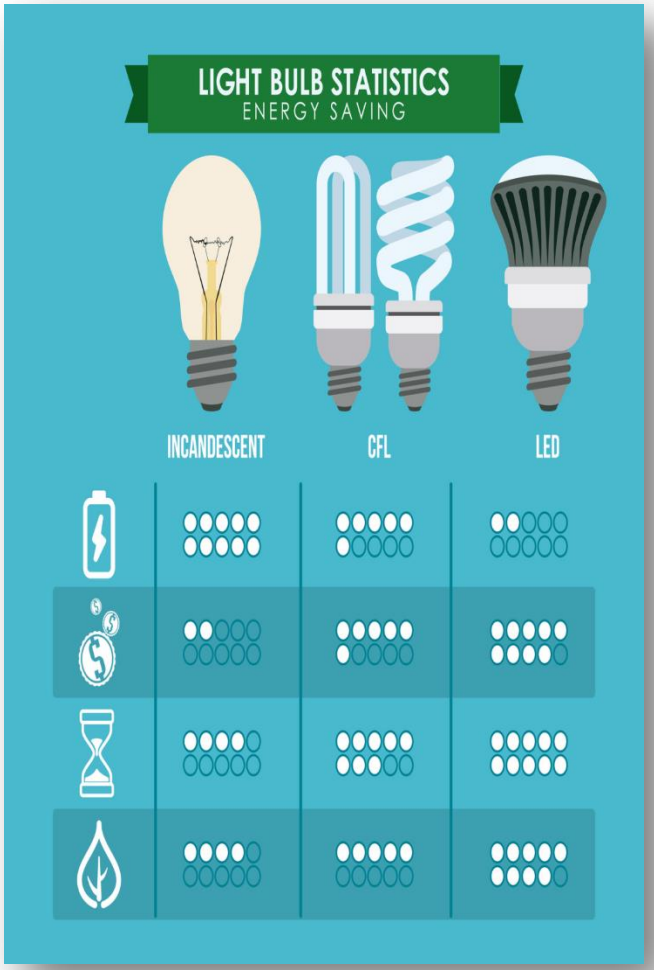
Energy Efficiency Programs in INDIA

- Standards and Labeling, 2006
- Energy Conservation Building Code, 2008
- Agriculture DSM, 2010
- Municipal DSM (Street Lighting), 2015
- Capacity Building of DISCOMs
- UJALA, 2015
- Strengthening of State Designated Agency (SDAs)
- Contribution to State Energy Conservation Fund (SECF)
- Perform Achieve and Trade (PAT), 2012
- Bachat Lamp Yojana (BLY), 2010
- Super Efficient Equipment Program (SEEP), 2013
- Domestic Efficient Lighting Program (DELP), 2015
- Energy Efficient Financing Platform (EEFP)
- Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE), 2012
- Venture Capital Fund for Energy Efficiency (VCFEE), 2017

Energy efficiency activities in Municipalities in INDIA – Through Energy Service Company

- The Municipality Demand Side Management (Mu-DSM) scheme of BEE was initiated during XI plan
  - **Objective of the project** was to improve the overall energy efficiency of the ULBs, which could lead to substantial savings in the electricity consumption, thereby resulting in cost reduction/savings for the ULBs.
- Energy Efficient Street Lighting Guidelines were issued
- The **India Energy Efficiency Scale-Up Program** will help Energy Efficiency Service Limited to expand UJALA's deployment of efficient ceiling fans, LED street lights and LED tube lights, along with successful LED bulbs procurement and distribution.
- Under the Street Lighting National Program (SLNP) of EESL has installed over 5.8 million LED street lights in three years across more than 500 municipalities
- EESL enters into long-term annuity agreements with municipalities to retrofit existing streetlights with LED lamps and fixtures, and maintain them for up to seven years.
- The entire investment is made upfront by EESL and recovered from the energy savings of municipalities/cities.

Street lighting System



LED lighting brings a better quality of light together with over 60% average annual cost savings.

