

Collaboration and Partnerships in Implementing Energy Efficiency Programs in India

Experiences from the ECO-III Project

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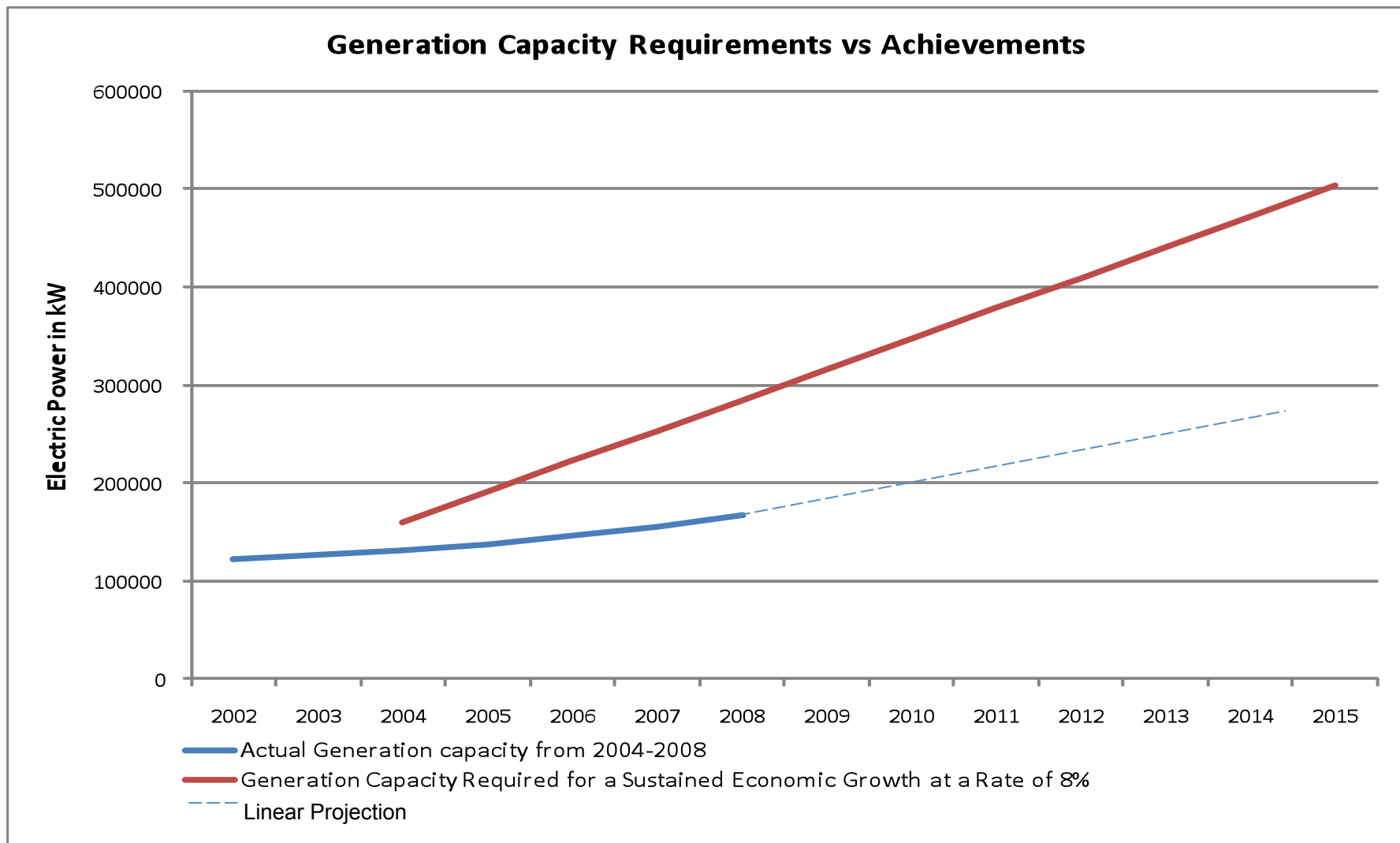
LBNL-DC Office, Washington, DC
7th July 2010



Presentation Outline

- Electricity Scenario in India
 - Comparing Requirements to Achievements
 - Per Capita Electricity Use, Distribution by Sector
 - Comparison with World Electricity Use
- Ongoing Government of India Initiatives
- About USAID ECO-III
- ECO-III Partners
- Major Activities
 - Energy Efficiency in Buildings
 - State Level Energy Efficiency
 - Institution Building/Enhancement
 - Educational Curriculum and Professional Training
 - Outreach Activities
- New Publications
- Screening of Regional Energy Efficiency Center Documentary

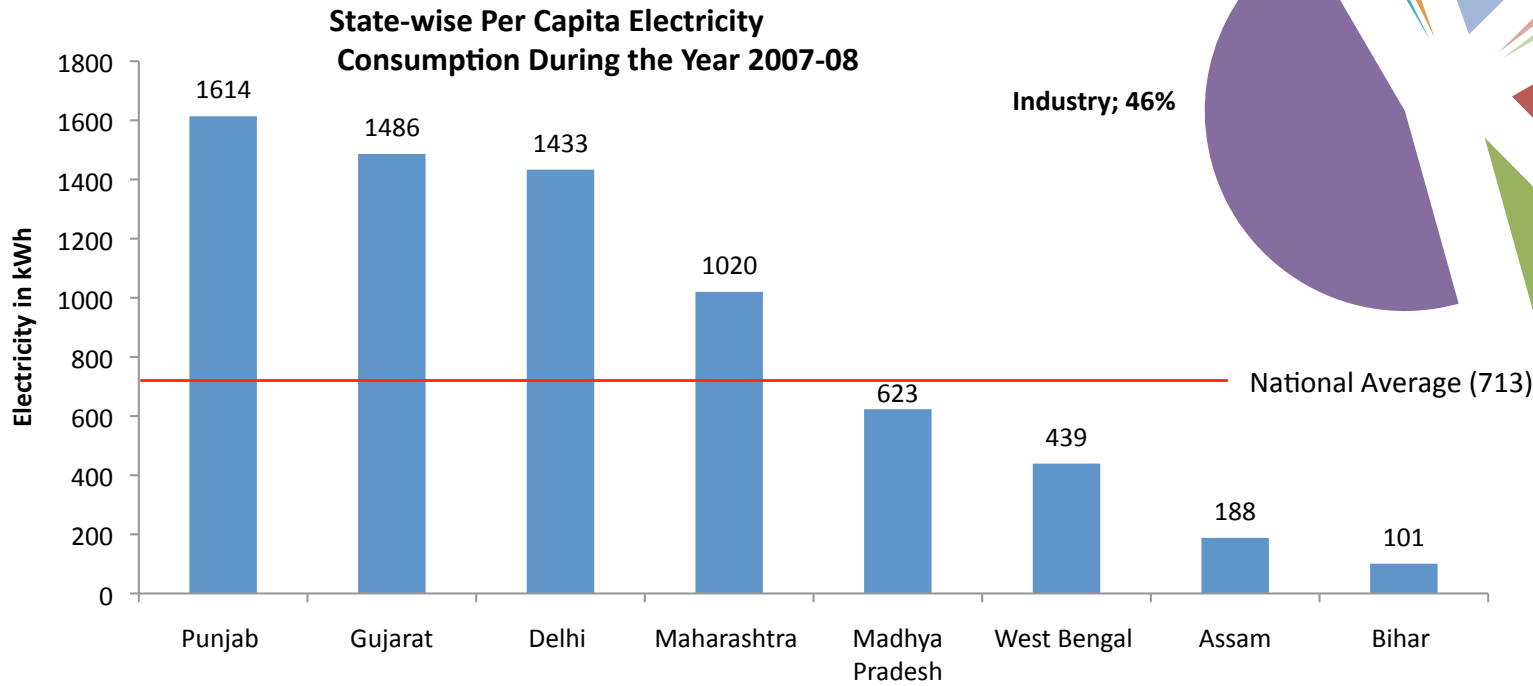
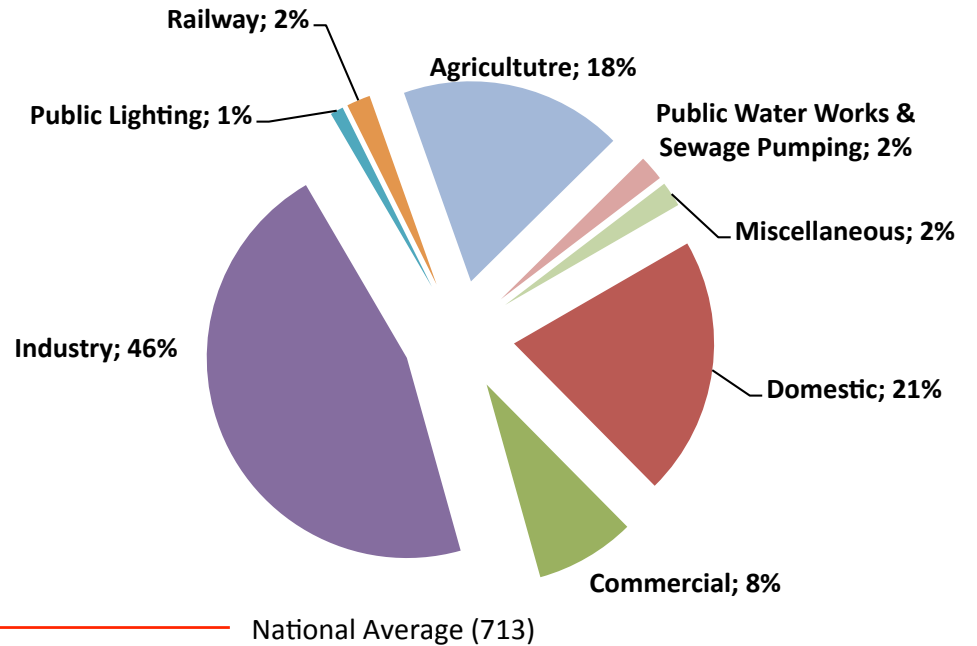
Electricity Scenario in India



