United Nations ECE/ENERGY/GE.6/2019/4

Economic and Social Council

Distr.: General
19 July 2019

Original: English

Economic Commission for Europe

Committee on Sustainable Energy

Group of Experts on Energy Efficiency

Sixth session
Bangkok, 7-8 October 2019
Item 4 of the provisional agenda
Joint Task Force on Energy Efficiency Standards in Buildings

Energy Efficiency Standards in Buildings

Background paper on main findings of the study on mapping of existing technologies to enhance energy efficiency in buildings in the ECE region

Note by the secretariat

I. Background information

1. The Committee on Sustainable Energy and the Committee on Housing and Land Management established the Joint Task Force on Energy Efficiency Standards in Buildings in 2015. In 2017-2019, projects in support of implementation of tasks by the Joint Task Force were funded by the Governments of Denmark and the Russian Federation and by the Black Sea Economic Cooperation Organization (BSEC). One of the implemented activities of the Joint Task Force is a study on mapping of existing technologies to enhance energy efficiency in buildings in the United Nations Economic Commission for Europe (ECE) region.

2. The study was carried out from July 2018 to February 2019 and was discussed, reviewed, and validated during the third, fourth, and fifth meetings of the Joint Task Force, respectively in Geneva on 3 October 2018, in Kiev on 13 November 2018 and in Yerevan on 14 March 2019. This document presents the main findings of the study.

3. In 2018, a comparative study on building standards in the ECE region, entitled "Mapping of Existing Energy Efficiency Standards and Technologies in Buildings in the UNECE Region" was prepared and presented to the Group of Experts (ECE/ENERGY/GE.6/2018/4). The report "Mapping of Existing Technologies to Enhance Energy Efficiency in Buildings in the UNECE Region" follows that earlier study by analysing the actual (as opposed to perceived) prevalence of specific types of energy-efficient technologies in the building stock in the ECE region, along with the levels and types of public policy interventions supporting their deployment. The study objectives were to evaluate the adoption of these technologies in ECE member States and appraise the gaps between the existing energy efficient technologies in buildings and their application and adoption, with assessments undertaken at national levels. The study aimed to highlight the variance in the use of technologies across countries through gap analysis, and to determine if any correlation

exists between the strictness and enforcement of existing standards and the levels of deployment. The data for this study was gathered through desktop research.

4. The ECE member States are disaggregated into subregions[1]. The analysis is based on empirical data, analysed on a 3-point scale for implementation of the building energy efficiency technologies. The technologies were aggregated into five high-level categories – "Building Envelope and Glazing", "Heating of Domestic Hot Water Supply", "Ventilation, Air Conditioning, and Cooling", "Appliances", and "Lighting" – and were separately assessed by building type. The tabulated data and country-specific narratives are documented in the report annexes.

5. The data present valuable findings for the ECE region that can help stakeholders in a variety of roles: policy makers to understand the potential for adopting energy efficiency technologies, private sector representatives to appreciate the market potential, and governmental entities (municipal and utility providers) to comprehend the ancillary benefits of promoting building energy efficiency.

II. Main findings

6. The data suggest that some aspects and types of energy efficient technologies are consistently deployed in buildings across the ECE member States. For example, all countries require efficient building envelope insulation (including windows), and many are phasing out incandescent light bulbs in favour of more efficient lighting technology. On the other hand, there are wide disparities in the prevalence of energy efficient decentralized space heating technologies. The broad findings of this study are as follows.

7. **Energy efficiency in the building stock is improving in all subregions**. Countries in Eastern Europe, Central Asia, the Russian Federation, and South-Eastern Europe – many of which traditionally have low domestic energy prices – have significantly increased mandatory energy efficiency requirements, especially for newly constructed buildings.

8. **Nevertheless, energy efficiency in the building stock is improving only incrementally and in a disjointed manner**. This finding is particularly unexpected, given that recent advances in technology design have yielded remarkable advancements in efficiency and this trend is expected to continue.

9. **Three types of public policy tools are particularly successful at supporting energy efficiency improvements in buildings**. These include legal regulations (such as building standards), financial incentives (rebates, reduced-rate debt, tax deductions), and information awareness programmes for various types of energy efficient technologies. Countries with comprehensive and stringent building standards in place tend to have higher penetration rates of energy efficient technologies.

10. **Effective design and implementation of public policy is key to increasing energy efficiency**. The substantial gaps between what is available in the market and what is being used makes it clear that effective governance and use of legal and financial instruments, rather than just technical advancement, are key.

11. **Three specific technology trends can be clearly observed**:

[1] Subregion A: Andorra, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.
Subregion B: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia.
Subregion C: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Republic of Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.
Subregion D: Canada, United States.
Subregion E: Albania, Bosnia and Herzegovina, Montenegro, Serbia, North Macedonia.
Subregion F: Turkey.
Due to insufficient data, San Marino and Israel were not included in this study.