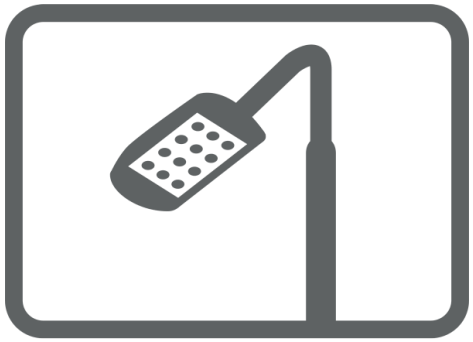
With the increased adoption of LEDs over the next 15 years will also reduce electricity demand from lighting by 62 percent, prevent 258 million metric tons of carbon emissions, and eliminate the need for 133 new power plants

Benefits:

1. The technology reduces energy consumption in comparison to the conventional high-pressure sodium (HPS) lights.
2. It also provides a significant reduction in the pollution level.

Street lighting System - Issues in Contemporary Street Lighting

- The main reason for the poor and inefficient design of the street lighting system in any municipalities are:
  - Selection of energy inefficient equipment,
  - Poor designing practice of street lights,
  - Poor power quality,
  - Higher O & M costs, and
  - Lack of skilled labor



- Following parameters contribute to low lighting levels on the street:
  - Improper pole to pole spacing and angle of title
  - Inadequate or higher mounting height,
  - Interruptions due to road side trees,
  - Improper selection of lamps and fittings, and
  - Poor maintenance of the lamps (continuous dust accumulation, change in orientation, non replacement of burn out lamps, etc.)

Designed based lighting system – Concept of lightning and non lighting materials

300 % Improvement in Service Delivery

58 % Energy Savings

Comparison of one Km Road length (Conventional v/s Design based Lighting)

	Conventional	Design based
No.s of Poles	33	22 (33% reduction)
No.s of Luminaries	66	44 + 2 (33% reduction)
Annual KWH	77500 Kwh	51700 Kwh (33% saving)
Saving by staggering	-	*(50% from conventional)*
Saving by Energy saver	-	(58% from conventional)
Average Illumination	Less than 12 Lux	30/35 Lux with 40% Uniformity

LED Street lighting and Energy Saving under SLNP

CITY	TOTAL LED STREET LIGHT INSTALLED	TOTAL ANNUAL ENERGY SAVINGS (MUs)	TOTAL PERCENTAGE SAVINGS (%)
Varanasi, Uttar Pradesh	947	1.56	71%
Jhalawar, Rajasthan	2449	0.37	55%
Mount Abu, Rajasthan	1807	0.65	60%
Visakhapatnam, Andhra Pradesh	91775	23.54	60%
Agartala, Tripura	34200	3.90	53%
Total	131178	30.02	

Source: EESL India

STREET LIGHTING NATIONAL PROGRAMME (SLNP)

Launched in 2015, EESL's Street Light National Programme (SNLP) has been instrumental in replacing over **50 lakh street lights** in **over 500 cities in India**, leading to **135 crore kWh** of energy savings and cost saving of **INR 742 crore every year**.

By 2019, SLNP aims to replace all the **1.34 crore** conventional street lights in India. This ambitious goal will make a tremendous difference, enabling peak demand reduction of **500 MW**, annual energy savings of **190 crore kWh,** and reduction in **15 lakh tons of CO2.**

