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Item 5 of the Provisional Agenda

Energy efficiency standards in buildings**Energy efficiency standards in buildings****Concept note on the principles-based energy performance standard in buildings¹****Note by the Secretariat****I. Introduction**

1. Energy is at the heart of the 2030 development agenda and addressing the climate change challenge. Improving energy efficiency and energy productivity, particularly in buildings, industry and transport, will reconcile the world's growing need for energy services with the impact that energy resource development has on the natural resource base. Buildings are responsible for approximately one third of total energy consumption and account for almost 40 per cent of CO₂ emissions from combustion. Standards are an effective instrument for addressing energy efficiency in buildings and to support the achievement of the targets set by several international initiatives such as energy-related Sustainable Development Goals, the Sustainable Energy for All (SE4All) initiative of the United Nations Secretary General, and the Geneva United Nations Charter on Sustainable Housing.

2. The number of national and international standards related to energy efficiency in buildings is continuously increasing. This generates confusion among policy makers, organizations, businesses and consumers concerning which standards in energy efficiency have the highest impact and are most relevant for their country.

¹ This concept note has been prepared by the ECE secretariat based on documentation provided by Dr. Robert Cavey, member of the Group of Experts on Energy Efficiency.

3. This concept note describes an approach to develop principles-based performance guidance for an United Nations Economic Commission for Europe (ECE) building energy standard that is outcome-based (i.e., anchored in energy actually consumed) and designed to project a vision of holistically designed and operated, ultra-high performance buildings as part of an integrated sustainable energy system.

II. Objective of the standard guidance

4. The objective of this document is to create a structure for a ECE building energy standard that can be developed by the Joint Task Force on Energy Efficiency Standards in Buildings of the ECE Region and other interested parties and individual experts. The objective refers to the conceptions of power generation and grid design necessary to complement buildings in a post-carbon strategy, such as distributed generation, Combined Heat and Power (CHP), renewable energy generation etc.

5. The structure and the standard guidance are proposed to be designed as sufficiently broad and inclusive. This way a final ECE document would provide useful guidance to architects, civil engineers, construction companies, and investors on the full range of factors that need to be addressed by an operational or technical building energy standard, in order to make the technical standard both transformational and effective for a post-carbon sustainable energy system.

6. Thus, without being itself a technical standard, the resulting ECE principles-based energy performance standard needs to take into account technical and operational realities well enough to suggest persuasively specific paths on which the goal of market transformation can be achieved.

7. The final goal of the ECE standard is to help usher in a progressive transformation of the world's commercial and residential building stock and many of the elemental principles on which the overwhelming bulk of buildings in the developed and much of the developing world are conceived, designed, constructed, employed, maintained, renewed, and retired.

8. Given that goal, the agenda and structure of existing building energy standards may not be a proper point of departure for the building energy standard of the future. It may be more appropriate to reconsider the agenda and structure and present a new concept of buildings and building energy standards. This would also encourage rethinking the risk profile of buildings. As an example, a shift in preferred building materials may entail a shift in other risks (e.g., fire, air quality, maintenance failure, respiratory diseases). New risks need to be anticipated and addressed.

9. A realistic list of obstacles to market transformation should be developed, so that the proposed building energy standard, and a communication programme for its implementation, can address the objections and the standard can be articulated to strengthen the science-based and experience-based confidence.

10. The main elements of the principles-based standard can include:

(a) Mission statement. The task of future building energy standards and codes worldwide, for which the ECE building energy standard could and possibly should be a guide, is to allow people to enjoy a sustainable built environment that is also appropriate to advanced development. Basic facts of energy and atmospheric science, taken together, indicate that future buildings must be net energy zero consumers or even become energy producers, be carbon emissions free, and contribute to sustainable development. Consequently, the energy demands of buildings must be reduced progressively to a level that can be addressed by carbon free energy sources;

(b) Metrics of success. Energy research has not yet brought scalable carbon free energy sources sufficiently within reach. Therefore, a proposed standard should assume that various “bridges” to a net carbon-free era will be necessary for most urban and metropolitan spaces.

III. Test and metrics of success for the building energy standard

11. A principal test of success for the proposed building energy standard is that the new concept put building standards and practices on a course to minimize or eliminate reliance on carbon-based energy, required today for energy services, and even to make buildings net-positive contributors of carbon-free energy. Further, the standard is less about an individual building and more about a building in the built environment in the context of a sustainable energy system.

12. Concretely, dramatic reductions in peak load on the power grid may be more readily attainable across the whole of a city’s building stock than, say, net zero or near net zero energy use building by building. But to be truly transformational, peak load reductions should not be regarded as successful if designed to sustain, rather than drive transformation of, existing energy generation and distribution models (i.e., existing private sector utility business models).

13. Hence, the metrics of success for the new building energy standard can be the following:

(a) The new building energy standard has to be based on building concepts that demonstrably achieve massive, visibly transformational reduction in the energy that buildings require for proper operation;

(b) The new standard can be fully articulated on whole building performance principles;

(c) Building performance under the new standard is measured on a full building basis (e.g., kWh, kW per square metre) in the context of a sustainable energy system;

(d) Market transformation can successfully be driven by incentives and knowledge sharing rather than by mandates – at least in the initial phases;

(e) Buildings should deliver quality of life -- residents’ comfort and well-being as well as safety and health;

(f) The new energy standard should be achievable in both developed and developing world;

(g) Building performance improvements should be sustained and measured in terms of actual energy consumed, not in modelled performance;

(h) Transparency is to be established and maintained, including the required sharing of measured performance metrics with documentation of successes and failures to be shared with others to expedite learning and quickly eliminate problematic designs, techniques and materials;

(i) The building energy efficiency standard requires full support of the various stakeholders involved throughout the cycle of a building, from conception through retirement;

(j) The new energy standard should not be limited to new build but also to refurbishments.

IV. Building energy standard agenda

14. Topics of the new building energy standard agenda will comprise:
- (a) Disseminating the building performance standard globally;
 - (b) Building delivery model – e.g., design-build, not template buildings; integrative processes;
 - (c) Building Life-Cycle: Certification, Commissioning, Labelling, Continuous Performance Evaluation, Renovation/Retrofit; Retirement;
 - (d) Linkages to Internet of Things technology and strategy, including strategically relevant data collection and analysis;
 - (e) Linkages to community of buildings, other community systems, and community life cycle;
 - (f) Utility model – redefining what the utility gets paid for;
 - (g) Finance model – bringing value of energy efficiency to building market value;
 - (h) Education:
 - (i) Building design professionals;
 - (ii) Construction and maintenance professionals and workforce;
 - (iii) Building owners and operators;
 - (iv) Policy and oversight professionals and workforce;
 - (v) Utility and finance professionals and workforce;
 - (vi) Grassroots market education: households and major building owners.
15. The outcome is expected to be both a guidance document for standards and a process for application of the guidance that includes dissemination, training and certification, performance benchmarking, and feedback from the field information to identify and resolve challenges and obstacles to progress.
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