EBC
Energy in Buildings and Communities Programme

BECWG NEWS

EBC Building Energy Codes Working Group E-Newsletter

In this issue:

This newsletter is published on a quarterly basis to communicate items of general interest and is part of a broader BECWG goal to encourage improvements and innovation in practices in building energy codes worldwide. In this issue, we highlight recent working group activities, emerging research, and opportunities to contribute.

Recent BECWG Activities

BECWG Annual Symposium

On 9 November 2020, the BECWG held its annual symposium virtually. The symposium consisted of a Working Group business meeting followed by two technical sessions with open discussions.

The first session titled "Integrating Research and Technology Breakthroughs in Codes" focused on energy code policies and how technology integration plays a role in code compliance. The session presenters were Dr. Paolo Bertoldi (European Commission Joint Research Centre), Mr. Rajan Rawal (Center for Advanced Research in Building Science and Energy, CEPT University, India), Dr. Tadj Oreszczyn (University College London Energy Institute, and Smart Energy Research Lab), and Dr. Masayuki Mae (University of Tokyo).

In the EU, Dr. Bertoldi explained how EU's building energy performance standards reflect their goal towards zero energy buildings. Requirements for new buildings must take into account decentralized energy supply systems based on energy from renewable sources, cogeneration, district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources and heat pumps. Building renovations must also take into account these high-efficiency alternative systems. India's commercial model building energy codes are also integrating renewable energy in line with their 2022 goal to reach 40GW from non-grid connected solar. Mandatory requirements include provisions to install renewable energy on rooftops or the site.

Dr. Oreszczyn's presented on how smart meter data in the U.K. shows heat loss and can better predict savings from efficiency measures in summer and winter. Using the data and additional monitoring will improve regulatory compliance and reduce the performance gap. Dr. Mae discussed Japan's evaluation of photovoltaic cells, fuel cells, batteries and plug-in electric vehicles in residential energy codes. Although they have had requirements related to PV in their codes for awhile, Japan is revising their program to obtain more accurate estimates of photovoltaic production. Fuel cells are showing a lot of potential given the larger reliability of these systems. Stationary batteries are becoming popular but evaluation standards are still insufficient.

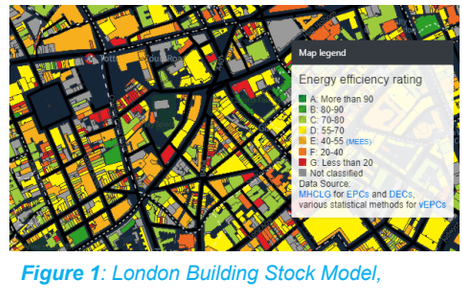

***Figure 1**: London Building Stock Model, referenced in Dr. Oreszczyn's presentation, showing energy efficiency ratings of buildings throughout London.*

The second session titled "Adapting/Expanding Code Coverage in Places with Hot Climates" explored code requirements and perspectives in hot climates and how codes can mitigate increases in cooling demand to reduce stress on the power system. Presenters in Session 2 included Mr. Siew Hwa

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Yong (Building and Construction Authority, Singapore), Dr. Roberto Lamberts (Federal University of Santa Catarina, Brazil), and Dr. Ellen Franconi (Pacific Northwest National Laboratory, U.S.). Mr. Hwa discussed code requirements and cooling systems in hot climates. Dr. Franconi analyzed historic and future energy code considerations, exploring how the U.S. is addressing future cooling growth. Dr. Lamberts discussed how bioclimatic principles play a critical role in Brazil's code regulation and implementation. The average home in Brazil, he explained, is not insulated as 89% of people prefer naturally ventilated environments. Brazil is working on making residential standards mandatory.

Figure 2: *Using Bioclimatic principals in building design, taken from Dr. Lamberts presentation.*

Symposium Event in collaboration with the U.S. National Energy Codes Conference

An additional symposium event was held in collaboration with the U.S. National Energy Codes Conference on 24 November 2020. The topics discussed included developing codes for hot and changing climates, net-zero energy building initiatives in codes, and codes for existing buildings. Speakers included Mr. Siew Hwa Yong (Building and Construction Authority, Singapore), Dr. Ellen Franconi (Pacific Northwest National Laboratory, U.S.), Dr. Vincenzo Corrado (Department of Energy - Politecnico di Torino, Italy), Mr. Alex Ferguson (CanmetENERGY, Natural Resources Canada), Mr. Greg Fairthorne (Codes Canada, National Research Council), and Ms. Gina Bocra (New York City Department of Buildings).

If you would like to watch the presentations, you can access them at www.iea-ebc.org/working-group/building-energy-codes.

On-going/Planned BECWG Activities

Energy Codes for Existing Buildings

It is estimated that in Organisation for Economic Co-operation and Development (OECD) countries, roughly 65% of the 2060 building stock already exists today. Many of these buildings were constructed and perform at significantly lower levels than assumed by codes and standards currently in force for new construction.

Building on the BECWG *Codes for Existing Buildings* hosted by Canada on 8 June 2020, a report on energy codes for existing buildings is underway. Led by Australia in collaboration with other countries, the report will provide a review of building energy codes and other mandatory regulatory instruments applied to existing buildings. Topics addressed will include applying building energy codes to renovation and refurbishment, GHG emissions or energy-based requirements, time horizons for targets, and prohibition of sale or lease below a certain performance threshold. The report also includes implementation topics like national and local government roles and policies, enforcement challenges, and needs for supporting policies. The report will consider lessons learned in leading countries and regions and opportunities and challenges with different approaches.

