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Improving energy efficiency in buildings

Energy Efficiency Standards in Buildings: analysis of progress towards the performance objectives

Note by the secretariat

Summary

The United Nations Economic Commission for Europe (ECE) is implementing project “Enhancing National Capacities to Develop and Implement Energy Efficiency Standards for Buildings in the UNECE Region”. The project is overseen by the Joint Task Force on Energy Efficiency Standards in Buildings, established under the Committee on Urban Development, Housing and Land Management and the Committee on Sustainable Energy, and hosted by the Group of Experts on Energy Efficiency

One of the project activities includes conducting a gap analysis between the performance objectives set forth in the Framework Guidelines for Energy Efficiency Standards in Buildings (ECE/ENERGY/GE.6/2020/4) and the current energy efficiency standards and their implementation in the selected countries. The gap analysis was conducted, and the study is available online.¹ It addresses the situation in South-Eastern Europe (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia), Eastern Europe (Belarus, Republic of Moldova, Ukraine), the Caucasus (Armenia, Azerbaijan, Georgia), Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan), and the Russian Federation.

The Group of Experts on Energy Efficiency at its seventh session (22 and 25 September 2020) requested the results of the gap analysis to be reported at the eighth session (ECE/ENERGY/GE.6/2020/2). The present document was developed in response to this request. It contains key conclusions of the gap analysis and recommendations on attainment of the performance objectives set forth in the Framework Guidelines for Energy Efficiency Standards in Buildings.

¹ See: https://unece.org/sites/default/files/2021-04/Gap_Analysis.pdf

I. Introduction

1. The project “Enhancing National Capacities to Develop and Implement Energy Efficiency Standards for Buildings in the UNECE Region”, funded by the Russian Federation, builds on previous activities of the United Nations Economic Commission for Europe (ECE) in the area of energy efficiency standards in buildings, and aims to enhance capacity of the ECE member States to develop and implement such standards.
2. The ECE Framework Guidelines for Energy Efficiency Standards in Buildings (the Framework Guidelines, ECE/ENERGY/GE.6/2020/4) provide guiding principles for sustainable buildings covering strategic approach, design and construction, and management. In line with these guidelines, buildings must be science-based, service-oriented, integrated with the built environment life cycle, cost-effective, using low-carbon technologies, having low energy consumption, performance-monitored and performance-based, safe, and healthy. These principles served as the “reference points” in assessment of the situation with energy efficiency standards and their implementation in the project countries.

II. Analysis of energy efficiency standards and barriers to their implementation in the project countries

3. According to the Framework Guidelines, the “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.” Further, “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.” Reportedly, these targets are not yet met. Nevertheless, examples of residential building retrofits show that the potential to reduce energy consumption is significant, though it requires more resources and efforts at all levels starting from planning, implementation, and compliance with the outcome-based approach.
4. A gap between potential of energy efficiency policies and effective achievement exists mainly due to barriers affecting those policies and measures. The three main categories of barriers were identified in the course of the analysis: (i) regulatory and institutional; (ii) economic (financial and market barriers); (iii) behavioural (awareness, advice, and skills). Regulatory barriers include a lack of secondary legislation and specific norms that make the framework law functional. The institutional barriers include absence of energy agencies in some countries as well as inefficiency of existing institutions in implementing national energy efficiency policies. Economic barriers include a lack of financing for major renovations of residential buildings, limited public financing options, long payback periods for energy efficiency projects, as well as low energy prices in some countries. Behavioural barriers are seen in low awareness of energy efficiency benefits at the individual level, lack of a large-scale information campaign in media, perception of high transaction costs for investing in energy efficiency, and lack of knowledge on how to incorporate energy efficiency into design and construction of buildings.
5. The analysis of the current situation revealed the following:
 - (a) Framework legislation (including energy efficiency and energy saving laws, along with relevant secondary legislation, energy development strategies, and specific energy efficiency programmes) is developed in most countries in the South-Eastern and Eastern Europe, the Caucasus, and Central Asia, and in the Russian Federation;
 - (b) Building energy codes (BEC) have been adopted in most reviewed countries;
 - (c) Energy performance certification, with requirements for energy performance certification for buildings specified in the laws on energy performance, is introduced in several reviewed countries, though mandatory monitoring requirements are absent in many countries. Energy labelling requirements are introduced in most reviewed countries;

