ECOnirman & third party assessors: innovative approaches to energy code compliance and enforcement in India

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Keywords

simulation, compliance, energy policy, energy performance, building codes, verification, whole building analysis, third party assessor

Abstract

Compliance with Energy Conservation Building Code (ECBC) of India can save up to 1.7 billion kWh annually. ECBC enforcement poses significant challenges to states and local governments who are responsible for enforcement especially given India's 12th Five Year Plan's compliance goals. This paper summarizes two important initiatives taken up in India for making energy code implementation and enforcement easier, leapfrogging the challenges that have been experienced in other countries.

In the first initiative, the United States Agency for International Development supported the development of the ECOnirman Whole Building Performance Tool, the first online code compliance energy simulation tool in the world. It assists developers and building designers in demonstrating performance-based compliance. It shows great promise for the future in India: it enables building developers to meet code by installing only those measures that improve building energy performance; it promotes innovation in design and technologies; it enables a large user-base to do energy simulations and results in true capacity building; and the database of inputs and results enables easier policy analysis. Tying the metered energy use of the buildings to the ECOnirman database will result in a robust dataset that will be a powerful policy tool for behavioural programs and rating and labelling of buildings.

The other code compliance initiative is a nationwide Third Party Assessor (TPA) framework for compliance checking of ECBC. Mandatory compliance with ECBC requires that each new building is checked during design and construction. Urban Local Bodies (ULB) that enforce building and development rules and bylaws, face technical and manpower related challenges when enforcing ECBC. This paper discusses the background research, the stakeholder engagement, and the institutional framework proposed for allowing the TPA model to be used across India.

This paper provides recommendations and next steps for ECBC compliance through future development of ECOnirman and implementation of the TPA framework.

Introduction

The Energy Conservation Building Code (ECBC) of India was launched by the Bureau of Energy Efficiency (BEE) in 2007 and is expected to save 1.7 billion kWh annually (BEE, 2009). The state by state adoption process has begun since 2011, and Figure 1 shows the current status and the anticipated adoption in the near future (BEE, 2012). The 12th Five Year Plan has a goal of reaching 65 % compliance by 2017. The state level adoption, whereby a state notifies the public and makes compliance mandatory, is a political process that is driven by each state's priorities, and the awareness of the benefits of the code. There are several challenges beyond this. True adoption also means that the requirements of ECBC need to be incorporated into the building bye-laws by each Urban Local Body (ULB) before that ULB can begin enforcement. Implementing the requirements of ECBC into the building design and construction requires building capacity in the construction industry. ULBs that enforce ECBC and BEE's State Designated Agencies (SDAs) responsible for the overall implementation do not have

the technical expertise or the manpower to do capacity building or check compliance.

With 67 % of the floor space for 2030 to be built in the next 18 years (Kumar 2010), a 9.9 % energy shortage, and a 16.6 % peak demand shortage (CEA 2009), ECBC presents a huge opportunity for energy savings, emissions reduction and contribution to the economic growth potential in India. ECBC compliant buildings are expected to save about 4,500 kWh/m^2 over the life of the measures incorporated in the buildings (Rawal 2012). These benefits can only be gained through high levels of compliance. Learning from other countries such as USA and China, India can aim to achieve high compliance rates by adopting successful technological and governance solutions. It has a chance to leap-frog the technologies and approaches used in countries that have resulted in low compliance rates, such as less than 50 % average in the USA (Khan 2008). A central command and control that allows setting up an elaborate infrastructure to mandate compliance like China (Bin, 2012) is unlikely to work in India. Two key barriers identified in various stakeholder forums were capacity within the ULBs to enforce code and capabilities of professionals to adopt the Whole Building Performance approach to compliance under ECBC. To overcome these barriers, three initiatives have been undertaken for a custom approach for India : (1) Under USAID funded ECO-III project, the ECOnirman online compliance tool was developed employing 21st century technologies; (2) The Tiered Approach to ECBC was developed under Shakti Sustainable Energy Foundation (SSEF) to reformulate ECBC to match the realities of the real estate and construction industry (Rawal 2012); (3) Third Party Assessor (TPA) framework has been developed that will utilize the expertise in the private sector for compliance checking and reducing reliance on the public sector and government agencies.