(a) Countries in the European Union (EU) show increased adoption of high energy efficiency boilers, along with shifts to cleaner fuel sources. However, strong concerns remain regarding the use of coal for residential space heating;

(b) With the implementation of labelling and Ecodesign regulations, the adoption of energy efficient appliances is on an upward trend;

(c) Most countries in the ECE region have banned, or are phasing out, incandescent light bulbs in favour of compact fluorescent lamp (CFL) and light-emitting diode (LED) technologies. However, lighting sensors and controls are being implemented less frequently.

12. **Energy performance certificates have accelerated retrofitting of existing buildings**, but much remains to be done.

13. **In addition to the numerous environmental benefits associated with decreased energy consumption and increased generation of renewable electricity, many of the technologies offer additional non-energy related social benefits**. Examples include boosting economic growth, developing local competitive markets, increasing employment, promoting implementation of lower-cost and accessible energy efficient technologies, and developing international markets.

14. Countries can take several priority actions to increase the deployment of technologies to enhance energy efficiency in buildings. The following recommendations cover multiple perspectives, such as educational, technical, regulatory, financial, institutional, technology adaptation, capacity development, and private sector involvement.

III. Recommendations

A. Policy and legislation

15. *Recommendation A*: Governments need to provide good policy, strong institutions, and efficient public services to ensure the private sector can thrive; they should also commit to develop and sustain the institutions that implement, oversee, and regulate these policies. The private sector is critical to economic growth, but it cannot and does not act alone, the public sector should support a balanced strategy.

16. *Recommendation B*: Governmental research and development programmes should advance technologies that are too risky for the private sector, which will require transparent collaboration between government, industry, and energy programme administration in order to convert some innovations into marketable products.

17. *Recommendation C*: More specific requirements to better define cooling degree-days should be included in energy efficiency building standards; this will help evaluate building energy performance during hot periods of the year more accurately.

B. Role of public and private sector; new market opportunities

18. *Recommendation D*: Governments should undertake initiatives to raise the bar for developing building energy efficiency technologies to meet specific local needs, which can create new international markets.

C. Connect building energy efficiency with Intended Nationally Determined Contributions (INDC) targets; reduce fossil fuel use in space heating

19. *Recommendation E:* Governments should explicitly connect building energy efficiency measures to INDC targets to further encourage improvement.

20. *Recommendation F:* Governments of countries in which coal is still used for residential heating, and coal is the lowest cost fuel, should promote the use of other fuels to drive the adoption of cleaner technologies.

D. Information awareness of multiple social benefits of energy performance certification

21. *Recommendation G:* Local governments should publish city-level data demonstrating both decreased energy costs and higher income associated with various levels of energy performance certification to promote building energy efficiency investments.

E. Technological adaptation through effective promotion and awareness campaigns

22. *Recommendation H:* Governments should scale up effective promotion and awareness campaigns which are essential to encourage consumers to purchase appliances labelled with high energy efficiency ratings.

23. *Recommendation I:* More stringent regulations are needed to promote exterior and interior lighting in non-residential buildings and develop social pricing structures for homeowners to install smart meters. Governments should create awareness programmes reflecting upon the variety of benefits from adopting these technologies.

F. Key focus on building retrofits

24. *Recommendation J:* Governments should promote the creation of datasets and tools which guide analysis of, and demonstrate, the financial benefits of increasing energy efficiency through retrofitting existing buildings. Specifically, this should include the use of simulation software tools for building energy performance during the design phase of both new building construction and major building retrofits.

25. *Recommendation K:* Governments should develop and promote programmes to encourage complete retrofit of decrepit and condemned residences, involving private real estate investors or developers.

G. Coordination between national and local authorities to reassess development and implementation of building codes

26. *Recommendation L:* National and local governments need to coordinate and work together to design policies and building codes which can be adopted either nationally or locally; performance-based building codes should be preferred to prescriptive codes, as the flexibility should increase compliance.

H. Investment and finance

27. *Recommendation M:* Governments should develop and promote multiple financial mechanisms to increase the adoption of energy efficiency projects across the building sector: residential, public, and commercial buildings. To help overcome the complexity of investments and lack of capacity at the individual and suppliers' level, Energy Service Companies (ESCOs) should be more heavily promoted by governments.

I. Capacity building to promote building retrofits

28. *Recommendation N:* Standard civil engineering educational and training curricula should focus more on the largely neglected discipline of building lifecycle management; this should emphasize courses and programmes on energy efficiency and building renovation.

29. *Recommendation O:* Financial institutions should be empowered to understand the profitability of energy efficiency investments; this would require more effective promotion and dissemination of best practices, appropriate de-risking, and financing solutions for bankers. Clear technical and financial criteria should be defined by the financial institutions on provision of loans. Additionally, a pre-approved list of eligible equipment manufacturers and suppliers can assist in measuring and avoiding risks.

J. Expanded use of Energy Performance Certificates (EPCs)

30. *Recommendation P:* Governments should create tiered energy tariffs linked to EPC rating; such EPC-based tiered pricing could both encourage energy performance certification and the implementation of energy efficient technologies.

31. *Recommendation Q:* Incentives for implementing energy efficient technologies should be linked to EPC rating. For example, a C-rated building that is retrofitted in such a way that it is rated A afterwards should receive a higher concession, higher land use tax compensation, or lower debt interest rate, compared to an upgrade from C to B.