

Existing Building Energy Performance: Challenges and Way Forward A Public Event to Share Experiences and Learning from UTC-TERI Center of Excellence for Energy Efficient Buildings in India

The expanding urban population of India beckons for a requisite growth in urban infrastructure for housing, and for commercial growth. The NITI Aayog estimates that per capita residential space in India will increase from 1.8 m² in 2012 to 35 m² in 2047, and per capita commercial building space from 0.7 m² to 5.9 m² over the same duration (NITI Aayog 2015). Further, as a predominantly rural population rapidly becomes urbanized, provision of adequate housing and workspace becomes an important public investment.. As per a national benchmarking study undertaken by the Energy Conservation and Commercialization (ECO-III) project, supported by USAID India and the Bureau of Energy Efficiency (BEE); the real estate growth in India is expected at a CAGR of 8 to 10% over the base year of 2010. In the commercial building sector, 2017 saw a leasing volume of 3.9 million square meters of floor space, with major absorption occurring in urban centers of Bengaluru, Delhi-NCR, Mumbai, Hyderabad, Pune, Chennai and Kolkata (Arora et al. 2018).It has been estimated that over 800 million square meters of commercial building space, namely hotels, hospitals, offices, retail, educational buildings and places of worship, will be added to Indian cities in the next 20 years (Kumar et al. 2017).

The building electricity demand projections suggests fivefold increase in electricity demand from residential buildings and a threefold increase in electricity demand from commercial building sector till 2047 over the baseline of 2011. This will amount to a total projected electricity demand of 2611 TWh by 2047 from the buildings sector.

Demand for electricity in the commercial building sector is primarily linked with the cooling-demand from the sector. The expected cooling demand from the sector; in next decade is estimated to more than double itself over the 2017 baseline and hence the expected increase for the overall electricity demand from the commercial sector is anticipated. To address the evident surge in the electricity demand across building sector, and to meet India's sustainability goals, the government of India has initiated various policy initiatives with a major focus on new constructions to incorporate green building and energy efficiency features.

With increase in the number of building being constructed over time at ever increasing growth rate, it is imperative to focus on the data driven policy measures to manage the energy demand in the sector. The building once constructed stands for a period of approximately 60-70 years; therefore addressing energy efficiency in existing building stock is of utmost importance for building practitioners in the present scenario.

Lack of statistical data for the Indian building sector; like stock of existing buildings, , energy consumption of buildings, baseline energy consumption for different subsectors etc. is not only a

deterrent in adequate and effective policy making but is also a hindrance in monitoring progress of schemes and evaluation of their impact. There is an urgent need to improve the existing system for collection and management of building sector related data. Also in order to support various policy measures and programs for enhancing existing building energy efficiency, there is an evident need and potential for rigorous data collection methods and institutional process for existing buildings.

In light of aforementioned challenges and opportunities, in the existing commercial building sub-sector in terms of energy saving and potential carbon mitigation, **United Technologies Corporation (UTC) and The Energy and Resources Institute (TERI)** have come together to set up a **Centre of Excellence (CoE) on Energy Efficient Building in Indian Cities**. The main objectives of the Centre of Excellence include

- Formulation of design and retrofit guidelines that could be suggested as an addendum to relevant codes and standards
- Development of Measurement and Verification (M&V) protocol for establishing the energy saving of various energy conservation measures
- Review of the existing building energy rating systems
- Development of tools and techniques for energy management, identification & cost benefit analysis of energy conservation measures

With aforementioned objectives CoE has been working to map the energy consumption patterns in commercial buildings across all climatic zones (excluding Cold Climate) of the country. The team has set out to conduct detailed energy audit of commercial buildings (Offices, Hotels and Hospital) and recording the current practices in terms of operation & maintenance, equipment & technologies used, and measurement & reporting framework followed by the building management teams. The exercise has provided an in depth learning on the energy end use trend of different buildings, their operating schedules and reporting & operational protocols followed by the building managers. The onsite measurement and interaction with field staff was used by the CoE as primary tools to understand the current existing building behaviors in terms of operational efficiencies, common practices, equipment used, and level of manual and automatic controls used within the building energy management plan.

The CoE has provided the audited buildings with various energy conservation measures in consultation with the building managers, equipment suppliers and service providers. These measures were assessed with utmost care on technical and financial viability, taking into account building operational requirements and desired comfort levels.

This thematic track “Existing building energy performance: Challenges and Way Forward” will highlight the findings of CoE activities and address the **issues related to implementation of energy conservation measures in existing buildings**, the session will be a platform for stakeholder engagement to deliberate on the various options and opportunities.

The CoE will be unveiling the “**Building Retrofit Guideline**” which may become an instrument for achieving efficiency in existing buildings (Office, Hotel and Hospital). It will help in determining the energy baseline of the building enabling building managers, and higher management in making informed decision towards achieving energy efficiency in existing buildings.

The workshop will also discuss the best practices followed across the world and the current industry practices used by some of the largest group of companies. CoE will also share the respective findings of the project recorded as of now which includes, the energy consumption patterns in building sub-sector, energy consumption measures and their applicability in different buildings.