This paper summarizes the innovative work that was done in the development of the ECOnirman tool, and provides an insight into the challenges that continue to exist in the area since the end of the ECO-III project. The paper also summarizes the proposed TPA framework, the stakeholder feedback and the policy follow-through at the government level that will be needed to make this a successful reality.

ECOnirman – a Whole Building Code Compliance Tool for India

BACKGROUND

ECBC allows compliance with the code using Prescriptive or Whole Building Performance (WBP) methods. In 2009, USAID ECO-III Project undertook development of the ECOnirman tool that checks compliance for buildings using the prescriptive method. The Energy Conservation (EC) Act of 2001 in India however, requires energy code compliance through an Energy Performance Index (EPI) expressed as the annual site energy normalized to the building area. The prescriptive approach does not meet this requirement of the EC Act since it does not assess performance of the building in terms of its EPI in annual kWh/m^2. The WBP method, using building energy simulations, compares the EPI of the proposed building with that of a reference building, thus complying with the EC Act. However, simulating energy use of buildings requires significant expertise and knowledge of building science. Most developers, architects and engineers do not have the skills, ability, time or access to simulation programs to do this on all their building projects. Additionally, since energy simulations are not practiced with similar consistency and standards across the country, large variations could be found in approaches to confirm the requirement of ECBC using WBP method, which in turn will result in unreliable code compliance submittals in India.

In order to encourage compliance using the WBP method and to overcome the barriers mentioned above, the ECOnirman WBP online application was developed under the leadership of the ECO-III project. ECOnirman WBP tool offers uniformity in practice for running code compliance simulations. ECOnirman WBP runs in a standard Internet browser and communicates with a web service, where the building model is created, and simulations are run in the cloud. The tool populates a central database as users feed in information about their buildings. It was designed to have a simple user interface that allows a user with skill levels of an architecture student to enter their building information and assess WBP compliance in less than one hour.

CURRENT VERSION

The current version 1.0 of ECOnirman WBP[1] assesses performance for the office building type. A total of 1,294 city locations in five climate zones in India are included. Users set up their login profile that gives them access to the projects they are working on. Users can create and save their projects. For each project, the user progresses through the interface specifying the inputs required by the tool, including building geometry, orientation, envelope, building use information, and salient aspects of HVAC systems. A screenshot of the user interface is included in Figure 2. The user is required to answer questions about mandatory requirements of ECBC. When the user requests a compliance check, the application develops a model of the proposed and the reference building (Standard Design as per Appendix B of ECBC). The application then invokes the required sizing and annual simulations. The user is able to see the EPI results for both the ECBC Standard Design and Proposed Building. The user can download a compliance report that can be submitted to the code enforcement authority to demonstrate compliance with ECBC. Figure 3 shows an excerpt of the summary page of the compliance report.

Research indicated that in India, circulation spaces, storage rooms and restrooms are often left as unconditioned spaces and buildings are sometimes designed with additional unconditioned spaces. In ECOnirman WBP, unconditioned zones are modelled identically in the Standard Design and the Proposed Building. Since buildings in India do not have cooling and heating enabled for the entire year, it is not reasonable to run simulation models with heating and cooling available indiscriminately. This would result in EPI predictions that are higher than real values. However, it is also not reasonable to let the user edit the schedule for cooling and heating availability, since that may allow users to game the inputs to suit their desired outcomes, and it would lead to a lack of consistency across projects leading to problems in the compliance checking

