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Joint Task Force on Energy Efficiency Standards in Buildings

Updated Framework Guidelines for Energy Efficiency Standards in Buildings

Note by the secretariat

Summary

The Joint Task Force on Energy Efficiency Standards in Buildings of the Group of Experts on Energy Efficiency was established in 2015 by the Committee on Sustainable Energy and the Committee on Urban Development, Housing and Land Management for 2016–2017 with a possibility of extension. Its mandate was extended for the period of 2018–2019, and further for the period of 2020–2021 with a possibility of extension.

The Joint Task Force on Energy Efficiency Standards in Buildings developed the Framework Guidelines for Energy Efficiency Standards in Buildings (ECE/ENERGY/GE.6/2017/4), and in 2017 the Committee on Sustainable Energy and the Committee on Urban Development, Housing and Land Management endorsed the document. To deploy the Framework Guidelines for Energy Efficiency Standards in Buildings and to set in motion the process of setting up international centres of excellence and a consortium of educational and research institutions, and thereby to accelerate transformation of the world's building stock, the United Nations Economic Commission for Europe launched a programme on high-performance buildings.

The United Nations Economic Commission for Europe continues to maintain the Framework Guidelines for Energy Efficiency Standards in Buildings and keep them updated. In view of this, the Work Plan of the Group of Experts on Energy Efficiency for 2020–2021 (ECE/ENERGY/2019/8) set the objective to further review and update the document, as needed. The related 21-day review process was organized involving the expert community of the Group of Experts on Energy Efficiency. This document contains the revised Framework Guidelines for Energy Efficiency Standards in Buildings, improved as deemed necessary.

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I. Introduction

1. Buildings are central to meeting the sustainability challenge. In the developed world, buildings consume over 70 percent of the electrical power generated and 40 percent of primary energy and are responsible for 40 percent of carbon dioxide emissions from related fuel combustion. While developing countries will need to accommodate 2.4 billion new urban residents by 2050, in Europe 75-90 percent of buildings standing today are expected to remain in use in 2050. Renewable energy technology alone cannot meet those requirements, despite recent improvements. The energy performance of buildings must be managed, but the capability to meet this challenge is in place.

2. Standards are an effective instrument for addressing energy efficiency in buildings. Development and deployment of standards support the achievements of the targets set by several international initiatives such as the 2030 Agenda for Sustainable Development, the Sustainable Energy for All Initiative, the Geneva United Nations Charter on Sustainable Housing, as well as by the Paris Agreement. The concepts set forth herein go well beyond the incremental, components approach of existing building standards. Rather, they represent a principles-based performance guidance for building energy standards that is outcome-based, anchored in energy actually consumed, and that is designed to project a vision of holistically designed and operated, ultra-high-performance buildings as part of an integrated sustainable energy system.

II. Goal

3. Economic growth and the quality of indoor environments have depended on increased primary energy use. Shifting that reliance to renewables requires a holistic, systems approach to building design, delivery and operation and a paradigm that envisions buildings as energy producers and not solely or primarily as energy sinks. At costs equal or close to those of traditional buildings, it is possible with today's technology to transform buildings to align with the highest standards of health, comfort, well-being and sustainability, including improving energy productivity and reducing carbon dioxide emissions.

4. The energy required by buildings can be reduced to a level that can be supplied largely, perhaps exclusively, by non-carbon-based energy. While further improvement in renewable energy technology and electrical and thermal storage is to be expected, the results will be more immediate and robust if buildings and the materials and technologies therein used are fundamentally transformed, while being assessed over their life cycle in terms of their energy performance. Limiting building heating and cooling requirements to 15 kWh/m²a in new builds and to 25 kWh/m²a for retrofit projects (final energy in conditioned space) each reduces energy needs sufficiently to permit renewable energy or zero carbon sources to meet most or all of the remaining space conditioning energy requirements. Total primary energy use in buildings' conditioned spaces, including heating, ventilation, cooling and hot water, can be limited to 45 kWh/m²a or, including plug-in loads (appliances), to 90 kWh/m²a. Over time with improvements in technology and materials and with enhanced connections to the built environment, these targets could be improved further. In addition, a viable indicator for primary renewable energy use should be introduced. In parallel, there will be need for effective controls for generation, distribution, and emission at full and partial demand loads to match energy use with building and occupant needs.