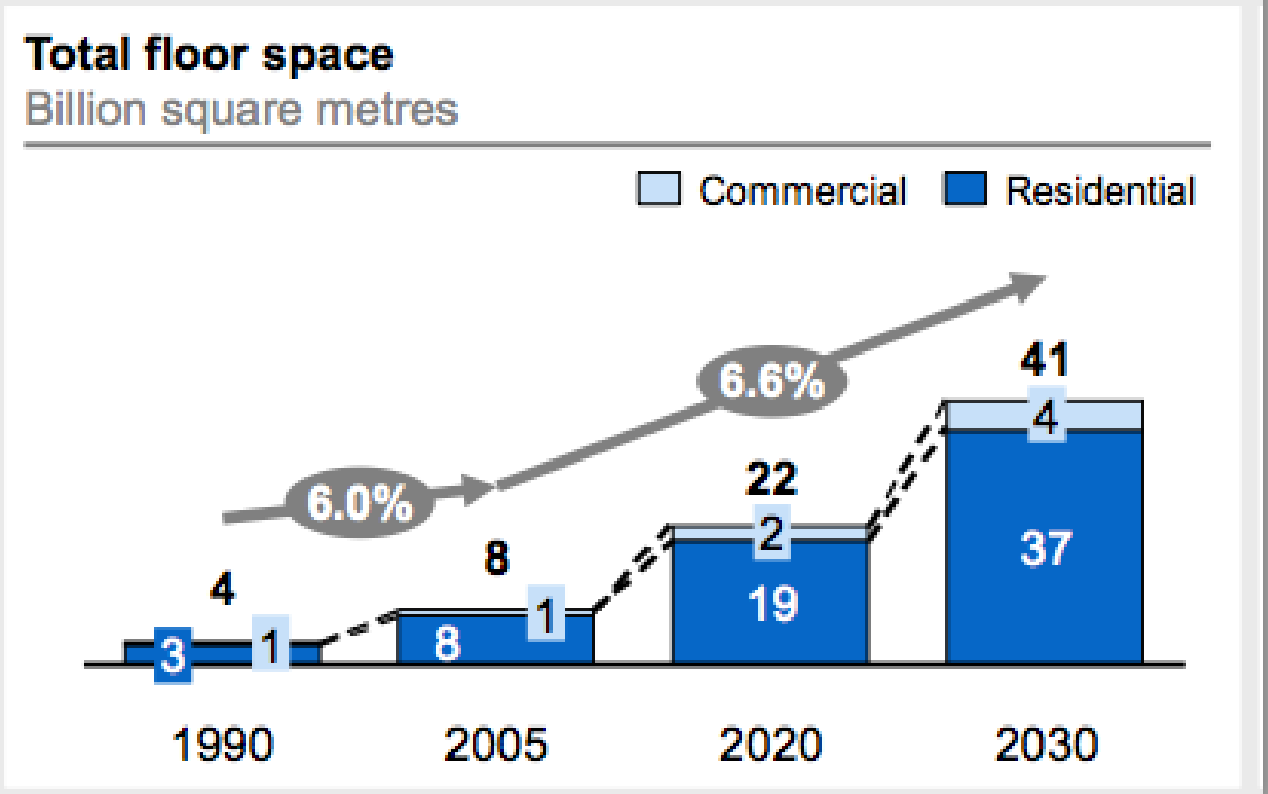
Water and Sewage Pumping

Opportunities of energy efficiency in Pumping system are as follows:

- Energy Consumption by public water works
  - 2.57% relative to total energy consumption by all sectors
  - More than 20000 million units saving potential
- Effective ways
  - Maintenance
  - Monitoring
  - Controls
  - Reduction of demand
  - More efficient pumps
  - Proper pump sizing
  - Multiple pumps for varying loads
  - Impeller trimming (or shaving sheaves)
  - Adjustable speed drives (ASDs)
  - Avoiding throttling valves
  - Proper pipe sizing

