ESIB Project of INOGATE

‘Energy-Saving Initiative in Eastern Europe and Central Asia’
Energy Efficiency of Buildings in Ukraine
Energy efficiency issues in housing are regulated in Ukraine by the following legal acts:

- National program for reforming and developing housing and municipal services sector for 2009-2014 (Law of Ukraine)
- Energy strategy of Ukraine for the period till 2030 (Decision of the Cabinet of Ministers of Ukraine No. 145-r of 15 March 2006);
- Sectoral energy efficiency and energy saving programme for housing and municipal services for 2010-2014 (Order of the Ministry of Housing and Municipal Services No. 352 as of 10 November 2009)
- A number of other regulations
Sectoral energy efficiency and energy saving program for housing and municipal services of Ukraine for 2010-2014

The program is aimed at solving problems of efficient use and reduction of energy consumption by the sector of housing and municipal services, enhancing use of electricity for heating of residential and public buildings and structures, enhancing application and broadening the sphere of application of unconventional and alternative energy sources; using innovative, technological and organizational solutions; creating economically attractive conditions for investment projects in the sphere of housing and municipal services.
Energy consumption in the sector of housing and municipal services

- For the time being, the sector of housing and municipal services consumes 44% of energy resources, or 70 million tons of conventional fuel which is approximately 30% of total fuel consumption in Ukraine.
- 85% of total fuel consumption by the industry falls on housing stock of the country and social segment.
- Annual consumption by the industry makes up about 10.0 billion kWh of electricity; about 14 billion cubic meters of gas; about 1.5 million tons of coal. Unconventional and alternative types of energy sources account for 0.87 million tons of conventional fuel.
- Consumption per one citizen of Ukraine is **0.7–1.0 tons** of conventional fuel.
- Energy consumption per unit of product manufactured and rendered utility services is 1.5 higher than abroad.
- Fuel input for production of 1 Gcal of heat in district heating is up 160-180 kg of conventional fuel while in developed countries this indicator is 145 - 150 kg of conventional fuel.
- Excessive fuel consumption leads to emission into the atmosphere of 45 g/MJ CO₂ instead of 26 g/MJ CO₂.
- Energy intensity of the national product in Ukraine today is 0.89 kg of conventional fuel/dollar. In developed European countries it is 3 times less on an average (particularly, in Germany – 0.26 kg of conventional fuel/dollar).
The structure of energy consumption in the sector of housing and municipal services of Ukraine defined in the Energy Strategy of Ukraine by 2030 is illustrated in the table.

Energy consumption in the sector of housing and municipal services of Ukraine

<table>
<thead>
<tr>
<th>Energy resources</th>
<th>2005</th>
<th>2008</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas, bln. cub. m</td>
<td>14.1</td>
<td>11.9</td>
<td>10.4</td>
</tr>
<tr>
<td>Electricity, bln. kWh</td>
<td>10.0</td>
<td>16.7</td>
<td>21.2</td>
</tr>
<tr>
<td>Coal, mln. tons</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Non-traditional renewable energy sources (NRES),</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mln. tons of conventional fuel</td>
<td>0.87</td>
<td>1.61</td>
<td>2.11</td>
</tr>
</tbody>
</table>
Housing stock

- Ukraine has about 600 thousand of buildings in the public, community, private and joint ownership, of which more than 70 thousand are five storied buildings.
- About 100 thousand social and cultural premises are equipped with centralized water supply. Centralized water supply covers around 12.8 million apartments and individual households.
- According to statistics, the housing stock consumes up to 80% of potable water of the total consumption in Ukraine, and 70% of heat. Because of low heat insulation properties of envelopes of residential building of mass construction, which account for 30% of the housing stock, we lose about 40% of heat produced, and up to 25% in the heat supply networks.
- The results of energy studies state that heat losses in the old residential buildings of mass construction is as follows:
  - through walls – 42%;
  - through windows – 16%;
  - through basement – 5%;
  - through roof – 7%;
  - air exchange – 30%
• Ukraine has about 12000 home owners’ associations functioning. They maintain ~ 45 million square meters of housing.
• By 2015, Ukraine plans to establish HOAs in 80% of housing stock.
• Provision of loans to HOAs must become one of the ways to settle the issue of rehabilitation of buildings run by HOAs. In exemplification thereof let us mention social transformation programs for Central and Eastern Europe in the cities of Nizhyn and Berdychiv. The goal of the project consists in hypothecation free crediting of HOAs at 7% per annum for rehabilitation of buildings with concurrent implementation of energy saving technologies
• The global experience confirms that energy crisis can be overcome only through solving of the problem of heating modernization of the housing stock.
• Ukraine is in the process of establishing an efficient institute for energy audit and introducing an energy certificate for each individual building.
Number of housing owners’ associations (HOAs) as of 01.01.2011
Analysis of heat and natural gas losses in district heating systems (based on the survey data of the working group of the Ministry of Housing and Municipal Services) shows that the biggest natural gas losses are caused by heat wasted by consumer – up to 30%, heat lost during heat transmission – up to 25%, and heat lost during heat production at a boiler – house – up to 22%.