Source: Central Electricity Authority General Review 2006 & 2009 and Planning Commission's Integrated Energy Policy Report 2006

Electricity Scenario in India

SECTOR- WISE ELECTRICITY CONSUMPTION IN INDIA (2007- 2008)

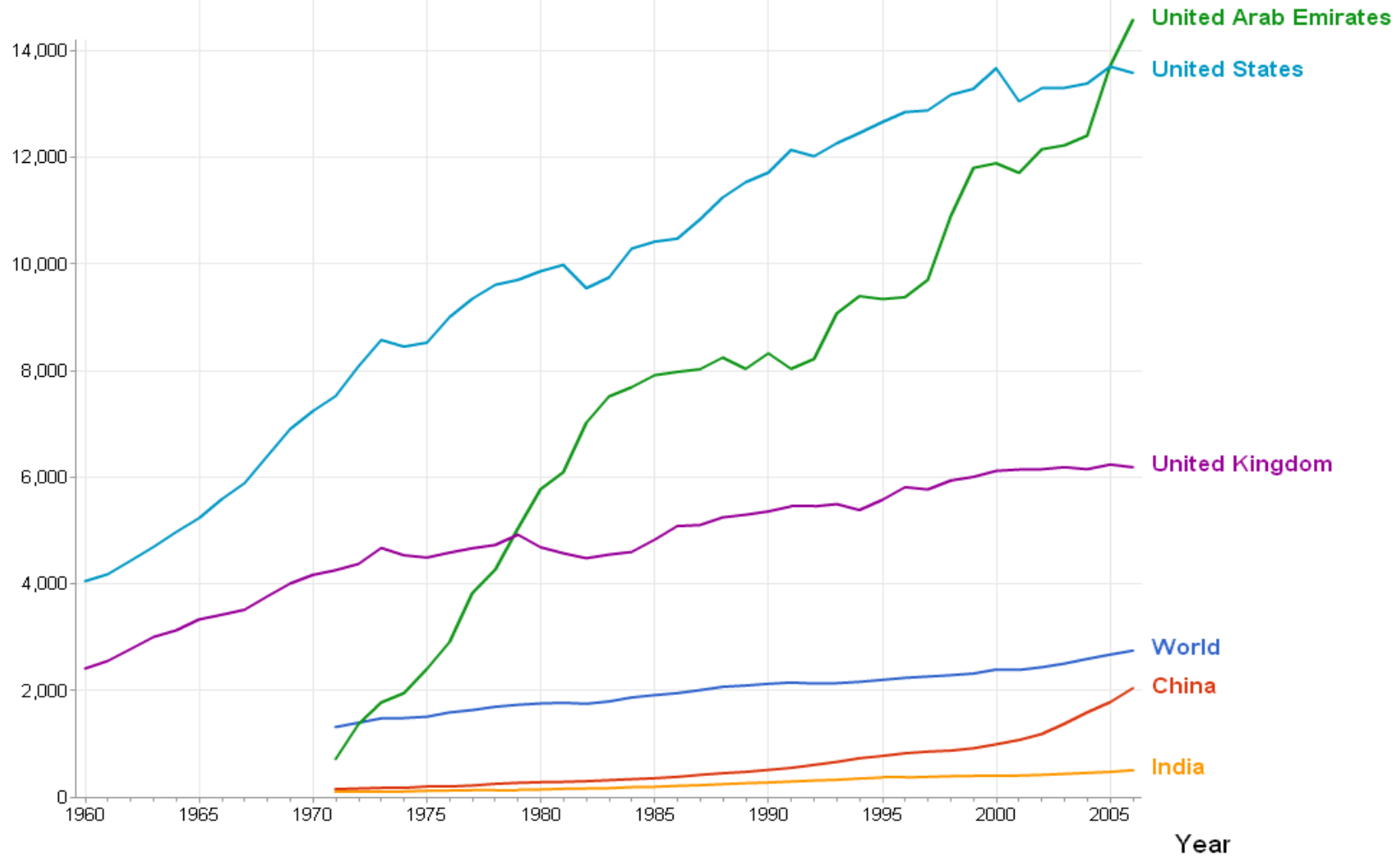


Source: Central Electricity Authority's 'Year End Review 2007-08'

World Energy Scenario

Electric Power Consumption (kWh, Per Capita)

Electric Power (kWh)



Source: World Bank



Government Energy Efficiency Initiatives

- Energy Conservation (EC) Act of 2001
 - Empowered Central and State Governments to facilitate and enforce efficient use of energy
 - Establishment of Bureau of Energy Efficiency (BEE):
 - Focus on:
 - **Energy intensive industries:** As designated consumers – reporting of energy consumption, periodic energy audits, industry-specific energy consumption norms etc.
 - **Commercial Buildings :** Energy Conservation Building Code (ECBC), Star Labeling, Benchmarking
 - **Energy Appliances:** Standards and Labeling (S&L) Program
 - **Utilities:** Demand Side Management
 - **Small and Medium Enterprises:** Energy Efficiency in clusters

Government Energy Efficiency Initiatives

- **National Action Plan on Climate Change:**
 - 8 National Missions including:
 - » National Mission for Enhanced Energy Efficiency
 - » National Solar Mission
 - » National Mission on Sustainable Habitat
- National Mission for Enhanced Energy Efficiency
 - Expected to save 23 million ton oil eqvl. of fuel and avoid need to build additional capacity of over 19,000 MW.
 - next four years, the mission will help achieve greenhouse gas emissions reduction of 98.55 million tons per year
 - Intended to create a market for energy efficiency, which is estimated to be around Rs 74,000 crore (USD16.5 billions)
- **Establishment of Energy Efficiency Services Limited (EESL)**
 - Approx. \$40 million (Rs. 190 crore initial capitalization) – as implementation arm of BEE – to promote energy efficiency services and products



About USAID ECO-III Project

- **Indo-US Bilateral Energy Conservation and Commercialization (ECO) Project**
 - USAID India and Government of India
 - Started in 2000
 - Phase III started in 2006
- **Focus Areas**
 - **Energy Efficiency in Buildings**
 - ECBC Implementation
 - Energy Benchmarking
 - M&V
 - Data Centers and Hospitals
 - **State Level Energy Efficiency Programs**
 - State Energy Conservation Action Plan (ECAP),
 - Municipal Energy Efficiency Project (MEEP),
 - Demand Side Management (DSM),
 - **Architectural Education Curriculum Enhancement**



- **Establishment of Energy Efficiency Institutions,**
 - Regional Energy Efficiency Centers (REECs),
 - Buildings (CEPT),
 - Appliances (WBREDA),
 - SMEs (See Tech),
 - Alliance for An Energy Efficient Economy (AEEE)
- **Energy Efficiency in Small & Medium Enterprises (SMEs)**
- **Capacity Building and Training & Awareness Efforts.**

ECO-III Project Partners - Key to Success

- **Public Sector Partners**

- Bureau of Energy Efficiency
- Reserve Bank of India, CPWD
- GEDA, PEDA and WBREDA
- Gujarat Urban Development Company
- US DOS, US DOE, LBNL, EVO
- World Bank

- **Industry Associations**

- CII Green Business Center
- ISHRAE
- NASSCOM
- GESCSL, Vatva Industrial Estate
- Glazing Society of India

- **Private Sector Partners**

- Alliance to Save Energy, NPC, DSCL Energy Services, CEPT, Conzerv, NISST, See-Tech, AEEE
- Infosys
- DLF
- E-Source, Colorado, USA
- DesignBuilder, UK

- **Academic Institutions**

- 20 Architecture/Engineering Colleges
 - CEPT, IIT-KGP, IIT-R, IIIT, MNIT
- IIM Ahmedabad
- Technical University of Vienna
- Jadavpur University