Projected Growth Across Building sector in India

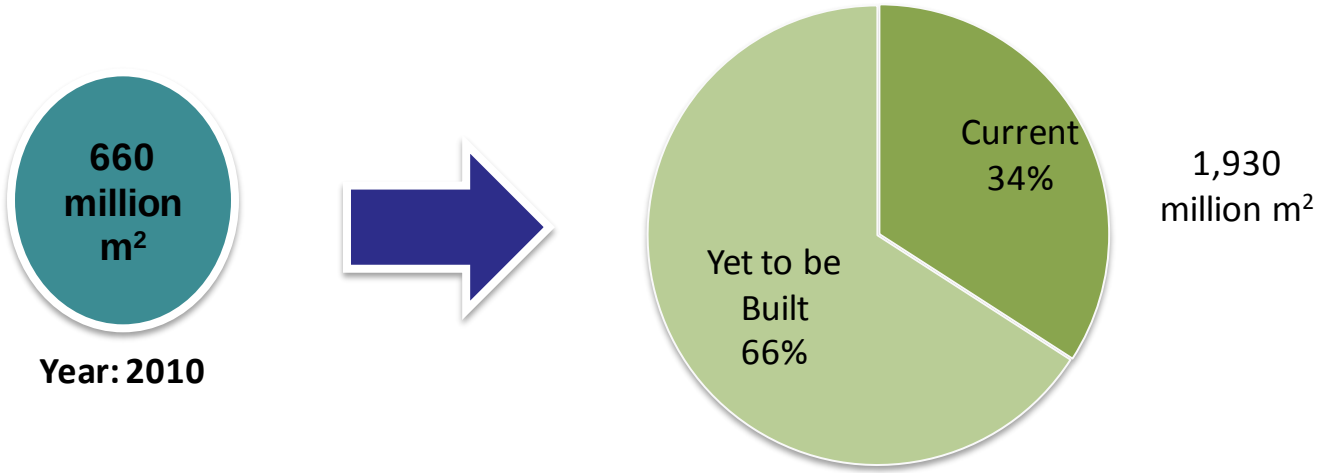
Demand growth up to 2030



Commercial Buildings Sector in India

- Commercial Buildings Growth Forecast
- Currently, ~ 659 million m^2 (USAID ECO-III Internal Estimate Using MOSPI, CEA and Benchmarked Energy Use data)
- In 2030,~ 1,900 million m^2 (estimated) *