Analysis of modern technical capacities, scientific and technical progress demonstrates a potential for reduction of natural gas losses during consumption, transmission and supply of gas by 22% on the average in the country.

World experience confirms that only those countries managed to overcome the energy crisis that solved the problem of thermal modernisation of a housing stock.

Implementation of energy audit of residential buildings and issue of an energy passport for a residential building are supposed to contribute to solving a task of rationalising energy consumption by residential buildings.

One of the priority steps in this direction is to establish an efficient institute of energy audit and issue an energy certificate for each individual building.
Approximate structure of heat losses in a residential building
Thermogram of heat losses in a residential building
Thermogramm of heat losses in a residential building
Thermogramm of heat losses in a residential building

Outside air temperature - 14°C

Temperature of a wall face - about +1°C

Temperature at the back of the wall +3°C…+5°C

Humidity of the back of the wall - 100%
Installation of metering devices and regulators might contribute to reduction of factual energy consumption in residential buildings by 15-20% and in some of the cases up to 30%.

The decision of the Cabinet of Ministers of Ukraine as of 11.06.2008 No. 838-r ‘On installation in Residential Buildings of Water and Heat Meters and Regulators’ provides for a mandatory installation of a general building meter and regular of heat consumption by heat supply companies and water meters by companies carrying out centralised water supply and wastewater disposal.
Legal Regulation Demand

1. Determination of legal and organisational principles ensuring energy efficiency of buildings in Ukraine.

**Law of Ukraine ‘On Energy Efficiency in Buildings’**

2. Establishment of a legal framework in the sphere of housing policy in order to introduce and put into practice a system of energy audit and energy certification of buildings.

**Decisions of the Cabinet of Ministers of Ukraine:**

- ‘On Approval of Methods for Calculating Energy Performance of Buildings and Procedure of their Application’;
- ‘On Approval of the Procedure for Establishing Minimum Requirements to Energy Performance of Buildings’;
- ‘On the Procedure of Monitoring of Energy Performance of Existing Buildings’;
- ‘On Approval of the Procedure for Maintaining a Unified State Register of Energy Certificates of Buildings’;
- ‘On Approval of the Procedure of Energy Audit and Energy Certification of Buildings of Public Authorities and Local Self-government Bodies’;
- ‘Methodological Recommendations on Organisation of Internal Control over Compliance with Minimum Requirements to Energy Performance of Buildings and Reporting Forms on Building Energy Audit Results (Assessment of Energy Performance)’
Draft LAW OF UKRAINE ‘On Energy Efficiency of Buildings’ proposed by a people’s deputy Y.V. Odarchenko (registration No. 206)

- This Law determines legal, economic and organisational principles ensuring energy efficiency of residential, office and public buildings.

- State of the draft law: under revision by the Committee of the Verkhovna Rada of Ukraine.

- The last version of the draft law was submitted by the Ministry of Housing and Municipal Services on 10 December 2010 for consideration and approval by the Cabinet of Ministers of Ukraine.

- The draft law was discussed with international experts.
Article 1. Definition of Terms

1. In this Law the terms shall be used in the following meaning:

- **energy efficiency of a building** is a property of a building, its structural elements and engineering equipment allowing to ensure an optimal microclimate in premises in accordance with a procedure defined by the legislation, based on factual or calculated energy consumption for heating, water heating, air conditioning, ventilation and lighting;

- **entity carrying out energy audit of buildings** is an entity authorised to carry out energy audit of buildings in accordance with the procedure defined by the law;

- **thermal modernization** is a series of repair and construction works aimed at improving thermal performance of building envelopes and ensuring their compliance with the minimum requirements to energy performance of buildings.