1. http://econirmanwbp.twgi.com/IndiaEPITool.aspx#/ProjectList

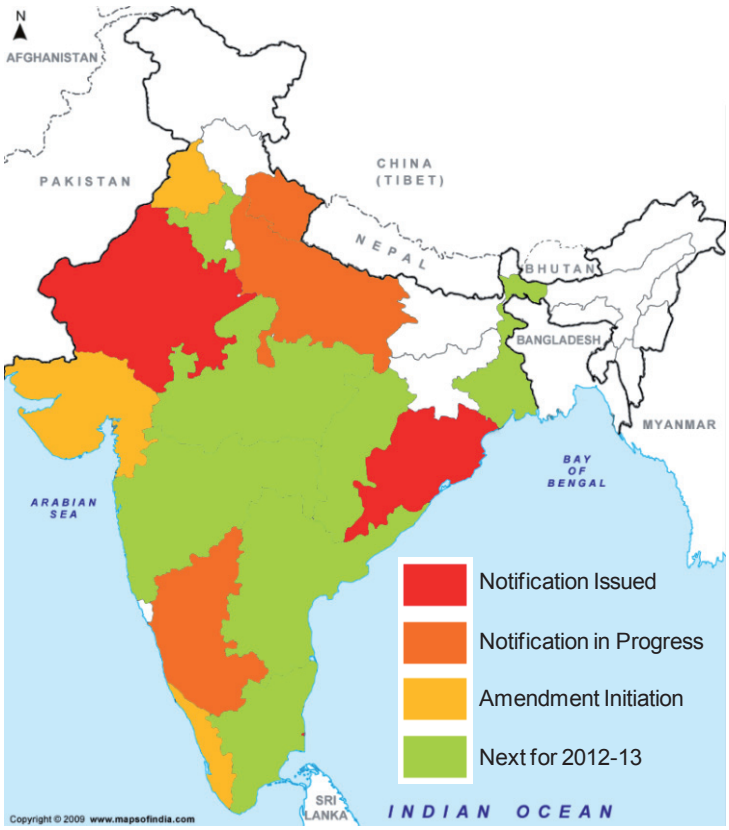

Figure 1. Status and Schedule of ECBC Adoption.

Figure 2. Building Shape and Orientation screen of ECOnirman WBP.

process. ECOnirman WBP, therefore, uses an algorithm based on the monthly average dry-bulb temperature and total enthalpy content of the outside air to establish heating and cooling availability, and this schedule is identical for the Standard Design and Proposed Building models. The user can select heating and cooling availability for the entire year or on a seasonal basis. The seasonal availability schedule is based on weather data for the building location. Heating is made available for the months when the monthly average dry-bulb temperature is below 15 °C. Cooling is made available when the monthly average dry-bulb temperature is above 26 °C or when the monthly average enthalpy is above 60 kJ/kg.

The development of ECOnirman WBP included a peer review by simulation experts in India, and a usability review by a group of building industry professionals. The feedback from these reviews was used in modifications during the development of version 1.0 and led to a list of desired features for future development.

The tool has outputs and a database that is made available based on permissions. Table 1 shows the current permissions and those envisioned for future versions.

FUTURE VERSION PRIORITIES

The ECOnirman WBP will need enhancements so that it can be used more widely for code compliance. The dynamic modelling and context sensitive defaults that are available for office building types need to be extended to other building types such as institutional, retail, hotels, hospital, multi-family residential and mixed use. Under the US and India Partnership to advance clean energy (PACE) projects, the possibility exists to add more building types, conduct research and add additional HVAC systems as well as include adaptive thermal comfort standards for India in ECOnirman WBP tool. ECOnirman can also assist with easier compliance checking by dynamically generating a compliance report that includes a list of the building features or ECMs that are incorporated in the building and their impact on the building energy performance. For every building, this will aid in prioritising the compliance checks, and provide accounting of savings. In addition, when a user performs a compliance check and the building is found to be non-compliant, the application can also provide clues and suggestions for the aspects of the building that need to be improved to result in an ECBC compliant building.

The database on ECOnirman and its ability to generate simulations of various scenarios can turn it into a powerful policy analysis tool: mining the database over time can yield valuable information about the nature of the building stock in India and the technologies that have been incorporated over time; impact assessment could be done by running simulations for various what-if scenarios for the entire building stock; and appending the database with actual energy consumption of the buildings can provide very high quality data for building benchmarking and labelling programs.

TRAINING AND INSTITUTIONAL NEEDS

The ECOnirman training program needs be designed for two different target groups viz. 1) code compliance officials and 2) building industry professionals (designers, architects, developers and others). Training will build capabilities to assist the use of ECOnirman tool at design, compliance and enforcement stages.

In order to institutionalize ECBC training, BEE has identified select academic institutions and research organizations to deploy ECBC training material developed under the ECO-III Project. These institutes will also be responsible for developing detailed lecture notes, presentations and exercises. Each institute will conduct a certain number of training events for trainers, officials and professionals and work act as a regional anchor for the group of neighbouring states.

Using funds from BEE, SDAs will lead these training programmes at the state level. They will receive funding from BEE to conduct such programs using the identified educational institutes.