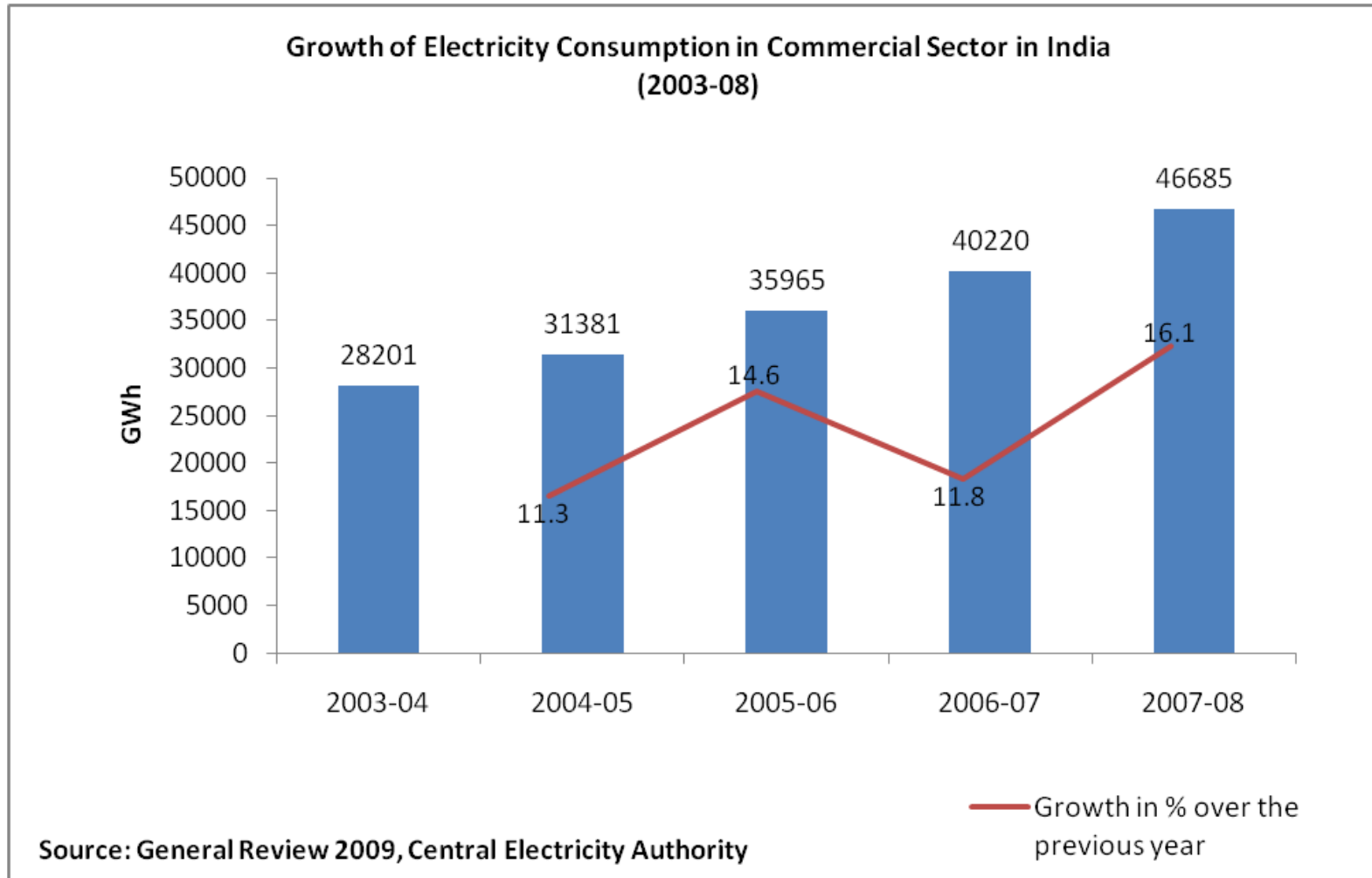


Energy Efficiency in Commercial Buildings

ECO-III PROJECT



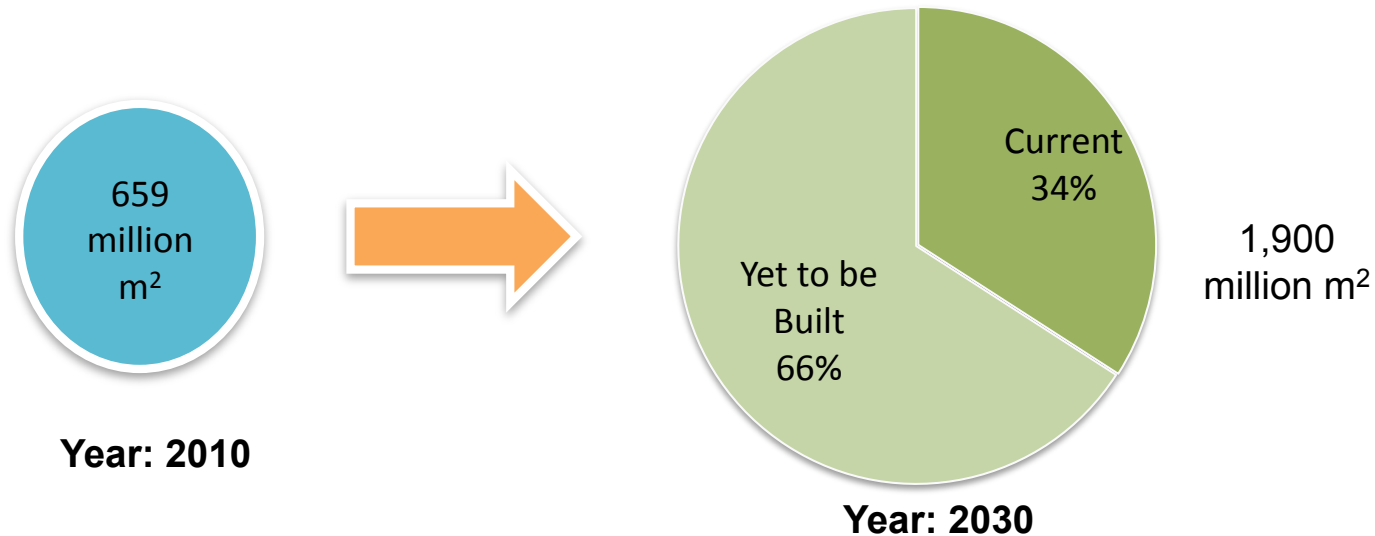
Electricity Growth in Commercial Sector



Growth in the Indian Building Sector

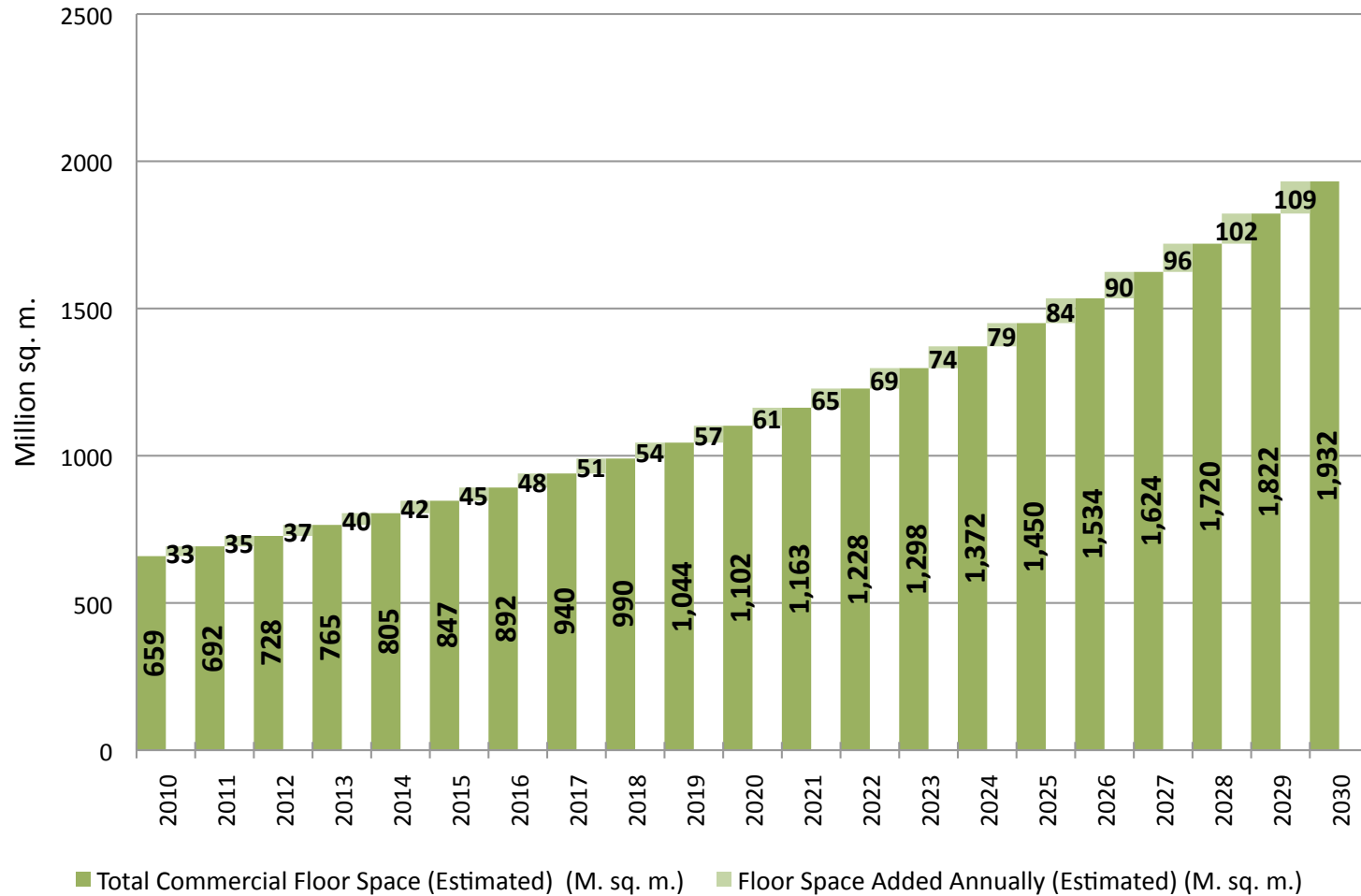
Commercial Buildings Growth Forecast

- Currently, ~ 659 million m² (USAID ECO-III Internal Estimate Using MOSPI, CEA and Benchmarked Energy Use data)
- In 2030, ~ 1,900 million m² (estimated)*
 - 66% building stock is yet to be constructed



* Assuming 5-6% Annual Growth

Commercial Floor Space Projection for India



(Source: USAID ECO- III Project)

* Assuming 5-6% Annual Growth

Energy Conservation Building Code Implementation

- Technical Resources Development and Capacity Building

- ECBC User Guide

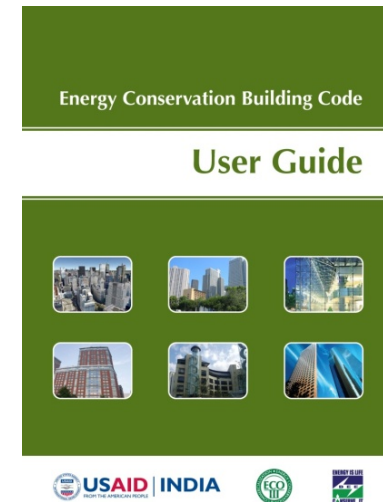
- Easy-to-understand, referred ASHRAE 90.1 User Manual
 - Aims to drive widespread understanding & implementation of ECBC