66% building stock is yet to be constructed



* Assuming 5-6% Annual Growth

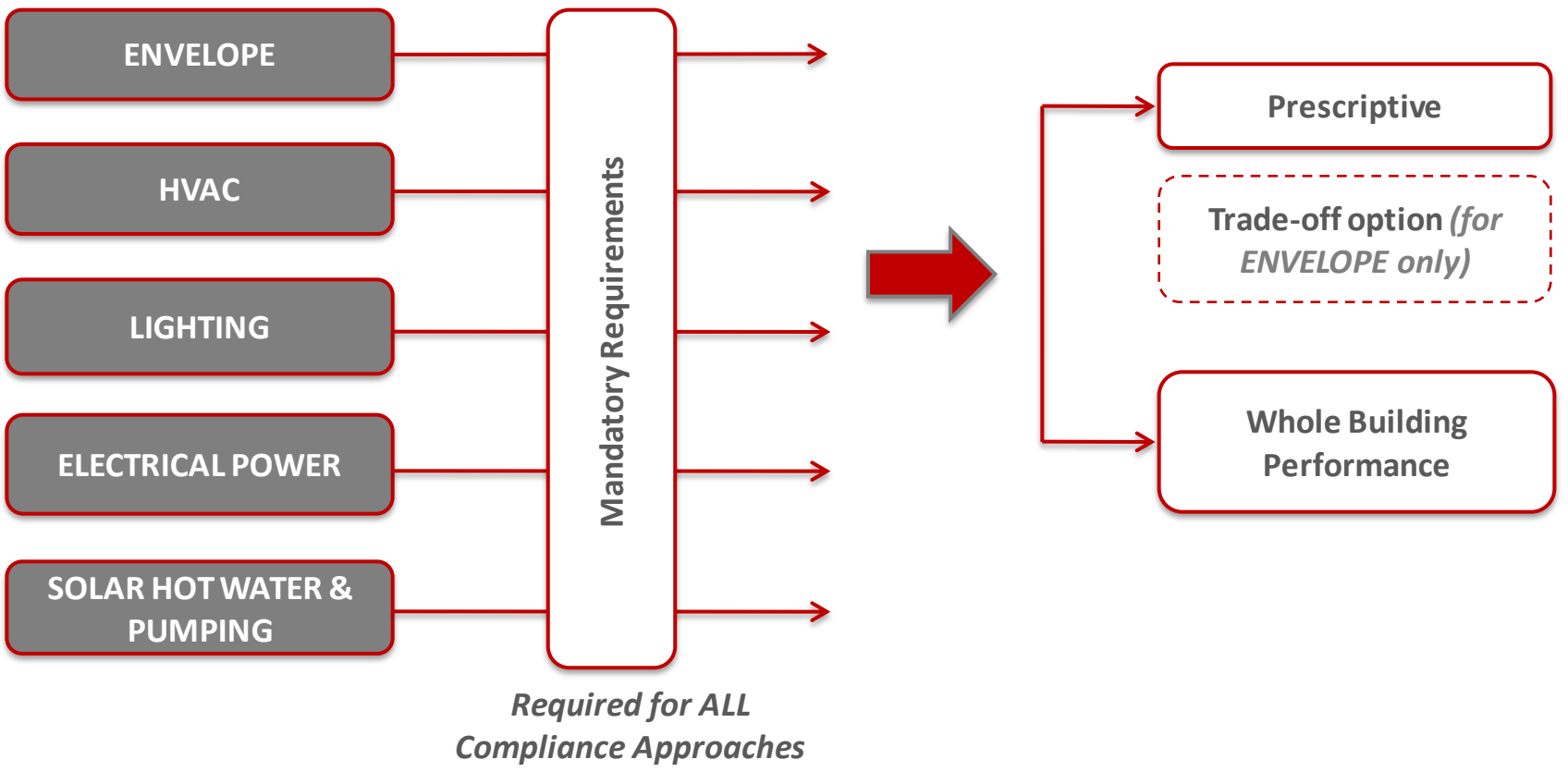
Source: USAID ECO- III Project, Lawrence Berkeley National Laboratory

Energy Conservation Building Code (ECBC)