Third Party Assessor Framework

BACKGROUND

Once ECBC becomes mandatory, compliance with the code requirements will be a significant challenge for the construction industry as well as the agencies that will enforce it. Studies conducted suggest that a number of barriers such as: flaws in current construction practices; lack of product performance standards, testing and labelling program; market failures like supply and demand for efficiency; lack of enforcement infrastructure in the current construction process; potential for graft and corruption may delay ECBC enforcement (Kumar, 2010; Rawal, 2012). Government and public sector agencies such as ULBs, SDAs or the utilities do not have the manpower or the technical competency to serve as the primary agency conducting ECBC compliance checks. After multiple interactions with various stakeholders and conducting background research, a Third Party Assessor (TPA) model emerged as the best path for successful implementation of ECBC.

It is normal practice in all ULBs that permits are required to be taken at two stages: first, before commencing the construction; and second before commencing the building operation and occupation. The utility provides power to the occupant only when the building has met mandatory requirements and has acquired the *Building Use Permission*. During the course of construction, utilities provide temporary power connection to construction site. In the framework envisaged, TPAs are independent professionals, and will not be associated with the project team or the ULB. A TPA will first review design documents and provide a recommendation to the ULB for provisional compliance approval, which will enable the owner to commence construction work on site. During the course of construction, the TPA will also conduct site inspections to ensure asset compliance with ECBC. After construction, the TPA will inspect the building and will recommend to ULB that the constructed building complies with ECBC. The TPA's scope is limited to checking for energy code compliance, and does not include other building code compliance checking.

Summary of research conducted

Research was conducted through personal interviews, literature review and stakeholder workshops in order to understand the barriers, challenges and success of various TPA models practiced so far within India and outside India. Of all the models selected for detailed study, some were related to building energy code or ratings systems, and some were not from build-

ENERGY CONSERVATION BUILDING CODE (ECBC)

Conformance Check Report
Whole Building Performance Method

1.0 Building Summary

Project Information		
Project ID	ac79f95f-514a-4cc6-8be4-737230eb4786	Date: 5/31/2012
Project Name	proposed-Delhi	
Project Address		
Organization Name	TWG	
Building		
Building Type	Office	
Building Occupancy	Daytime Use	
Total Conditioned Area (m²)	8,700	
Total Unconditioned Area (m²)	1,300	
Total Interior Floor Area (m²)	10,000	
Number of Floors	2	
Floor to Floor Height (m)	4	
Location		
State/UT	NCT	
City	New Delhi	
General		
Climate Zone	Composite	
Weather File	IND_New_Delhi_421820_ISHRAE	
Simulation Program	DOE2.1	

Building Conformance Summary		
Proposed Design Electricity Use per year (kWh/year)	**Standard Design Electricity Use per year (kWh/year)**	**Percent Savings: Electricity Use per year**
23,67,091	25,25,390	6.3%
Proposed Design EPI (kWh/m²/year)	**Standard Design EPI (kWh/m²/year)**	**Percent Savings: EPI**
237	253	6.3%
10.3.2(e) of ECBC Satisfied (Y/N)?		Y
Mandatory Requirements Met (Y/N)?		Y

Building Conformance as per the ECBC	**CONFORMING**

Figure 3. Conformance Check Report with Conformance Summary of ECOnirman WBP.

Table 1. Permissions for viewing ECOnirman WBP outputs and database.

Output	Project Level User	Compliance Checker/ Local Government	Bureau of Energy Efficiency	Public (after Right to Information request)
Compliance Report (single project)	Yes	Future	No	No
Summary of Inputs (single project)	Yes	Future	No	No
Building characteristics database (all projects)	No	No	Future	Future
Simulation files (all projects)	No	No	Future	Future

ing sector, but still offered valuable insights towards developing a TPA model for ECBC implementation in India. The models that were studied are:

1. Chartered Accountant Model (CA) in India
2. Company Secretary Model (CS) in India
3. Property Assessors (Valuers) Model in India
4. LEED – India
5. GRIHA in India
6. LEED for all Rating Systems except LEED for Homes in the USA
7. LEED for Homes in the USA
8. EPA ENERGY STAR in the USA
9. Energy Code Compliance with TPAs in various Jurisdictions in the USA (Fairfax County, VA; Dayton, OH; Pittsburgh, PA; Washington, DC)
10. Energy Code Compliance through use of Design Professional Accountability/Self-Certification in the USA (Wisconsin & Arizona)
11. Energy Code Compliance in China

Each of the above eleven examples were analyzed for the following aspects for establishing and functioning (TWG CEPT 2012) of an independent third party system: (a) Roles, (b) Appointment methods and national level scalability, (c) Fee structure and conflict of interest, (d) Process of review or audit, (e) Standards followed, (f) Complaint resolution, (g) Qualifications, (h) Credentialing, (i) Education and training, (j) Quality assurance.