- ECBC Tip Sheets

- Tip Sheets on Envelope, HVAC, Lighting, Energy Simulation (ASE)
 - E-Source Technology Atlas Series used as resources
 - Help drive enhanced understanding on ECBC Concepts to Applications

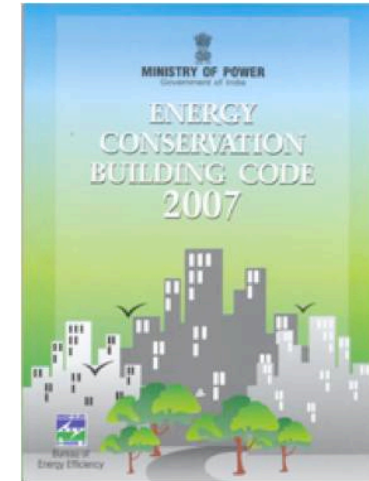
- Awareness Workshops and Seminars

- National level dissemination on ECBC
 - Key Partners: BEE, State Designated Agencies (GEDA, PEDA, MEDA)
 - Over 2,600 people have attended our training & awareness workshops

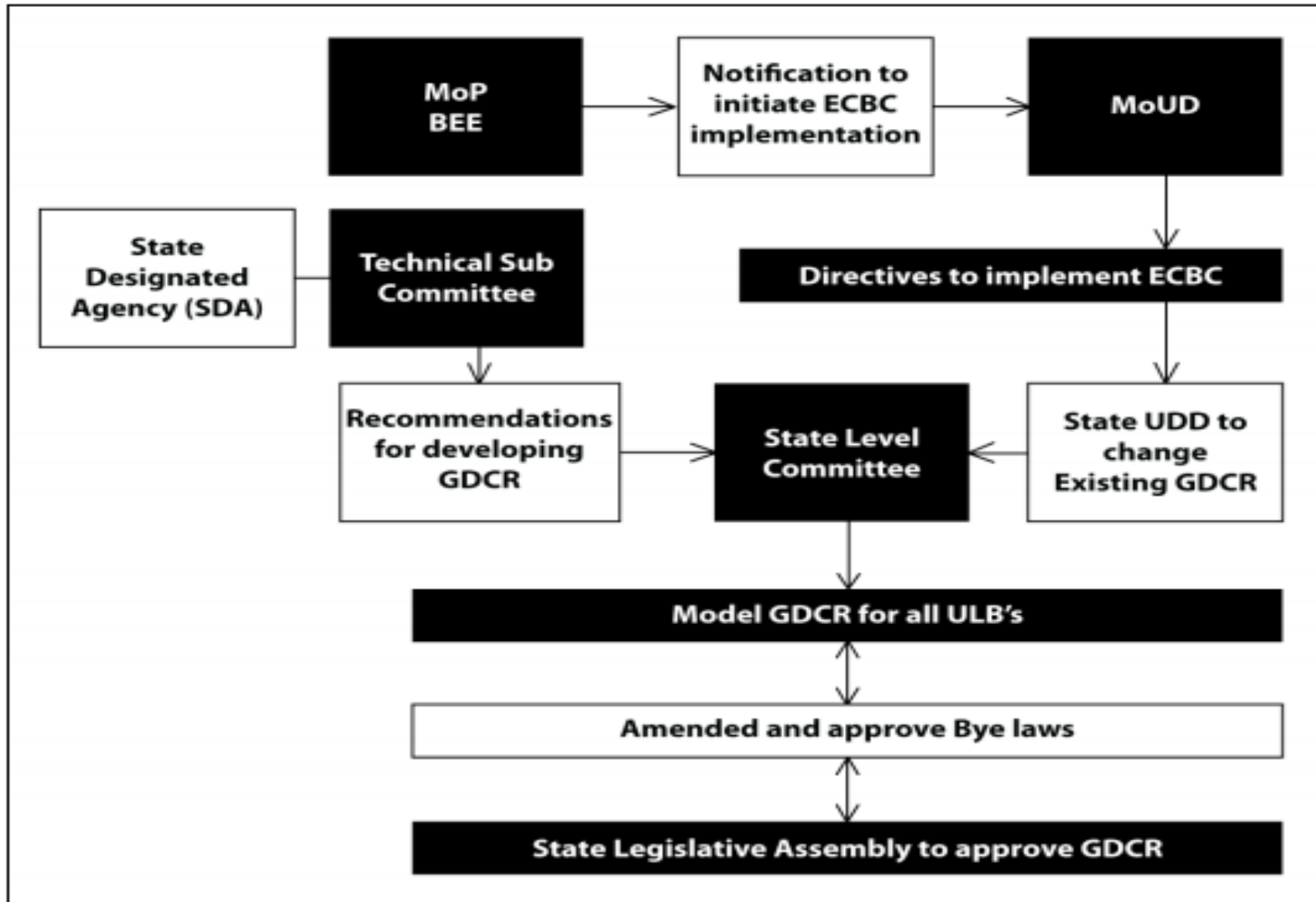


Energy Conservation Building Code Implementation

- Moving From Technical Resources Development and Capacity Building to Implementation
 - **ECBC Implementation Roadmap (with BEE)**
 - Create framework to test ECBC implementation in one state
 - Key Partner in Gujarat – CEPT University,
 - Creation of a replicable model for use across the country
 - **ECBC Compliance Check Tool (with BEE)**
 - “ECONirman” – easy-to-use online tool to check prescriptive and trade-off compliance, like COMcheck.
 - Knowledge Partner – US DOE/PNNL (Developers of COMcheck)
 - Scalability of compliance mechanism.
 - **ECBC Professional Certification Program (with BEE)**
 - Addresses a need for rigor through a BEE-Certified program
 - Train building professionals to be conversant with ECBC
 - Basic understanding of building physics
 - Building Physics module being developed in partnership with TUV,
 - Training and certification program to be rolled out for Architects and ECBC Code Compliance officials



State level ECBC Implementation



ECBC Compliance Check Software: EConirman



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System Security Messages

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Project | Envelope | Lighting | Mechanical

Owner/Agent | Designer/Contractor

Code/Location

State : 

City :

Country : India

If your City is not included here choose a near by location with same weather condition

Project Type

New Construction Addition

Project Details

Title :

Description :

Compliance Option

Prescriptive Trade Off (For Envelope only)

Whole Building

Construction Site

Address1 :

Address1 :

City :

State :

Pin Code :

Permit

Permit# :

* Permit Date :

Help?

Use the gray buttons at the top of the Envelope screen to create a list of building components present in your proposed design. Each component you select is added to the building components displayed on the Envelope screen. For each component, enter appropriate values for all fields with white boxes. These fields may include the assembly type, gross area (or perimeter), cavity R-value, continuous R-value, assembly U-factor, construction details, SHGC, and/or projection factor.

ECBC Professional Certification Program

- Training Objectives

- Create awareness about ECBC
- Provide administrative guidance
- Provide guidance for demonstrating compliance
- Provide technical guidance (2-day workshop only)
- Provide reference list and other resource material
- Help prepare for ECBC Knowledge Evaluation Test (2-day workshop only)

- Workshop Options

- Two day comprehensive training including concepts, requirements, compliance paths, evaluation test
- Half-day training focused on demonstrating ECBC compliance

- Workshop Format

- Eight Training Modules
 - Building Physics Primer
 - ECBC Awareness
 - ECBC Scope and Administration
 - Building Envelope
 - Heating, Ventilation & Air Conditioning (HVAC)
 - Service Hot Water & Pumping
 - Lighting
 - Electric Power
 - Demonstrating Compliance
- Evaluation Test (administered by BEE) – Two hour examination (2 Day training only)
- Panel of Certified ECBC Professionals

Energy Simulation Initiative

- Energy simulation identified as a high priority activity
 - ECBC Whole Building Performance compliance option linked with energy simulation
- Key Partners
 - BEE, DesignBuilder, Vienna Institute of Technology
 - CEPT, IIIT, MNIT, and IIT Roorkee
- Awareness and Training Programs for Building Design Professionals and Academic Institutions
- International Building Performance Simulation Association (IBPSA-India) Launched on January 31, 2009
 - 1st workshop held on February 14th, 2010
 - Raise awareness and quality of energy simulation
 - Provide a forum for professionals, academicians, and students
 - Target holding the IBPSA conference in 2013
- Linked with Educational Curriculum Initiative



Impact of ECBC Implementation- ECO-III Efforts

- Expected Impact in 3 years

- Enhanced adoption of ECBC in new commercial buildings
- Integration and streamlining of ECBC provisions in the building bye-laws

ECBC Implementation: Partners

- Bureau of Energy Efficiency:
 - Govt. of India and Implementation Partner
- ASHRAE:
 - Provided resources for ECBC User Guide.
- E-Source Technology Atlas Series:
 - Used as resources for ECBC Tip Sheets.
- State Designated Agencies (PEDA, GEDA, MEDA):
 - Implementation and Dissemination Partners.
- CEPT University:
 - Helped create ECBC Implementation Roadmap for state of Gujarat.
- US DOE / PNNL:
 - Knowledge Partner for ECONirman – ECBC Compliance Check Tool.
- Technical University of Vienna (TUV):
 - Knowledge partners to help create ECBC Professional Certification Program.
- DesignBuilder, TUV, CEPT, IIIT, MNIT, and IIT Roorkee
 - Knowledge and Implementation Partners for the Energy Simulation Initiative.



