Development of technical recommendations for Nearly Zero Energy Building (NZEB) in Ukraine

Project Background

Name of applicant	Ministry of Communities and Territories Development (MCTD)
Project info/Project name	Development of technical recommendations for Nearly Zero Energy Building (NZEB) in Ukraine
Contractor	VTT Technical Research Centre of Finland Ltd.
Project duration	May 2022 – January 2023
Contract value	€203,500.00

Project Summary

1 Project Summary

This project addresses opportunities to improve energy efficiency and reduce costs and emissions in the building sector by improving energy efficiency and provides technical recommendations for nearly zero-energy building (NZEB) in Ukraine. This project focuses on two building types in the context of Ukraine: residential blocks of flats and school buildings. These were selected as they have a significant impact and represent a large share of the building stock in the context of NZEB development. Both building types were modelled and simulated using IDA-ICE dynamic simulation software for two climate zones, i.e. Kyiv (North) and Odesa (South). This report presents the building layouts and parameters used in the simulations, as well as the methodology and results of the technical and economic studies.

Three workshops with key stakeholders, collaborators and companies were arranged during July 2022 and September 2022 to share information about the ongoing project, discuss state-of-the-art energy regulations and NZEB in Ukraine and collect first-hand information on the building design and costs. The last workshop was arranged during November 2022, where the main outcomes and findings of the project were shared with local stakeholders.

2 Project Conclusions

The focus of the study was the energy efficiency of the buildings. A study was conducted on reducing the use of heating energy in buildings. However, changes in this area also affected cooling load and electricity consumption. Between the building types, the main factors that affected the study results were ventilation flow rates, roof area, and electricity and heat tariffs. The technical assessment showed mostly similar results for both building types, in that the greatest potential for efficiency improvements, by a considerable margin, was from ventilation heat recovery, followed by window U-value and external wall U-value improvements.

For the school building, ventilation heat recovery and roof U-value improvements represented the greatest relative potential due to the higher ventilation flow rate and roof area, while for the block of flats building, improving the window U-value yielded better relative efficiency benefits due to the higher glazing-to-envelope ratio.

The economic assessment showed that energy-efficiency improvements to the block of flats building type could only be made profitable with the inclusion of ventilation heat recovery, while for the school building, an increase to the roof U-value and a moderate increase to the window U-value were found to be profitable in themselves. However, with the increasing cost of energy,

improvements to windows, walls, floors, roofs and ventilation heat recovery become cost-effective solutions for NZEBs. Therefore, to reach NZEB levels, improvements to the building envelope and ventilation heat recovery systems of both the block of flats and school building types are recommended.

Policy and building regulations should be designed to allow the existing building sector to accelerate the transition towards NZEB buildings. Moreover, regulations should promote conditions that reduce investment costs for energy-efficient building components, lower interest rates, channel financial benefits and provide tax benefits for the construction sector when building NZEBs in Ukraine.

For the block of flats building type, the onsite integration of renewable energy sources, i.e. photovoltaics (PV), has the potential to meet 20-25% of energy demand, depending on the climatic zone. However, for the school building this was 30-47% depending on the climatic zone. It was found that it was profitable to integrate PV in the school building due to high electricity tariffs, the alignment between generation and consumption, and the larger roof area available. Given increasing energy prices, PV integration will be beneficial.

It is highly recommended to design energy policy and regulations that will promote PV integration onsite (on buildings) and in nearby areas. Regulations should make it easier for end-users to share surplus energy with neighbours, empowering them by putting them at the centre of decision-making. It is recommended that energy storage, the energy communities concept and new business models be promoted. These measures together will support reducing energy costs, emissions and energy imports and provide greater energy security and better indoor environments.

3 **Impact on Human Rights and the project's Sustainable Development Goals (SDGs)**

Implementing the NZEB recommendations would positively impact on human rights by supporting improvements to infrastructure and living standards, ensuring environmental sustainability and increasing energy security, giving all consumers, including vulnerable groups, access to affordable, reliable and modern energy services.

Overall, the project could positively impact the following SDGs:

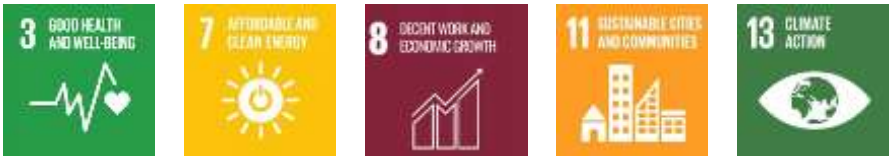
Goal 3: better indoor air quality by controlled ventilation in NZEBs

Goal 7: the cheapest energy is energy saved; increased energy efficiency, increased share of local RES and reduced energy bills for end-users

Goal 8: more green jobs in the NZEB industry, growth in the number of production facilities for building materials, equipment and RES

Goal 11: one NZEB building is part of the district and city

Goal 13: CLIMATE ACTION – high end-use energy efficiency of NZEBs and high share of local RES



4 **Project Deviations**

Project commencement was delayed due to the Russian invasion of Ukraine. No significant deviations over the course of the project.

5 **Project Lessons Learnt**

Lessons learnt

Under current conditions, in which 80% of the residential sector in Ukraine is not energy efficient, implementing the recommendations would be highly beneficial.

Policy and building regulations should be amended to enable the existing building sector to accelerate the transition towards NZEBs. Additionally, regulations should create conditions that reduce investment costs for energy-efficient building components, lower interest rates, channel financial benefits and provide tax benefits to the construction sector for building NZEBs in Ukraine.

Active participation of beneficiaries, as in this project, produces better results.

Benefits of the project

Basing NZEB technical recommendations for new residential and public buildings on current energy-efficiency legislation, local practice, technologies and costs will enable a smooth transition to cost-efficient NZEBs.

The project will help to accelerate future steps towards the implementation of technical NZEB regulations and requirements in Ukraine.

The development of the proposed project will support the first five-year period of the National Plan and speed up the development of technical regulations and requirements for NZEB buildings.

The NZEB approach will also be desperately needed for Ukraine's recovery and reconstruction after the war, since both the residential and energy sectors have been damaged significantly by the Russian invasion. Energy efficiency and independence remains a high priority for the future.

Effectiveness of the project

The project was implemented successfully and the project deliverables comply with the FS targets and FUTF objectives, including promoting cooperation between Finland and Ukraine and identifying project opportunities.