III. The Principles

5. The principles required for an era of truly sustainable buildings emerge from building science, materials science, digital science, information and communication technology and more. They reflect accumulated lessons learned and best practices of building owners, designers, engineers, builders, managers, policy makers, and more. The principles shift the building industry paradigm from fragmented and serial to holistic and integrated.

6. The principles cannot be prescriptive because of the vast diversity of circumstances and conditions experienced around the world. Rather, the principles provide guidance for

planners, builders, and the entire building delivery and management chain as elements of innovative sustainability strategy.

A. Strategic

7. Buildings must be:

(a) Science-based: design, construction, and management;

(b) Financed through policies recognizing the value of better buildings;

(c) Service-oriented: meet the sustainability demands of the populations served;

(d) Integrated with their built environment lifecycle to connect buildings as energy consumers and generators (prosumers);

(e) Cost effective to mobilize private investment and entrepreneurs;

(f) Low-carbon technologies oriented to encourage clean and potentially renewable energy-based technologies utilization to lower greenhouse gas emissions;

(g) Low energy consumption targeted to encourage energy efficiency increase in buildings leading to lower greenhouse gas emissions;

(h) Performance-monitored with feedback loops to operations and design tools;

(i) Performance-based: evaluated by system outcomes, not component prescriptions;

(j) Safe and healthy: made taking the impact of buildings on human health into account;

(k) Cognizant of the whole value chain, including taking account of the amount of energy consumed to produce building materials, for more accurate calculation of energy efficiency.

B. Design and Construction

8. Conception and delivery of buildings must be:

(a) Holistic and integrated: recognize buildings and their environment are part of a system;

(b) Affordable: high performance buildings costing the same as or less than in 2016 based on a life-cycle assessment, taking account of cost reductions from learning effects and economies of scale;

(c) Validated: based on energy models that reliably predict actual building performance;

(d) Sustainable: made using sustainable materials, equipment, construction, management and retirement practices, with due consideration given to passive building design where practicable;

(e) Code-driven: with local adaptation of global building standards by having a normative template for specific choices in method, boundary conditions and in input data, to tailor the procedures to the national or regional context;

(f) Skills based: develop workforces to provide technology/skills needed for design, construction and operation.

C. Management

9. Building must be maintained over their lifecycle:

(a) Commissioning: With commissioning and re-commissioning of building active systems;

(b) Performance-based: With on-going benchmarking, monitoring & reporting of actual performance data;

(c) Certification: Maintain certification or labelling to ensure energy performance is incorporated in asset value;

(d) Managed: Large or complex buildings, not leaving other types behind, to be all professionally managed with ethos of sustainability & social responsibility;

(e) Data-linked: with advanced building information management capacity, where public infrastructure permits;

(f) Evaluated: On going performance evaluation and improvement;

(g) City-scaled: information analysis and outcomes;

(h) Life cycle-based: with long term analysis.

IV. Implementation

10. Transformative change in buildings is possible, and the capabilities to create a new world of buildings and energy is in hand or within reach. Already today we have the techniques to achieve climate neutrality in the building sector until 2050/2060. Progress will require multisectoral follow-on action in five areas to support the Framework Guidelines for Energy Efficiency Standards in Buildings and make its vision a reality:

(a) Dissemination: national, regional and municipal leaders in the public, private, research and education sectors must be made aware of the Framework Guidelines for Energy Efficiency Standards in Buildings – its vision, logic, practicality, and advantages;

(b) Education: information, guidance, instruction, and avenues to ongoing dialogue and knowledge resources must be provided to policy, market, and knowledge stakeholders to foster local development of building standards, codes and practices aligned with the Framework Guidelines for Energy Efficiency Standards in Buildings;

(c) Research: through collaborations among leaders in science and technology, focused on the frontier challenges in such areas as: (1) building components and materials; (2) building design, construction and operation; (3) energy production, distribution and consumption; (4) integrated urban systems and life cycle management; and (5) strategies for each country and climate zone to be carbon-free in 2050/2060;

(d) Consultation: formal and informal channels with local policy, market, and knowledge stakeholders for evaluation of impact, dialogue on in impact strategy, addressing discovered or unanticipated challenges, and cultivating global consensus in support of the Framework Guidelines for Energy Efficiency Standards in Buildings;

(e) Participation: networks of support and engagement among leading corporations, foundations, universities, professions, civil society and others with the array of resources – intellectual, experiential, financial, and relational – that will be required to make transformation a grass roots or deep market movement.