Benchmarking of Energy Consumption in Commercial Buildings

ECO-III PROJECT



Energy Benchmarking

- Need for Benchmarking
 - Energy consumption data is largely unavailable for the commercial building sector
 - Lack of standardized approaches to data collection and analysis
 - Absence of performance benchmarks based on actual energy consumption
- Key Partners: BEE, LBNL, ICMQ, ps Collective
- ECO-III Efforts
 - Worked with BEE to initiate data collection
 - Created standardized format for collecting building energy consumption data
 - 861 buildings data collected so far



Benchmarks for Commercial Buildings in India (N=861)

Number of Buildings	Building Type	Floor Area (m ²)	Annual Energy Consumption (kWh)	Benchmarking Indices	
OFFICE BUILDINGS				kWh/m²/year	kWh/m²/hour
145	One shift Buildings	16,716	20,92,364	149	0.068
55	Three shifts Buildings	31,226	88,82,824	349	0.042
88	Public Sector Buildings	15,799	18,38,331	115	0.045
224	Private Sector Buildings	28,335	44,98,942	258	0.064
10	Green Buildings	8,382	15,89,508	141	-
HOSPITALS				kWh/m²/year	kWh/bed/year
128	Multi-specialty Hospitals	8721	24,53,060	378	13,890
22	Government Hospitals	19,859	13,65,066	88	2,009
HOTELS				kWh/m²/year	kWh/room/year
89	Luxury Hotels (4 and 5 Star)	19,136	48,65,711	279	24,110
SHOPPING MALLS				kWh/m²/year	kWh/m²/hour
101	Shopping Malls	10,516	23,40,939	252	0.05642

BEE Star Rating Program for Buildings

- Rating based on actual building performance (Energy Performance Index – kWh/sq. m./year)
 - Based on preliminary results from BEE/ECO-III benchmarking study
- Launched Star Rating Program for
 - Office Buildings in February 2009
 - Business Process Outsourcing (BPO) Buildings in Dec 2009
- Under development
 - Retail Malls
 - Hotels
 - Hospitals



Star Rating - New Methodology Proposed to BEE

- **Estimate the energy consumption of a benchmark building**

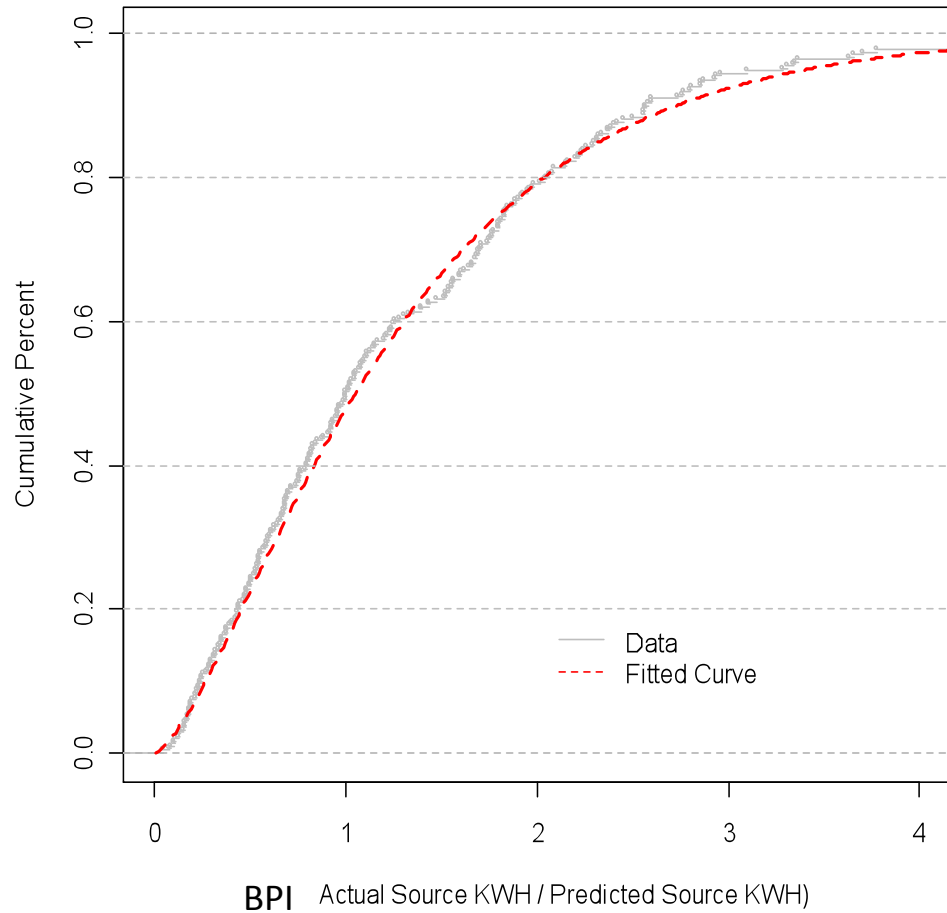
The benchmark building represents a representative building with similar use type, physical and operating characteristics and located in same climatic zone. This estimate is derived by applying regression techniques to a large dataset of surveyed buildings.

- **Compute a statistic called Building Performance Index (BPI)**

It is calculated as the ratio of actual electricity consumed to estimated electricity consumed by the benchmarked building

BPI Graph and Lookup Table

Building Performance Indicator (BPI)



BPI	Percentile	BPI	Percentile	BPI	Percentile	BPI	Percentile
0.06	0.01	0.57	0.26	1.07	0.51	1.85	0.76
0.09	0.02	0.58	0.27	1.1	0.52	1.89	0.77
0.12	0.03	0.6	0.28	1.12	0.53	1.94	0.78
0.14	0.04	0.62	0.29	1.15	0.54	1.98	0.79
0.17	0.05	0.64	0.3	1.17	0.55	2.03	0.8
0.19	0.06	0.66	0.31	1.2	0.56	2.09	0.81
0.21	0.07	0.68	0.32	1.22	0.57	2.14	0.82
0.23	0.08	0.7	0.33	1.25	0.58	2.2	0.83
0.25	0.09	0.72	0.34	1.28	0.59	2.26	0.84
0.27	0.1	0.74	0.35	1.3	0.6	2.33	0.85
0.29	0.11	0.76	0.36	1.33	0.61	2.39	0.86
0.31	0.12	0.78	0.37	1.36	0.62	2.47	0.87
0.33	0.13	0.8	0.38	1.39	0.63	2.55	0.88
0.35	0.14	0.82	0.39	1.42	0.64	2.63	0.89
0.36	0.15	0.84	0.4	1.45	0.65	2.73	0.9
0.38	0.16	0.86	0.41	1.48	0.66	2.83	0.91
0.4	0.17	0.88	0.42	1.51	0.67	2.94	0.92
0.42	0.18	0.9	0.43	1.55	0.68	3.07	0.93
0.44	0.19	0.92	0.44	1.58	0.69	3.22	0.94
0.46	0.2	0.94	0.45	1.61	0.7	3.4	0.95
0.47	0.21	0.96	0.46	1.65	0.71	3.61	0.96
0.49	0.22	0.98	0.47	1.69	0.72	3.88	0.97
0.51	0.23	1.01	0.48	1.72	0.73	4.26	0.98
0.53	0.24	1.03	0.49	1.76	0.74	4.9	0.99
0.55	0.25	1.05	0.5	1.81	0.75	Inf	1

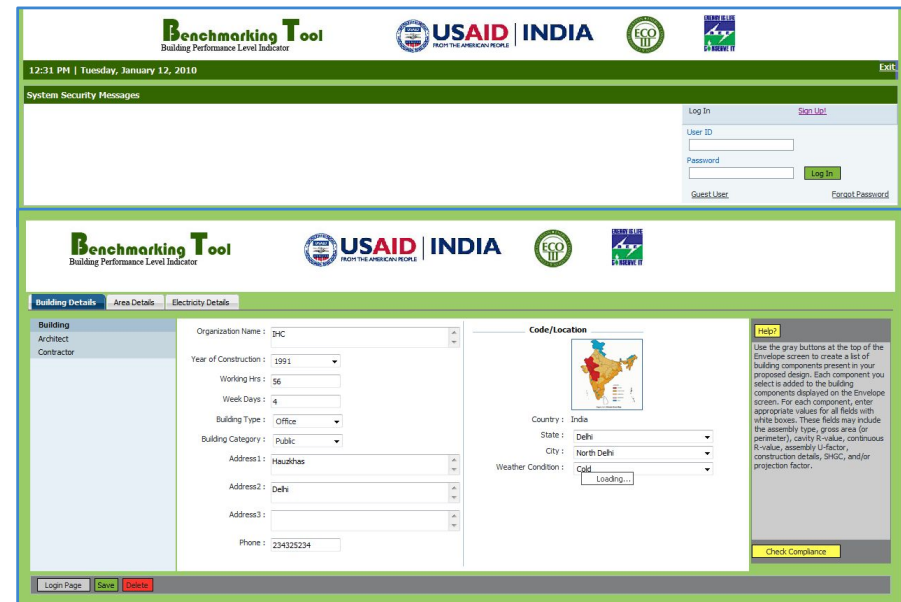
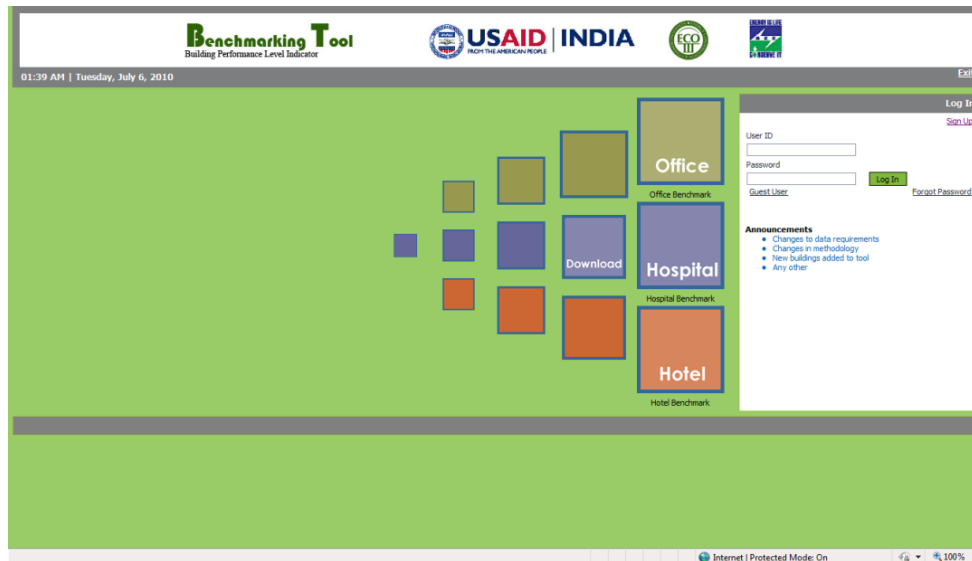