Preliminary research led to the following principles, which formed the basis for developing the TPA framework:

a. Demand and supply of TPAs should be decided by the market with a regulatory framework in place to enforce code of conduct, fees charged and quality of services.

b. TPAs should be seen as independent workforce available at national level rather than state or regional level.

c. TPAs should be seen as checkers with technical capabilities but should not be seen in a role of administrative or regulatory authority.

d. Finance mechanism to support TPA work should not include any direct transaction between TPA and the project team.

TPA FRAMEWORK

The Third Party Assessor framework for ECBC Compliance Check for buildings is an institutional framework that includes roles, scope of work, deliverables, pre-qualifications, examinations and qualifications, quality assurance and funding/financing mechanism. It defines relationships between project teams, TPAs, the SDAs, BEE, ULBs for ECBC compliance checking. The process for quality assurance of the TPA work ensures that compliance rates may be measured and over time, improved upon.

Roles

The Third Party Assessor framework encompasses the following roles (also see Figure 4): **BEE** is in-charge of the technical standards and recognizing qualified individuals as TPAs who can provide ECBC compliance checking services. **Project teams** consisting of the developer, owner, architect, engineer, and contractor are responsible for ensuring that the building meets with ECBC requirements. **ECBC Accredited Professionals** (ECBC APs) are part of the Project Team that includes the builder, developer, designers, contractors and other consultants, to assist them develop ECBC compliant building design, in the installation of materials and equipment to meet with ECBC requirements, and for preparation of the compliance documentation It is advisable to have ECBC APs as part of project team but not a pre-requisite to demonstrate compliance. **TPAs** are qualified individuals that check compliance of the building with ECBC requirements during design and construction. **Quality Assurance (QA) Bodies** are organizations appointed by BEE to review the TPAs' work for quality and consistency. **Urban Local Bodies** such as development authorities, municipal corporations, etc. approve a building for construction or occupancy based on the TPA's recommendation that a building meets the ECBC requirements. A **National Bank** and its state selected branches collect and disburse payments to the TPAs.

Third Party Assessor

The TPA is a registered person and not a firm, who shall be a building professional with a Bachelor's Degree in a relevant field, and will have passed a qualifying exam as per norms of BEE. A candidate needs to have a minimum prescribed apprenticeship experience (TWG CEPT, 2012). Persons who are qualified as TPAs for ECBC compliance checking will be listed on BEE's website – this national level list will be maintained by BEE. Qualified TPAs can provide compliance checking service across the country.

TPA fees are proposed as a non-negotiable amount prorated for the area of each building; the fees shall be INR 10.00 per m^2, with a minimum fee of INR 50,000 (approx. 700 Euro at 72 INR/Euro) and a maximum of INR 250,000 (approx. 3,500 Euro). BEE will notify this schedule of charges for TPA at national level. Energy savings for ECBC compliant buildings based on Equipment Useful Life (EUL) for ECBC measures are estimated at 4,500 kWh/m^2 (Rawal, 2012), which demonstrates that the cost of the TPA work would be less than INR 0.002/kWh of energy saved.

SDAs in each state negotiate a Letter of Credit (LOC) approach with a selected bank. The terms of the LOCs are set as per the payment schedule defined for the TPA work (TWG CEPT, 2012). An SDA official is identified to authorize the release of payment to a TPA by the bank.