(d) Energy pricing measures are not introduced in some countries. Low energy prices lead to absence of a driving force for energy efficiency improvement in buildings and make the payback periods too long, thus less attractive for banks and financial institutions;

(e) In several countries, there is no energy service companies (ESCO) market, while in the other ESCO activities are lacking. ESCO activities in the countries of South-Eastern Europe are in their early stages and limited despite the existence of relevant legislation;

(f) Awareness programmes and initiatives to promote energy efficiency among final consumers, as well as specific training courses for energy auditors, inspectors and evaluators exist in many reviewed countries. Information measures and best practices are regularly featured in National Energy Efficiency Action Plans and target general public as well as business and industry sectors in the countries of South-Eastern Europe. In the countries of Eastern European and the Caucasus, awareness programmes for energy efficiency are actively implemented. In the Central Asian region, similar activities are also introduced. Despite this, low awareness on the benefits of energy efficiency still exists at the individual level and can preclude the introduction of energy efficiency measures both at individual and community levels;

(g) Residential sector is the largest or the second largest energy consumer in the project countries. In South-Eastern Europe, final energy consumption in buildings is significantly higher than previewed in their national energy efficiency targets; consumption in the residential sector in the Eastern Europe, the Caucasus, and Central Asia is very high. Construction of new buildings can lead to energy efficiency improvements, however, observation of performance-based requirements in buildings and ensuring the compliance with BEC is required. Energy consumption has recently increased for heating and cooling in many countries, and very high energy consumption in the existing building stock is a problem in all reviewed countries;

(h) The countries introduced prescriptive technical requirements in their BEC. Performance-based requirements for new buildings also exist, however, such requirements for the existing buildings are not present in many countries. Energy performance monitoring requirements are present in Albania, Montenegro, North Macedonia, Serbia, the Republic of Moldova, the Russian Federation, Azerbaijan, Georgia, Kyrgyzstan, and Uzbekistan. They are absent in Bosnia and Herzegovina, Belarus, Ukraine, Armenia, and Kazakhstan;

(i) Financial incentives, such as subsidies, soft loans, tax exemptions or reductions are present in most countries. However, specific incentives for improving compliance with BEC are absent in some countries. Mandatory regular inspections were introduced as part of enforcement mechanisms. Penalties for non-compliance with BEC are absent in many countries;

(j) Energy agencies aimed to monitor and implement energy efficiency measures and activities exist in seven out of 17 project countries. Such agencies are not established in Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Montenegro, Tajikistan, Turkmenistan, and Uzbekistan;

(k) Building codes that embraced policies on energy efficiency slowed in 2017-2019. Overall, in the countries of South-Eastern Europe, Eastern Europe, the Caucasus, and Central Asia, and in the Russian Federation the standards for energy efficiency have been introduced. However, minimum energy performance requirements, energy labelling systems, and carbon pricing seem to lag;

(l) The standards set forth in the Framework Guidelines should be addressed in the national legislation, which in turn should be recent and consider the current trends and modern technologies to enhance energy efficiency in buildings. However, in many project countries the existing energy efficiency standards are not regularly updated and thus do not reflect technological advances. The Framework Guidelines also indicate that buildings, materials, and technologies should be assessed over their life cycle in terms of their energy performance, and that energy efficiency standards in buildings are to be outcome-based. However, it is not the case for all countries. The countries have different levels of standards addressing the performance of buildings. The existing performance-based requirements in