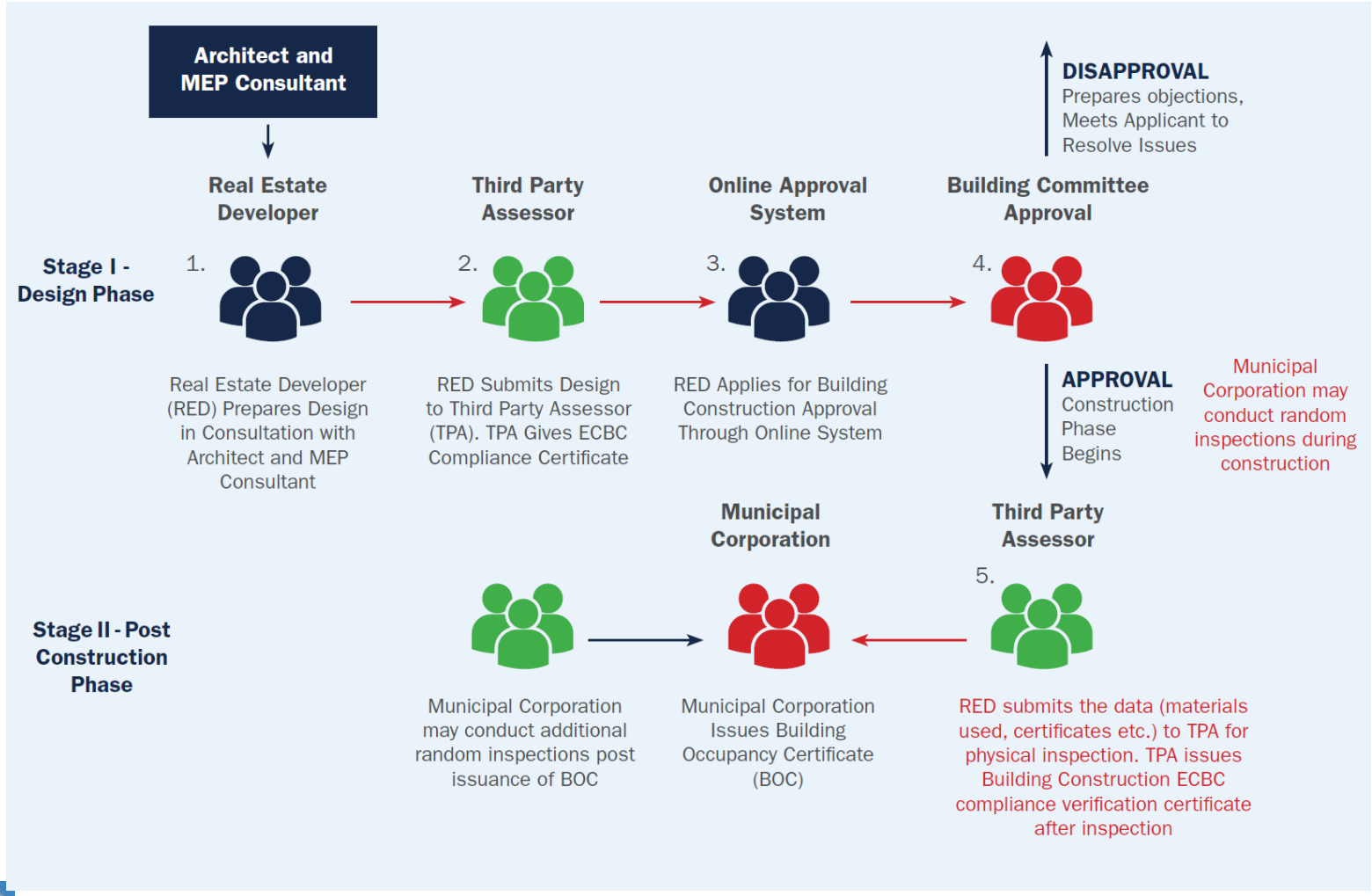
OVERVIEW

1. ECBC sets minimum energy efficiency standards for design and construction of commercial buildings
2. ECBC encourages energy efficient design of new buildings and major renovations
3. Addresses local design conditions and helps improve existing construction practices
4. Emphasis on Integrated Building Design approach
5. First generation code – ease of use and continuous improvement