USAID
FROM THE AMERICAN PEOPLE

INDIA



Online Benchmarking Tool



- Overview:
 - Aimed at comparing energy performance parameters of the buildings within peer group
 - Making energy consumption Information available in public domain

Next Steps - Benchmarking

- **Benchmarking Workshop: 14th July, 2010**
 - Conducting in partnership with BEE
 - Discussion on refinement of existing performance based Star Labeling program
 - Also discussing on institutionalizing the national level energy data collection efforts
- **System-level information collection & benchmarking**
 - Working with Dalkia in collecting Hotels & Hospitals Data
 - Working with Infosys for office building data
- **Conducting detailed study on the effect of climate on energy consumption**

Impact of Benchmarking - ECO-III Efforts

- Expected Impact in 3 years

- Better understanding of the building energy performance by building users
- Refinement of national rating program
- Establishment of national level energy Benchmarks for commercial buildings
- Development of linkages between ECBC requirements and benchmarking /rating programs

Benchmarking: Partners

- **BEE:**
 - Implementation Partner and Executive Sponsor, rolling out BEE Star Labeling Program
- **LBNL:**
 - Knowledge Partner, Strategic Guidance
- **ICMQ:**
 - Engaged by BEE for data gathering, field work.
- **ps Collective:**
 - Statistical Analysis



Measurement & Verification (M&V) Program

ECO-III PROJECT



Capacity Building for Measurement & Verification

- Knowledge of M&V in India at a very nascent stage
- Building capacity of energy efficiency professionals (EVO)
- Promoting AEEE as the M&V Support organization in India
- Trained more than 100 energy efficiency professionals on M&V
- At present 8 Certified M&V Professionals in India
- Developed 3 India-specific M&V case studies

Next Steps on M&V

- 2nd M&V CMVP Training & Certification: 27-29 July
 - 50 people are expected to take the test
- Conducting one day program : M&V Summit: 30 July
 - To discuss the current issues related M&V and chalk out a strategy for India
- M&V Train the Trainer Workshop (tentatively in September)
 - Developing EVO certified Indian Trainers

Impact of M&V Programs - ECO-III Efforts

- Expected Impact in 3 years

- Energy savings estimation will become more reliable
- Increased number of energy efficiency projects in India with adoption of international protocol
- Transparency in Energy Efficiency Business

M&V: Partners

- **BEE:**
 - Implementation Partner and Executive Sponsor
- **Efficiency Valuation Organization (EVO):**
 - Knowledge Partner, Strategic Guidance, Workshops Support
- **Alliance for an Energy Efficient Economy (AEEE):**
 - Implementation Partner, Host Country Industry Led Association.

State Level Energy Efficiency

ECO-III PROJECT



Municipal Energy Efficiency Program

- First state-level municipal energy efficiency program in Gujarat
 - Street lighting and water pumping
- Model through ESCO route in partnership with GUDC, IL&FS, and ASE
 - EOI and RFP document – Technical Best Practices and Legal Review
 - Structuring of the program
 - Best practices on M&V
 - Role and Responsibilities of ESCOs, Govt., and PMC
 - Project Facilitation/Management Concept Being Tested
- Comprehensive Legal Review of Contracting Documents
 - Work with EESL in standardizing contract documents



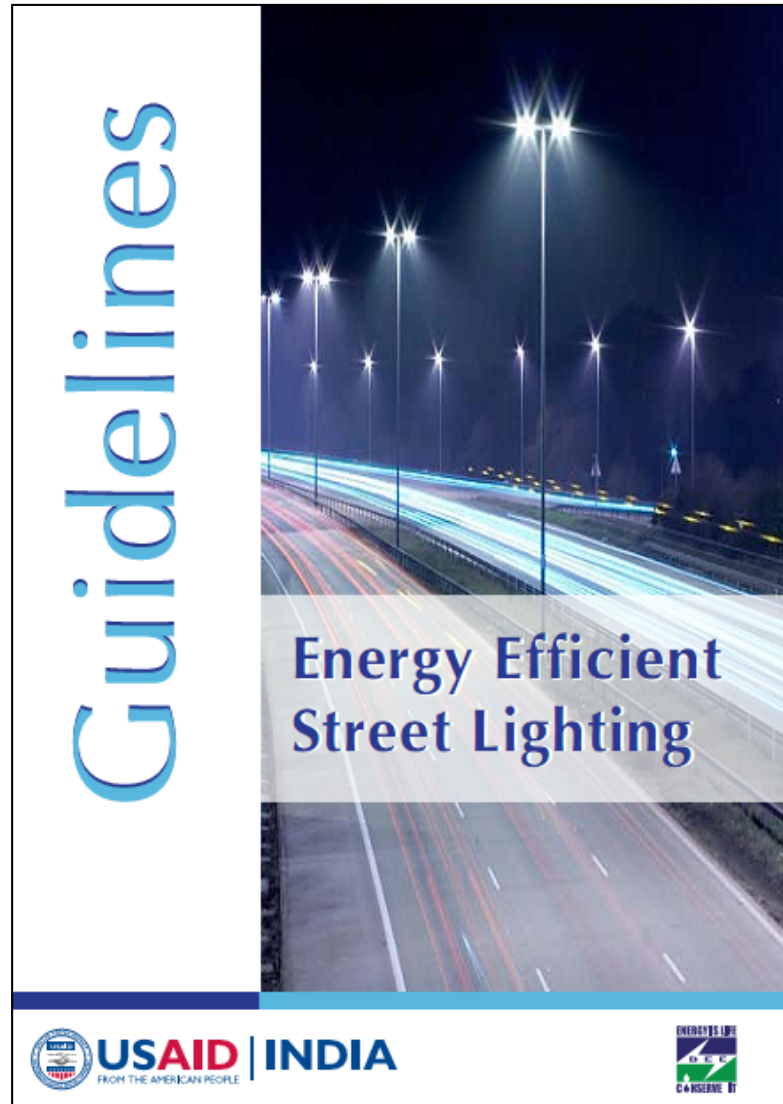
Municipal Energy Efficiency Program

- Partners:
 - GUDC – State nodal agency acting as “aggregator” at customer end, contracting authority
 - IL&FS – Project Management Company for effective coordination
 - DESL – ESCO, energy performance contract implementation
 - USAID ECO-III – Facilitation, technical assistance, best practices guidance
 - Alliance to Save Energy – on the ground experience with similar programs
 - Legal Experts – risk management capabilities and advice
 - Energy Performance Contracting domain experts
 - M&V domain experts

Municipal Energy Efficiency Program

- Coverage – Total 159 ULBs and 7 MCs across state
 - Pilot - 5 ULBs for municipal water pumping
- GUDC Role - Nodal agency
 - Coordinating on behalf of all MCs
 - Contracting authority – selection of ESCO, negotiation and signing energy performance contract, administering entire project
- GUDC Achievements
 - Savings estimated at approximately Rs. 100 crore (~USD 21 M) (for all 159 ULBs and 7 MCs for street lighting and water pumping)
 - Facilitating project without any investment and risk for municipal corporations – Contractor has taken on full investment and risk
 - Project finance and investment by ESCO – First State to successfully initiate ESCO project in India
 - Repayment solely through energy savings
 - Guaranteed minimum savings by ESCO
 - Additional revenues from reduced energy bills for MCs

ECO-III Publications – Street Lighting Guidelines



- Reference to Indian Standards (BIS 1944-7, 1981)
- Best Practices Guidance on:
 - Lighting Requirements
 - Retrofits and New Installations
 - Technical Assessment of Technologies
 - Selection of lamps, ballasts, luminaires
 - Includes a brief section on LED street lights advantages and disadvantages
 - Design and Procurement of EE Street Lighting Systems, including discussion on:
 - Poles,
 - Height,
 - Spacing,
 - Outreach,
 - Overhang
 - Siting, etc.
 - Controls,
 - Operations & Maintenance
 - M&V, Metering, Monitoring,
- Brief Case Studies

Municipal Energy Efficiency Program

- Next Steps
 - Signing of EPC for pilot projects with 5 ULBs for water pumping
 - Work with BEE and EESL in transferring lessons learned for large scale implementation
 - Including TA for MuDSM and EESL, per BEE request
 - Introducing rigor in building and municipal energy audits
 - Building Energy Assessment Guide
 - Standardized Data Collection Formats before audits
 - Impact can be seen in the benchmarking activity
 - Standardized set of contract documents
 - Use GUDC as an example
 - M&V Capacity Building
 - Work with EVO and AEEE