A project team selects the TPA for their project, and the TPA is required to declare no conflict of interest for each project he/she reviews. Project team will follow all other processes to acquire building construction and occupancy permits as required by each ULB. TPA will only check for ECBC compliance and not any other aspects of the building code. Engaging a TPA on the project requires the Project Team to provide the TPA with a Letter of Credit of the bank selected in that state. The TPA reviews each building project in two stages to determine ECBC compliance. The first stage is a Design Review and the second stage is Construction Review. During the Design Review stage, the TPA reviews the drawings, specifications, and ECBC Compliance Forms to ensure that the energy conservation measures (ECMs) are appropriately reflected in the project Design Documents. During the Construction Review stage, the TPA reviews the ECBC Compliance Forms and inspects the building to ensure that the ECMs are reflected in the construction of the building and the installation of its systems.

If ECMs that are required to meet ECBC are not found, the TPA notifies the project team and requests documentation or proof of specific ECMs. The TPA ensures that the EPI of the proposed building is reported consistently to BEE using the ECOnirman WBP Tool. If the proposed building complies with ECBC, the TPA sends a Letter of Recommendation along with the checklist to the ULB and the SDA.

The ULB uses the TPAs recommendation in their usual process of construction and occupancy approvals. The SDA compiles the records and authorizes the bank to release payments to the TPA for each milestone and its completed deliverable.

Quality Assurance

Quality Assurance (QA) is included in the TPA framework primarily to improve compliance rates over time. QA Bodies will be selected organizations that have experienced TPAs on their staff. A national level technical committee will help BEE select the QA Bodies. QA is done by organizations that review the TPAs' work, and report findings that help the TPAs understand the shortcomings of their checks, and, in the process, measure the compliance rates and accurately account for energy savings resulting from ECBC compliance. All the annual work of a TPA is assigned to one QA Body for performance review. The QA

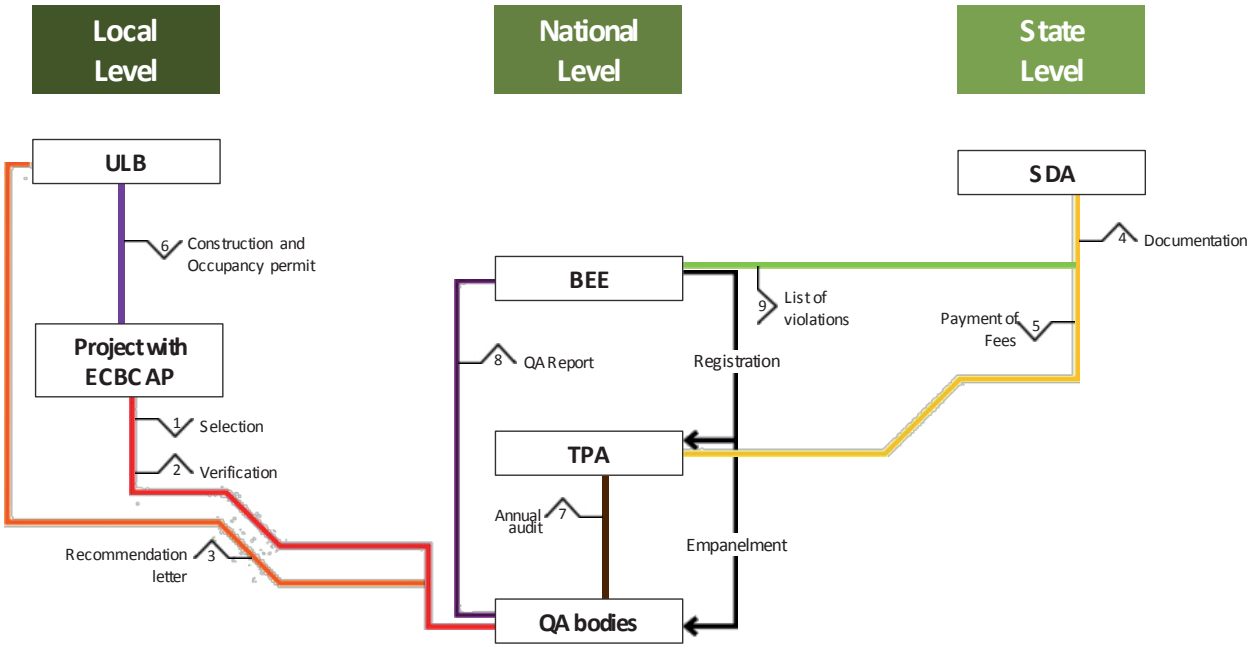

Figure 4. Operating Model for Third Party Assessment for ECBC Compliance Checks.