ECBC Compliance



Building approval process that includes ECBC compliance



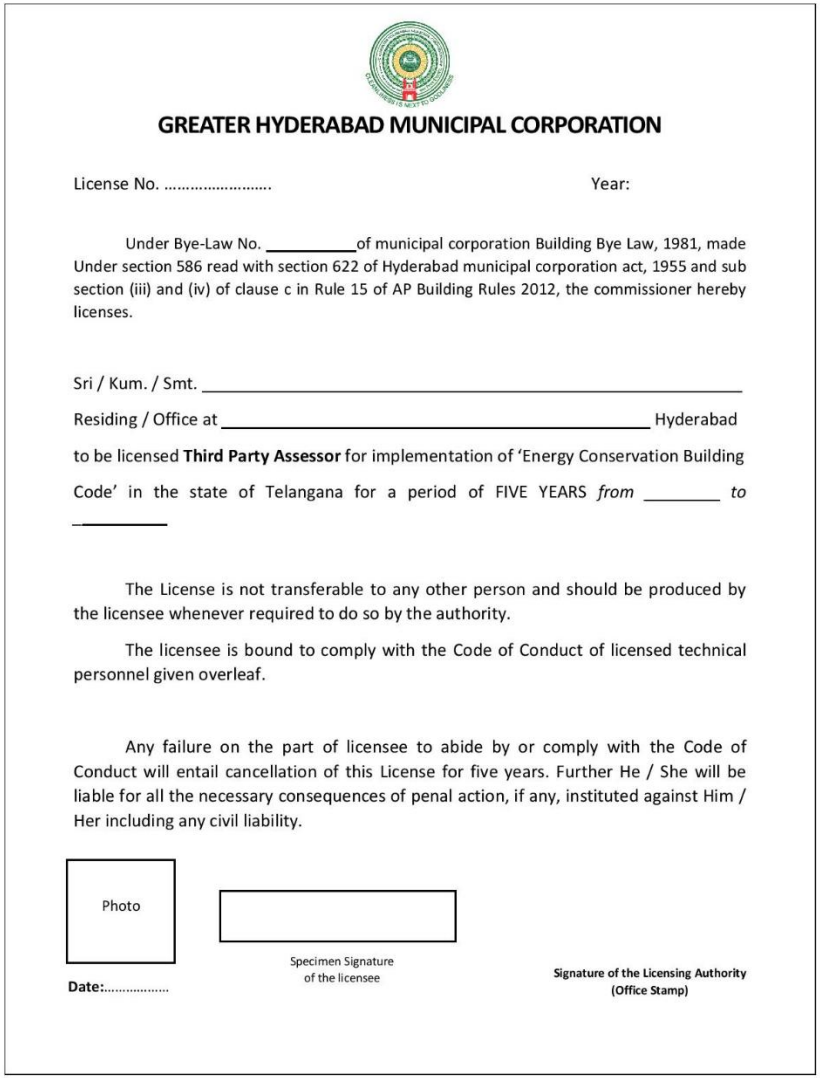
TPA License Format

Every empanelled Third Party Assessor shall possess the following License document.

- ✓ The license form specifies the name, address, license number and the term of the licensee with an official stamp from the GHMC.
- ✓ Each TPA will be assigned with a unique license number which will also be replicated in the Compliance Certificate.

Significance: The License enables the Third Party Assessor to scrutinize the building documents for ECBC compliance and issue the "ECBC Certificate".

It also enables the GHMC to monitor the TPAs



GREATER HYDERABAD MUNICIPAL CORPORATION

License No. ..... Year:

Under Bye-Law No. _____of municipal corporation Building Bye Law, 1981, made Under section 586 read with section 622 of Hyderabad municipal corporation act, 1955 and sub section (iii) and (iv) of clause c in Rule 15 of AP Building Rules 2012, the commissioner hereby licenses.

Sri / Kum. / Smt. _____

Residing / Office at _____ Hyderabad

to be licensed **Third Party Assessor** for implementation of 'Energy Conservation Building Code' in the state of Telangana for a period of FIVE YEARS *from* _____ *to* _____

The License is not transferable to any other person and should be produced by the licensee whenever required to do so by the authority.

The licensee is bound to comply with the Code of Conduct of licensed technical personnel given overleaf.

Any failure on the part of licensee to abide by or comply with the Code of Conduct will entail cancellation of this License for five years. Further He / She will be liable for all the necessary consequences of penal action, if any, instituted against Him / Her including any civil liability.

Photo

Specimen Signature of the licensee

Date:.....

Signature of the Licensing Authority (Office Stamp)

TSECBC Compliance Certificate at Design Stage

Percentage of savings:

- ✓ ECBC certificate highlights the percentage savings of the building.
- ✓ The star rating is awarded based on the percentage of savings obtained from calculating the EPI.

Significance: Increases the marketability of the building.