Demand Side Management

- Gujarat DSM and Load Research Survey
- Development of a roadmap for Utility driven DSM and EC Programs (Knowledge Partner: LBNL)
 - Developed Cost of Conserved Energy for EE ACs, Refrigerators, and Agricultural Pump-set replacements
- Load Research Survey in Gujarat with IIM Ahmedabad (Implementation Partner)
 - Collected residential and commercial energy use characteristics along with time of use information (600 customers)

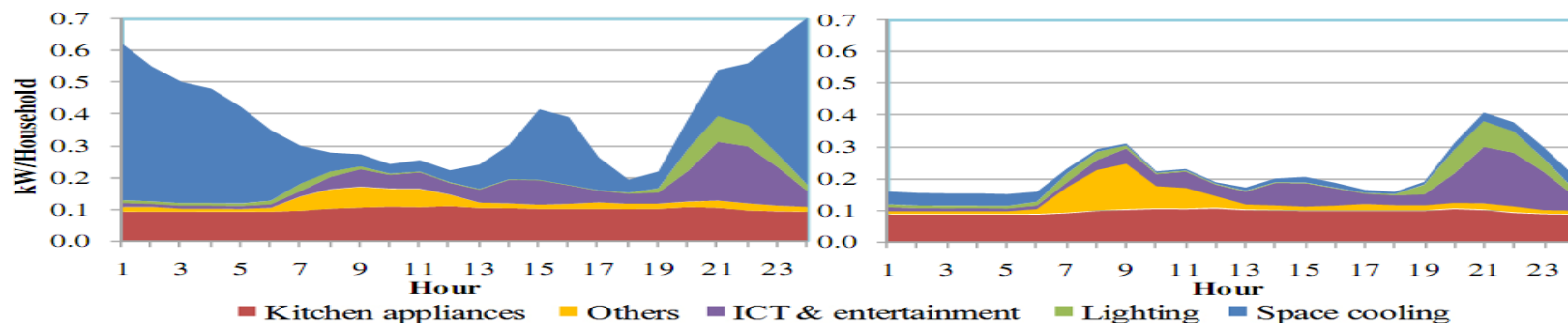


Figure 14: (a) Load curve for end-use categorization during summer (b) Load curve for end-use categorization during winter

- Assisting IIM Ahmedabad with implementation of pilot project as a replicable model:
 - Energy audit of IIM-A campus nearing completion

Impact of DSM Activity - ECO-III Efforts

- Expected Impact in 3 years

- Pilot Studies will help regulatory commissions and Discoms to design more robust large scale DSM programs at the state level

Institutional Development

ECO-III PROJECT



Strengthening/Creating EE Institutions

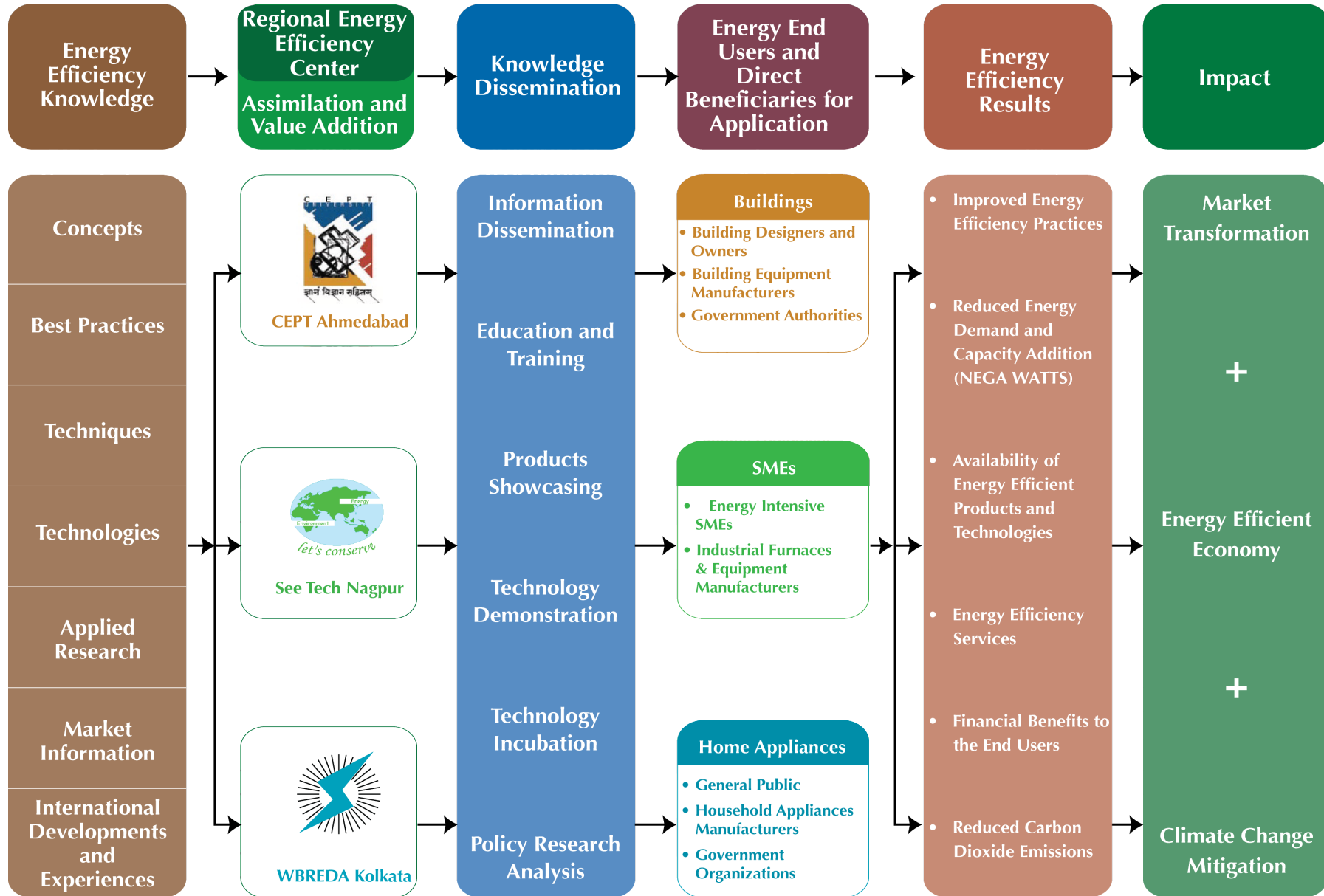
- Formation of Alliance for an Energy-Efficient Economy
- Supported the formation of AEEE
 - Objective: Provide a platform to promote energy efficiency industry and services
 - Mission: A Policy Research & Advocacy Organization supporting GOI
 - Supported by Alliance to Save Energy, Schneider Electric, Thermax, Grundfos, CEPT, DSCLES, Alien Energy, Invensys, The Weidt Group, Team Catalyst, and others
- ECO-III closely supported AEEE in building capacity on M&V in India
 - Helped with incorporation and charter development process
 - 1st M&V Training Workshops in Mumbai and Bangalore
 - M&V and IPMVP Training Program in Mumbai
 - Roundtable – Role of M&V in implementing & Evaluating EE Program
 - 1st EVO South Asia Training & CMVP Examination in Delhi (19-21 November 2009)
 - Organized the Hospital Energy Efficiency workshop in partnership with ECO-III

Strengthening/Creating EE Institutions

Establishment of three Regional Energy Efficiency Centres

- Building Envelope & Energy Modeling – CEPT
 - SMEs (Industrial Furnaces) – SEE-Tech
 - Domestic Appliances – WBREDA
- Major Objectives of REECs
 - Enhance energy efficiency awareness and education among energy end-users
 - Facilitate showcasing and demonstration of energy efficient products for public at large
 - Promote development (incubation) of energy efficient technologies
 - Encourage research and interdisciplinary collaboration on energy efficiency
 - Catalyze the development and growth of energy efficiency market and business in the country

Regional Energy Efficiency Centers



REEC at CEPT, Ahmedabad: Buildings & Energy Simulation



- Objectives:
 - Establish simulation training facilities, envelope performance lab, fenestration testing, certification & labeling program,
 - Assist State Govt. to adopt ECBC.
 - Create a PPP by leveraging USAID's resources
- ECO-III Assistance (\$250k):
 - Seed Funding, Technical Assistance
- Partners:
 - Glazing Society of India (\$350k):
 - Spectrophotometer, staffing of REEC, Labeling program.
 - Ministry of New & Renewable Energy (\$160k):
 - Solar Calorimeter.
 - Government of Gujarat (\$225k):
 - For construction of a “Net Zero Energy Building for REEC”.