Body selects projects for audit from the TPAs' work, ensuring the number of projects audited is statistically significant. During the audit, the QA bodies will conduct a thorough check of entire work done by TPA, which will include a check of all documents at the design stage, documents at the construction stage, site inspection reports and submittal to ULBs. The QA bodies will also carry out on-site inspection. Statistical significance for selection of project for audit will ensure that every TPA's work gets reviewed annually. This audit assesses the quality of the work done by the TPA and the findings are compiled in to a report. Violations of standards of service or low quality work are reported to BEE as well as the SDA. BEE may decide to take further action by revoking the TPA's registration and end his or her ability to do provide these services.

QA Bodies will meet annually to share experiences and present compliance and checking issues that have been discovered. QA Bodies also assist in resolving conflicts that may arise between TPAs' and the project team. QA Bodies are paid by BEE from central government funds. These funds are allocated specifically for measuring and improving ECBC compliance rates.

STAKEHOLDER FEEDBACK

The Third Party Assessor framework was presented at various consultative meetings with multiple stakeholders from February through October 2012, and at a joint Stakeholder Workshop in New Delhi in October, 2012. Overall the discussions have been positive. These stakeholders consisted of: SDAs and ULBs in the states of Maharashtra, Gujarat, and Rajasthan; developers, architects and engineers; building energy efficiency experts and green building professionals; officials from BEE and BEE's United Nations Development Program (UNDP) Global Environmental Fund (GEF) Energy Efficiency in Commercial Buildings Project; and, officials from other donor organizations that are involved in energy efficiency in India.

Maharashtra Energy Development Agency (MEDA) and the ULBs in that state were receptive of the TPA approach to ECBC enforcement. They stated that it addressed aspects of ECBC implementation, particularly enforcement, which had been unclear in terms of roles, responsibilities and capacity building. Of the options for funding that were presented, a majority of the stakeholders at the MEDA meeting preferred a self-sustaining model where the TPA fees were paid out of the project development costs. A central government funding model was not favoured by these stakeholders. ULBs were relieved that they would not be responsible for the technical compliance checks related to ECBC enforcement. MEDA's research shows that in recent years about 250 buildings that would fall under the scope of ECBC were built annually in Maharashtra.

Experts in Rajasthan opined that the TPA approach to ECBC compliance checking is necessary and will be useful for the building approval process there. They confirmed that ULB officials do not have the expertise required to enforce ECBC, and that the private sector had the capacity to provide these services.

In Gujarat, officials were receptive of the TPA framework. They stated a preference to use local experts to provide TPA services to overcome potential barriers related to language and approachability. ULB officials expressed a concern that TPAs as individuals are likely to be pressured and influenced into approving compliance. Gujarat Energy Development Agency (GEDA) stated that BEE needs to be responsible for the overall quality management of the TPA work, and that the agency would prefer to not be directly involved in financial transactions for the TPA work.

BEE has evinced a favourable response towards the Third Party Assessor framework and indicated that it could potentially be launched under the UNDP-GEF-BEE Energy Efficiency in Commercial Buildings Project.

Building energy efficiency experts that were consulted have helped refine the scope of work for TPAs and found the proposed fees acceptable to provide services for that scope; these 10 experts estimated that between them, they would be able to provide TPA services for about 150 building projects in a year. Adding a select group of other such experts could serve as the initial qualified TPAs and provide the capacity that is needed in the first year of ECBC compliance checking.

NEXT STEPS RECOMMENDED

BEE is the Central Government's agency mandated to prescribe and guide energy efficiency under the Energy Conservation Act of 2001. State and local government bodies look towards BEE to provide guidance and set standards for ECBC compliance. Therefore, BEE's role in setting up the infrastructure for the TPA model to operate successfully is critical. BEE needs to appoint a Technical Committee to oversee the TPA framework. This committee can identify and select the first group of TPAs who can provide the compliance check services across India during the time that rest of the TPA institutional infrastructure is being set up. These individuals can be appointed by BEE for a limited three-year period. The technical committee will also identify and select QA Bodies that BEE can then appoint.

BEE needs to enter a contract with a testing and examination agency that can take on the full responsibility of developing the question paper, conduct awareness and marketing campaigns, and administer the examination and qualification process over a long term.