2. Other terms shall be used in the meanings prescribed in the Law of Ukraine ‘On Energy Saving’.
In addition, the draft law of the Ministry proposes:

- Energy certification of buildings is an activity for determining actual/estimated energy performance of buildings and their conformity to the minimum requirements for energy efficiency of buildings, as well as developing recommendations regarding the implementation of energy saving and energy efficiency measures (for existing buildings) with a mandatory feasibility study, which results in the issuance of a building energy certificate;

- Building energy certificate is a standard form document, which contains data on energy efficiency of the building and recommendations for its improvement;

9) Minimum requirements to energy efficiency of buildings is a set of indicators that characterize the property of the building, its structural elements and engineering equipment to ensure optimum energy consumption throughout an expected building lifecycle without violating standard sanitary requirements to the premises of this building;

14) Thermal modernization is a series of repair and construction works aimed at improving thermal performance of building envelopes, energy consumption of engineering systems and ensuring energy efficiency of a building at the level not lower than the minimum requirements to energy performance of buildings;

15) Experts in the sphere of energy efficiency of buildings are natural persons that have a right to provide services in the field of energy efficiency of buildings in accordance with the legislation of Ukraine.
Article 3. Legislation on Energy Efficiency of Buildings


2. With the objective of solving problems in the field of energy efficiency of buildings, first of all problems of thermal modernisation of existing residential, office and public buildings the Cabinet of Ministers of Ukraine shall approve a state target programme, while local self-government bodies shall approve local target programmes providing for energy efficiency of existing residential, office and public buildings.

1. The basic principles of state policy on energy efficiency of buildings include:

- ensuring energy efficiency of buildings according to European standards;
- maintaining proper technical conditions in buildings and extending their lifecycle;
- reducing emissions of carbon dioxide in the atmosphere by raising energy efficiency of buildings;
- encouraging of building owners and tenants for rational and efficient use of fuel and energy resources, diversification of energy sources and implementation of energy saving (energy efficiency) measures; diversification of funding sources for energy saving (energy efficiency) measures;
- creating conditions for attracting domestic and foreign investment for energy saving (energy efficiency) measures.
Article 7. Competences of the Central Body of Executive Power in Charge of Implementation of a State Policy in the Sector of Housing and Municipal Services related to the Sphere of Energy Efficiency of Buildings

1. The central body of executive power in charge of implementation of a state policy in the sector of housing and municipal services shall:
   1) develop and submit to the Cabinet of Ministers of Ukraine proposals on a state policy in the sphere of energy efficiency of buildings;
   2) take part in development of state target programs in the sphere of energy efficiency of buildings;
   3) draft and submit in accordance with a defined procedure to the Cabinet of Ministers of Ukraine legal acts in the sphere of energy efficiency of existing residential buildings;
   4) develop and approve standards, norms and rules for energy efficiency of existing residential buildings within its competence;
   5) ensure implementation of energy saving (energy efficiency) measures in existing residential buildings within its competence;
   6) fulfill control over equipment of existing residential buildings with heat meters and regulators;
   7) issue legal acts on energy efficiency of existing residential building, also in conjunction with other central bodies of executive power;
   8) execute other powers stipulated by the legislation.
Article 8. Competences of the Central Body of Executive Power in Charge of Implementation of a State Regional Policy and the Policy in the Sphere of Building, Architecture and City Planning related to the Sphere of Energy Efficiency of Buildings

1. The Central body of executive power in charge of implementation of a state regional policy and the policy in the sphere of building, architecture and city planning shall:

1) develop and submit to the Cabinet of Ministers of Ukraine proposals on a state policy in the sphere of energy efficiency of new buildings;
2) take part in development of state target programs in the sphere of energy efficiency of new buildings;
3) draft and submit in accordance with a defined procedure to the Cabinet of Ministers of Ukraine legal acts in the sphere of energy efficiency of new buildings;
4) develop and approve standards, norms and rules for energy efficiency of new buildings within its competence;
5) issue legal acts on energy efficiency of new buildings and buildings subject to capital repair and reconstruction, also in conjunction with other central bodies of executive power;
6) execute other powers stipulated by the legislation.
MINIMUM REQUIREMENTS TO ENERGY PERFORMANCE OF BUILDINGS

Article 11. Factors to be Considered during Establishment of Minimum Requirements to Energy Performance of Buildings

1. During establishment of minimum requirements to energy performance of buildings the following factors should be considered:

1) type of building;
2) functionality of building;
3) building lifetime;
4) technical state of building;
5) climatic conditions;
6) constructive characteristics of windows, systems of heating, hot water supply, air-conditioning, ventilation, in-built lighting equipment, building as a whole;
7) geometric, heat engineering parameters of building envelopes, spatial planning parameters;
8) orientation of building;
9) passive solar energy systems and protection from sun;
10) natural ventilation;
11) natural lighting;
12) optimum micro-climate conditions in premises, including designed micro-climate conditions.