TSECBC COMPLIANCE CERTIFICATE

LICENSEE NUMBER. 456

SILICON PLAZA,
Hyderabad

has successfully achieved following level of certification established by Government of Telangana for Energy Conservation Building Code compliance

OCTOBER, 2017

3 STAR RATING at Design Stage

METHOD OF COMPLIANCE

○ PRESCRIPTIVE ● WHOLE BUILDING PERFORMANCE ○ BUILDING ENVELOPE TRADEOFF

GENERAL INFORMATION	TECHNICAL INFORMATION
Applicant Name: Rajkiran V **Address:** Rajbhavan Rod, Hyderabad **Project Description:** New **Project Category :** Shopping Mall **Site Area:** 3000 Sq.mts **Built Up Area:** 6000 Sq.mts **Conditioned Area:** 4000 Sq. mts. **Unconditioned Area:** 2000 Sq.mts	**Project Base case EPI :** 100 kWh/m2/year **Project Existing EPI :** 88 kWh/m2/year **Star Category Awarded:** 3 Star Rating **Percentage of Savings 12%**

Name of Licensee/Firm : Satish S Magal

Signature of the Licensee/Firm

TSECBC Compliance Certificate at Occupancy Stage

Percentage of savings:

- ✓ ECBC certificate highlights the percentage savings of the building.
- ✓ The star rating is awarded based on the percentage of savings obtained from calculating the EPI.

Significance: Increases the marketability of the building.

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Name of Licensee/Firm : Satish Kumar

Signature of the Licensee/Firm

GHMC - Efforts

Expression of Interest for Empanelment of Third Party Assessors for implementation of ECBC in Telangana

FAQs on Online Compliance System for ECBC

Benefits of Energy Efficiency

- **Environmental**
  - Increased efficiency can lower greenhouse gas (GHG) emissions and other pollutants, as well as decrease water use.
- **Economic**
  - Improving energy efficiency can lower individual utility bills, create jobs, and help stabilize electricity prices and volatility.
- **Utility System Benefits**
  - Energy efficiency can provide long-term benefits by lowering overall electricity demand, thus reducing the need to invest in new electricity generation and transmission infrastructure.
- **Risk Management**
  - Energy efficiency also helps diversify utility resource portfolios and can be a hedge against uncertainty associated with fluctuating fuel prices.

Opportunities to improve Energy Efficiency(1/3)

- **Local Government Operations and Facilities** –
  - **Energy costs** can be a significant line item in a local government's annual operating budget.
  - By **investing in energy efficiency**, local governments can achieve substantial energy cost savings across their **facilities**, and **demonstrate energy and environmental leadership**.
  - **Improving the efficiency** of existing and new facilities, local governments can incorporate energy efficiency criteria into product procurement decisions.
- **Water and Wastewater Facilities** – Municipal water and wastewater facilities are typically the largest consumers of energy in municipal operations.
  - Improving the energy efficiency of equipment and operations at water and wastewater facilities can **reduce energy costs, GHG emissions**, and increase treatment efficiency.

Opportunities to improve Energy Efficiency (2/3)

- **Non–Governmental Buildings** –
  - Government buildings typically account for a relatively small percentage of the total GHG emissions.
  - **Strategies** to improve the **energy efficiency** of commercial, industrial, and other non-governmental buildings allow local governments to achieve much greater benefits than by focusing on their buildings alone.
- **Residential** –
  - Helping homeowners improve energy efficiency in their homes can be an effective strategy for local governments
    - To reduce energy demand
    - To Reduce greenhouse gas emissions
    - To Increase the households savings
    - To Improve comfort

Opportunities to improve Energy Efficiency (3/3)

- **Utilities and Energy Efficiency Program Sponsors** –
  - By working with **electric and gas utilities**, regional energy efficiency alliances, and other organizations dedicated to improving energy efficiency
  - **local governments** can leverage resources and capitalize on the expertise and unique abilities of utilities and alliances to improve energy efficiency among **end users**

Steps for developing municipal energy efficiency projects

1. Self assessment to choose the best fit option for undertaking Energy Efficiency (EE) program
2. Collect energy usage data by carrying out a preliminary (walk-through) audit
3. Develop and issue a request for Expressions of Interest (EOI)
4. Issue of Request for Proposal (RFP)
5. Evaluate the proposals
6. Finalize ESCO selection
7. Award the Investment Grade Audit (IGA) contract
8. Package the documentation for third party financing
9. Enter into the performance contract
10. Monitoring and Verification (M&V)

THANK YOU

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