BEC are mostly observed in the countries of South-Eastern Europe and Eastern Europe, and in the Russian Federation, while significantly less present in the countries of Central Asia;

(m) The Framework Guidelines particularly indicate the building heating and cooling requirements for new buildings and retrofit projects as well as provide guidance for total primary energy use in buildings' conditioned spaces, including heating, ventilation, cooling, and hot water. However, not all countries introduced performance-based limits directly in their BEC. Such requirements are in line with the Framework Guidelines in Albania; in North Macedonia, the limits of annual consumption for residential and non-residential buildings are higher than those indicated in the Framework Guidelines; in Belarus, the annual consumption requirements for heating and cooling are higher than those indicated in the Framework Guidelines; in the Republic of Moldova, the annual consumption requirements for certain categories of buildings is higher than that in the Framework Guidelines; in Montenegro and in Serbia, as well as in all countries in the Caucasus and Central Asia, the requirements based on annual energy consumption are not specified.

III. Recommendations on attainment of the performance objectives set forth in the Framework Guidelines

6. Based on the analysis, the following recommendations were made to help bridging the gap between the performance objectives set forth in the Framework Guidelines and current energy efficiency standards and their implementation in the project countries.

- (a) Strategic guidance:
 - (i) Governments should develop a comprehensive and long-term building code strategy, gradually increasing its strictness;
 - (ii) Governments should ensure the introduction of performance-based approach in BEC and other energy efficiency standards;
 - (iii) BEC should be frequently evaluated, revised, and improved in order to understand the existing strengths and eliminate weaknesses of energy efficiency policy design and implementation;
 - (iv) Energy efficiency policies should be developed and adjusted to different regional contexts and institutional realities within each country;
 - (v) Governments should set up targets for increasing the share of new high-performance buildings; moreover, as Governments play a key role in awareness raising and promotion of energy efficiency, new public buildings should be built following high-performance standards showcasing the best practice;
 - (vi) Governments should set up the ambitious timeline and targets for renovation of the existing buildings;
 - (vii) Improved energy performance of building components and systems should be a target to improve the energy performance of all buildings;
 - (viii) Sustainable high-performance construction know-how should be introduced into the curriculum of educational institutions;
 - (ix) Awareness of population on energy efficiency benefits needs to be raised through implemented demonstration projects and media campaigns.
- (b) Design and construction:
 - (i) Governments should aim for net-zero energy consumption in new buildings;
 - (ii) Comprehensive retrofits of existing residential and non-residential buildings should be planned and undertaken to reduce energy requirements and increase energy savings in buildings;
 - (iii) Minimum energy performance standards should be mandatory for both new and existing buildings;

- (iv) Governments should introduce tax exemption or reduction to provide the initial incentive for purchase of energy saving technologies, as high costs of such technologies may discourage consumers to install them;
 - (v) Financial incentives should be introduced to encourage investment in the long-lasting high efficiency improvements;
 - (vi) The stakeholders in the building sector should be educated on the importance of BEC in order to increase support for compliance and effective implementation of the energy efficiency policy.
- (c) Management:
- (i) Energy agencies, playing a crucial role in recognition of energy efficiency as a priority action, should be established;
 - (ii) Baseline data on energy demand should be available to measure success in implementation of energy efficiency policies;
 - (iii) Energy performance certification of buildings should be applied as a mandatory measure, along with introduction of energy rating for buildings;
 - (iv) Building energy labels (certificates) should be required at sale or rental;
 - (v) Efforts to develop or improve ESCO market should be undertaken;
 - (vi) Energy pricing might be used as a tool for enhancing attractiveness of investments in energy efficiency;
 - (vii) Strong compliance and proper monitoring mechanisms should be established to ensure effective building codes enforcement;
 - (viii) Low-interest loans for energy efficiency technologies and building constructions and retrofits should be introduced as an instrument promoting energy efficiency;
 - (ix) Carefully designed and targeted awareness-raising programmes should be developed to encourage energy efficiency improvements.
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