If you would like to help inform this topical report, please fill out this short (~5-minute) survey looking for national and subnational (state/ providence, region, or city) level codes driving improvements to existing buildings: https://www.surveymonkey.com/r/Q88DLSZ.

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Topical Report: Compliance Best Practices
Building energy code compliance is essential to achieving energy savings but requires resources and capacity to ensure effective implementation. While building energy codes vary in format and approach across nations, many face the same compliance issues, such as requiring faster and easier methods to verify codes.

Collaboration began on a report exploring code compliance best practices across the world, including analyzing differences in institutional setup and compliance enforcement mechanisms. Currently, the following countries are collaborating on the report: the United States (lead), Australia, Canada, Brazil, India, Japan, New Zealand, Turkey, and the UK. The country delegates had their first meetings on the paper outline in early December where they discussed the preliminary outline and existing challenges with code compliance in each country. Additional topics included differences between residential and non-residential compliance, disconnects between codes set at a national level but implemented at a local level, how to identify "best practices", problems of energy labeling, and ways to use innovative technologies for compliance. The anticipated completion date is September 2021.

If you have interest in collaborating or learning more, please reach out to Meredydd Evans (m.evans@pnnl.gov) or Alison Delgado (Alison.Delgado@pnnl.gov).

Research Highlight

India produces databanks of thermal characteristics of walling materials and assemblies in support of its residential building energy code
The Bureau of Energy Efficiency (BEE) India launched the Energy Conservation Building Code (residential), also called Eco-Niwas Samhita (ENS), in 2018. One of the main aims of the code is to limit heat transmission through the building envelope and hence improve thermal comfort and reduce the energy required for space cooling or heating. For cooling dominated climates, ENS defines Residential Envelope Transmittance Value (RETV) which is a measure of the net heat gain rate from the building envelope. RETV is heavily influenced by the U-value (heat transmittance) of the external wall. The accurate computation of the U-value of the external wall is essential for checking compliance with the ENS. For the implementation of ENS, a databank of thermal characteristics of walling material and walling assemblies is required. Presently, ENS provides reference values for a few types of bricks that needs to be expanded given the diversity of walling material and walling technologies used in India.

To fill this gap, a two-part project was jointly undertaken by the Centre for Advanced Research in Building Science and Energy (CARBSE) at CEPT University to build a database of thermo-physical properties of walling materials and walling technologies.

Walling material samples were collected from different parts of the country and tested for a variety of thermo-physical properties, such as thermal conductivity, specific heat, dry density, water absorption and compressive strength. Based on the measured results, correlations have been established between the dry density and thermal conductivity for the two types of materials. This means that by measuring the dry density of a brick, the thermal conductivity value of a brick/block can be established. Envisaging large scale adoption of ENS, such method is affordable and scalable. Such a database will help greatly in the calculation of RETV and implementation of ENS.

In the second part of the project, the U-value of about 30 non-homogeneous walling technologies has been derived based on laboratory testing. This

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effort will supplement the Compendium of Prospective Emerging Technologies for Mass Housing brought out by the Building Materials Technology Promotion Council (BMTPC) which will be used for affordable mass housing construction in the country. The research work was supported by the Shakti Sustainable Energy Foundation.

This research highlight was provided by Dr. Rajan Rawal, Executive Director of the Centre for Advanced Research in Building Science and Energy, and Professor at CEPT University in Ahmedabad, India.

Special Issue of *Atmosphere* on "Building Energy Codes and Greenhouse Gas Mitigation"

The deadline for submitting papers to the special issue of the journal *Atmosphere* on building energy codes and greenhouse gas mitigation has been extended to **10 June 2021**. We encourage you to submit original research articles, as well as review articles, addressing building energy codes and greenhouse gas mitigation. Topics of interest include but are not limited to:

- Modeling to assess the impact of building energy codes on greenhouse gas mitigation
- Analysis of what makes codes effective in mitigation, including assessments of code impacts post-construction
- Implementation and compliance case studies and analysis
- Nearly zero carbon and similar aggressive "stretch" codes
- Building energy codes for existing buildings

More information may be found at the following link: ***https://www.mdpi.com/journal/atmosphere/special_issues/building_energy_GHG***

Special Issue Editors

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Building Energy Code Resources

ICC Global Building Codes Tool. The International Code Council (ICC) recently released a tool called the *Global Building Codes Tool.* The tool provides information about the building codes and standards used in countries around the world but is still being populated with data. The tool found at https://global.iccsafe.org/global-codes/ provides users an opportunity to provide additional information on their country codes or suggested changes to the tool.

BECWG Webpage

Last year, the BECWG launched its webpage on the EBC website: https://www.iea-ebc.org/working-group/building-energy-codes

In addition to general information on the Working Group, visitors can find information on upcoming meetings and webinars, as well as slides and recordings from previous webinars, and Working Group published reports.

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We invite you to check out the webpage regularly for updated information.

Working Group Leadership |

David Nemtzow, U.S Department of Energy, United States (Chair)
Michael Donn, Victoria University of Wellington, New Zealand (Co-Chair)
Meredydd Evans, U.S. Pacific Northwest National Lab, US (Operating Agent)

Participating Countries |

Australia, Brazil, Canada, China, India, Ireland, Italy, Japan, New Zealand, Portugal, Singapore, Sweden, Turkey, United Kingdom, United States

Further information | https://www.iea-ebc.org/working-group/building-energy-codes