BEE needs to develop the curriculum guide with references to materials for study for the exams. Template documents and checklists to be used by TPAs also need to be developed. Some of this work was started under the ECO-III project and has been taken forward in the ECBC Implementation Roadmap in Gujarat. There is a need to identify a National Bank and develop template terms for the Letter of Credit payment system to be used by SDAs for working with state level branches.

BEE needs to appoint an expert who can provide consultation to the SDAs for setting up the TPA model within the state.

SDAs in states such as Rajasthan, Orissa, Tamil Nadu, Maharashtra, Gujarat etc., which lead ECBC implementation, need to set up the Third Party Assessor framework to assist Urban Development Department and ULBs in ECBC enforcement.

Conclusions

ECOnirman Whole Building Compliance tool provides an innovative method for the building industry in India to demonstrate compliance with ECBC and to bring the building stock in to the purview of labelling and benchmarking programs. It provides a standardised way to do simulations for code compliance and build capacity in the building industry such that the practitioners may not require in-depth knowledge of simulation or the energy code. Training programs for ECOnirman are being formalized by BEE. Additional development of ECOnirman to include other building types and to provide continued support to the building industry is an important task for the immediate future.

Implementation of TPA framework requires BEE to set up a national level Technical Committee for oversight, and contracting with examination agencies to begin the process of qualification of TPAs. The Third Party Assessor framework proposed can resolve the issue of lack of manpower and expertise to enforce ECBC at the local government level. Pool of TPAs available at national level will ensure availability of their services across the country. However, mobilising BEE to put the framework in place could be a challenge and a time consuming task. Some of this can be overcome by state level initiatives demonstrating effectiveness of the TPA framework. The proposed TPA framework has been envisaged after rigorous research of TPA models in other countries and other walks of life in India, and with stakeholder inputs that have guided the development. The government institutions, the non-profit institutions providing QA, and the private sector TPAs have roles to play in this framework: the TPAs execute the checking process; the non-profit institutions measure the effectiveness of the checking; and the government provides the regulatory framework and sets the standards of quality. The QA process and the national level Technical Committee will be a critical part of the framework in the future to ensure that the TPA model evolves to meet the administrative, technical, and operational issues that are discovered as the model is implemented across the country.

These innovations are necessary to realize the significant energy savings that ECBC promises in India.

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Acknowledgements

Inputs and guidance in development of framework were provided by: BEE, MEDA, GEDA; ULBs of Pune, Pimpri-Chinchwad, Ahmedabad, Vadodara, Surat, Jaipur; State PWDs, CREDAI, MNIT, IIIT, MetricTrac, Prometric. Additional inputs were provided by: Sonalal Dutta, Deepa Sathiaram, Neeraj Kapoor, Rishabh Kasliwal, Saket Sarraf, Ankoor Sanghvi, Selvarasu. M, Swati Puchalapalli, Anagha Paranjape Purohit, Anurag Bajpai, Suraj Shah, Sanjeevani Sagwekar, Gaurang Lele, Aditi Lanke, Vasant Kachi, Hemant Patil , Prof. D S Gandhi, S L Kolhatkar, Poorva Keskar, Ketaki Rairikar, Jayant Sarvade, Vivek Dixit, Manish More, Nitin Adhari, Yashodhara Deshpande, Aparna Dixit, Subhash Chaudhari, Vatsal Patel, T.M.Lad, Ashwini Kumar, Mayank Trivedi, Prabhat Patel, CB Vasava, D.M Patel, Rajendra Pandya, Anil Purohit, Brijesh Purohit, Bajrang Singh, Pushpak Pandit, Dr. Jyotirmay Mathur, H.S. Sancheti, N.K. Khare, Dr. Vishal Garg, Kanagraj, Vasudha Lathey, Tanmay Tathagat, Ashish Rakheja, Kavita Gusain, Veena Joshi, Shammi Noor, Shabnam Bassi, Manila Agarwal, Sudipto Ghosh, Deepa S Kumar, Aalok Deshmukh, Rajesh Dongre, Jaydeb Ghosh, Bodhisatya Datta, Karan Mangotra, Saswati Chetia, Girja Shankar, Sanjay Seth.

Shakti Sustainable Energy Foundation supported the research and development of the proposed framework. Research and development of the proposed framework was done by CEPT University, The Weidt Group, and Sudha Setty.