REEC at SEE Tech, Nagpur: Industrial Furnaces in SMEs



- OBJECTIVES
 - Demonstration of lab scale models of efficient and inefficient furnaces
 - Demonstration of energy efficiency concepts, practices & technologies
 - Capacity Building of SMEs, energy auditors and consultants
- ECO-III ASSISTANCE:
 - Grant : Development & installation of lab scale demonstration furnaces
 - Tech. Assistance: Development of efficiency guides, case studies, etc.
- Conducting consultancy energy efficiency studies funded by BEE (value \$200k) for two SMEs Clusters (Ceramic Tiles and Brass Making units)
- World Bank showed interest to fund additional TA to expand SMEs activities



REEC at WBREDA, Kolkata: Home Appliances



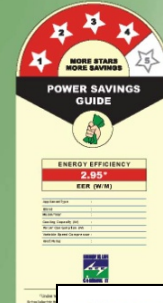
- OBJECTIVE
 - Catalyze & facilitate use of energy efficient home appliances in households
- ECO-III ASSISTANCE
 - Business Plan, Tech. material, Building Design, Base-line Study, SMEs Program Strengthening WBREDA through PPP
 - Support to West Bengal Government
 - REEC building, staffing, etc.
- Plan to set up demonstration/show casing of energy efficient facilities in REEC through partnership with appliance manufacturers
- Climate Works Foundation interest for possible support for REEC

Regional Energy Efficiency Center for Home Appliances



Energy Efficiency Guide

Buying and Maintaining an Energy-Efficient Room Air Conditioner



Energy Efficiency Guide

Buying and Maintaining an Energy-Efficient Home Refrigerator



Energy Efficiency Guide

Buying and Maintaining an Energy-Efficient Ceiling Fan



Impact of REECs - ECO-III Efforts

- Expected Impact in 3 years

- Market transformation of energy efficiency business
- Incubation of new energy efficient technologies
- Extensive research and interdisciplinary collaboration on energy efficiency

Educational Curriculum and Professional Training

ECO-III PROJECT



Curriculum Enhancement for Academic Institutes

- Long-term Capacity Development Initiative – first in the world
 - Focus on HR Development at the national level and help prepare next generation of architects and engineers
- Enabled BEE-University partnership
 - 18 educational institutions involved
 - DesignBuilder / EnergyPlus distributed
 - E-Source Technology Atlas distributed to 32 organizations
- Train the Trainer workshop for 18 faculty members in partnership with National Institute of Advanced Studies in Architecture (NIASA), Pune
- Organized a Regional workshop at IIT Roorkee
 - Participation of 9 institutes (Faculty Members and Students)



Curriculum Enhancement for Academic Institutes

- Next Steps:
 - Include another 20 institutes in the program
 - Garner support from REEEP and Technical University of Vienna:
 - To develop web-based curriculum for Building Science (Undergraduate) & Energy Modeling (Post-Graduate)
 - National TOT workshops to enhance the capacity of faculty members
 - Working with Infosys to organize the program at the Mysore campus from August 2-6, 2010
 - Another regional building physics workshop being planned in collaboration with Sir JJ College of Architecture and Academy of Architecture from August 9-13, 2010

Impact of Curriculum Enhancement - ECO-III Efforts

- Expected Impact in 3 years
 - Availability of large pool of next generation of professional and faculty members with energy efficiency expertise
 - More number of academic institutions offering energy efficiency subjects/courses

Outreach and Extension Activities

ECO-III PROJECT



Outreach Activities

- Two Study Tours to US Institutions & Energy Centers
 - Provided exposure to Indian energy professionals (from MOP, BEE, REECs, GEDA, PEDDA, AEEE, GSI, NPC) on energy efficiency programs of US government, and services provided by Energy Centers of US
- Monitoring & Verification workshops with support from EVO and AEE
 - Three Level-II Training workshops
 - First Certified M&V Professional workshop
- Helped with the organization of US – India 2nd Energy Efficiency Technology Cooperation Conference
- Total Professionals Trained: More than 3,000
- Created and maintaining a dedicated project web site (www.eco3.org)
 - Continuously updated and modified
 - Widely used by EE Community for technical documents and resources



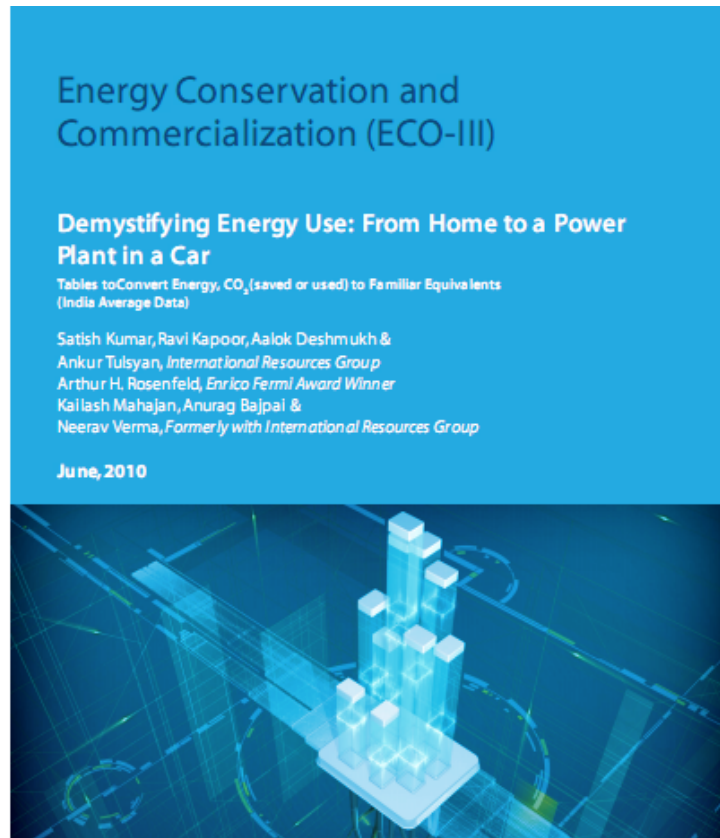
New Publications

ECO-III PROJECT



ECO-III Publications – Energy Equivalence Matrix

ECO-III-1029

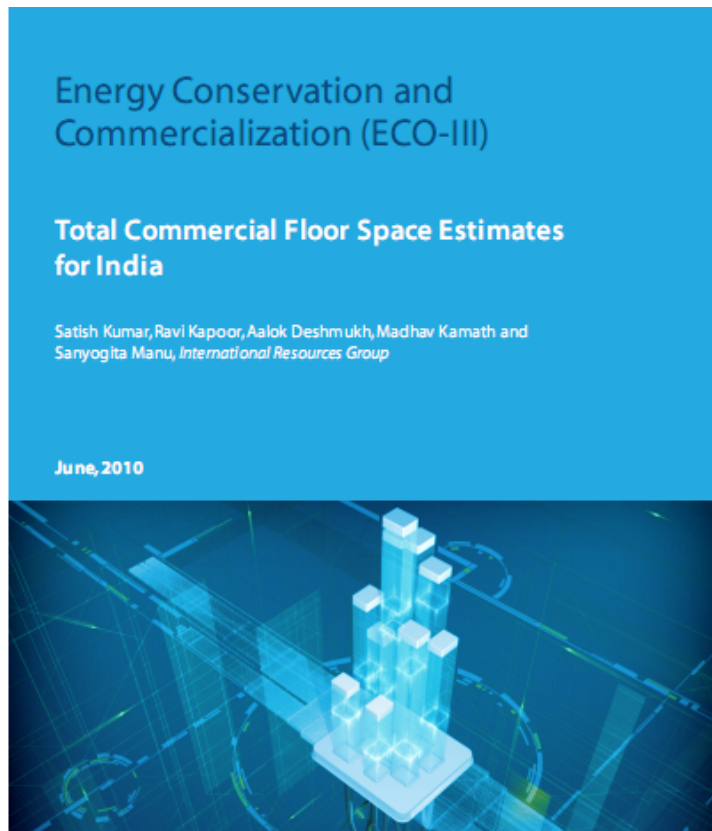


- Tables to easily convert used or avoided energy use or emissions to familiar metrics such as homes and cars.
- Updated with latest available data for India.
- Estimated savings for ongoing programs such as ECBC Implementation, Bachat Lamp Yojana
 - ECBC implementation will allow the equivalent of powering approximately 11 lakh typical urban Indian homes.
 - Bachat Lamp Yojana will free up capacity for approximately 23 typical thermal power plants.



ECO-III Publications – Commercial Floor Space Estimate

ECO-III-1030



- Aimed at putting out transparent estimates to raise the quality of discussion around the issue.
 - Press for consensus on important numbers that can guide policy decisions and strategic framework
- Based on:
 - LBNL's India Energy Outlook,
 - MOSPI Economic Census 2005,
 - CEA's General Electric Review 2009
- Compared with estimates by:
 - McKinsey & Company
 - LBNL
 - Climate Works Foundation
- Current (2010) estimate for commercial floor space in India: 659 M sq. m., growing at ~4-5% p.a.



ECO-III Publications – Conference Publications

ECO-III-1032



Energy Conservation and Commercialization (ECO-III)

Performance Based Rating and Energy Performance Benchmarking for Commercial Buildings in India

Satish Kumar, Madhav Kamath & Aalok Deshmukh, *International Resources Group*
 Saket Sarraf, *psCollective*
 Sanjay Seth, Sameer Pandita, *Bureau of Energy Efficiency*
 Archana Walla, *United States Agency for International Development*

June, 2010

To be presented at
 BauSIM 2010 in Vienna, Austria
 September 22-24, 2010

ECO-III-1031



Energy Conservation and Commercialization (ECO-III)

Architectural Curriculum Enhancement for Promoting Sustainable Built Environment in India

Sanyogita Manu, Anurag Bajpal, Satish Kumar, Shruti Narayan and Ankur Tulsyan, *International Resources Group*
 Rajan Rawal, *CPT University*
 Sudha Setty, *Alliance to Save Energy*

May, 2010

To be presented at
 2010 ACEEE Summer study on Energy Efficiency in Buildings
 Pacific Grove, California
 August 15-20, 2010

ECO-III-1028



Energy Conservation and Commercialization (ECO-III)

Developing an Energy Conservation Building Code Implementation Strategy in India

Satish Kumar, Ravi Kapoor, *International Resources Group*
 Rajan Rawal, *CPT University*
 Sanjay Seth, *Bureau of Energy Efficiency*
 Archana Walla, *USAID India Mission*

May, 2010

To be presented at
 2010 ACEEE Summer study on Energy Efficiency in Buildings
 Pacific Grove, California
 August 15-20, 2010

Coming Soon – Revised ECO-III Website



For More Information

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Please standby for the documentary!