2. Establishing minimum requirements to energy efficiency of buildings, one should take into account the possibility to use:

1) active solar energy systems and other heating and electric systems based on non-conventional and renewable sources of energy;
2) electricity produced by cogeneration of heat and electricity;
3) systems of district and block heating and air conditioning.
1. Minimum requirements to energy performance of buildings as well as a methodology for their establishment shall be approved by the Cabinet of Ministers of Ukraine.

2. Minimum requirements to energy performance of buildings shall be revised not less than once per five years and consider leading technologies in construction.
Article 13. Assessment of Energy Efficiency of Buildings

1. Energy efficiency of buildings is assessed with the objective of determining compliance of calculated energy performance of new buildings with minimum requirements to the indicated parameters.

2. Energy efficiency of buildings is assessed during preparation of a design documentation for a new building and after completion of construction prior to commissioning of a new building with consideration of deviations from initial technical solutions that took place during construction.

3. The procedure for implementation of building energy efficiency assessment shall be approved by a central body of executive power in charge of implementation of a state regional policy and the policy in the sphere of building, architecture and city planning upon agreement with the central body of executive power in charge of implementation of a state policy in the field of energy efficient use of energy resources and energy saving.
Article 14. Energy Audit of Buildings

1. Energy audit of buildings shall be carried out with the objective of defining compliance of factual/calculated energy performance characteristics of existing buildings with minimum requirements to energy performance of buildings and providing recommendations on implementation of energy saving (energy efficiency) measures as well as their technical and economic grounding.

2. Based on energy audit results a report shall be prepared.

3. Recommendations of the report on implementation of energy saving (energy efficient) measures should include the following:
   1) a detailed description of mentioned measures (calculations, schemes, technical characteristics);
   2) calculation of parameters of technical and economic efficiency (capital costs, annual savings, payback period) of the measures that can be implemented;
   3) methodology for calculating a factual saving of fuel and energy resources.

4. Energy audit of buildings shall be carried out in accordance with the procedure defined by the law.
Article 15. Energy Certification of Buildings

1. Energy certificate of a new building is to be prepared by a design institute and shall be incorporated as a separate document into design documentation, in the chapter related to implementation of requirements to energy saving and assessment of building energy performance.

2. Energy certificate of an existing building is to be prepared by a building energy audit expert based on energy audit results carried out upon a request of a building owner or a body authorised by him, housing owners’ association, housing (housing and construction) cooperative or local self-government body.

3. It is forbidden to carry out reconstruction, capital repair of existing buildings as well as to alienate or provide for rent buildings/apartments that have no energy certificate. Notary officers shall check the availability of a building energy certificate while certifying agreements on alienation or rent of buildings/apartments.

4. For energy certification of buildings building energy audit experts and design organisations shall use national standards on energy efficiency of buildings.
Energy Audit in Buildings

Residential building + Assessment of energy efficiency potential = Energy Audit Report

Passport

Buildings
5. An energy certificate of a building shall contain:

1) information about the owner;
2) location;
3) functionality;
4) total surface;
5) energy efficiency class;
6) technical and energy efficiency characteristics of building envelopes and engineering systems;
7) minimum requirements to energy performance of the building;
8) calculation of a basic consumption of fuel and energy sources;
9) factual/calculated energy performance in comparison with minimum requirements to the indicated characteristics of the building;
10) recommendations on implementation of energy saving (energy efficiency) measures in the building (in short);
11) certificate number and date of issuance;
12) information about a building energy audit entity/design organisation that prepared a building energy certificate;
13) other data stipulated by the legislation.
6. Form of energy certificate and procedure for its preparation shall be approved by a joint decision of authorised public administration bodies in the sphere of energy efficiency of buildings.

7. Energy certification of buildings is carried out using a specialised software, the main requirements to which are to be approved by a joint decision of authorised public administration bodies in charge of energy efficiency of buildings.

In office and public buildings as well as in multi-apartment residential buildings near the central entrance to premises there should be displayed an extract from the energy certificate of the building. List of data of such an extract depending on the type of building is to be approved by authorised public administration bodies in charge of energy efficiency of buildings.

9. **The validity of the building energy certificate is 10 years.**

10. The fee for building energy audit/assessment of energy performance as well as for preparation of a building energy certificate is to be defined in the contract.

11. Building energy certificate data should not be a basis for calculating costs of housing and municipal services.
Article 17. Monitoring of Energy Performance of Existing Residential Buildings

1. Monitoring of energy performance of existing residential buildings is carried out with the objective of ensuring implementation of a state policy in the sphere of housing and municipal services in accordance with the types of buildings based on information provided by local self-government bodies in order to improve energy performance, develop and adjust schemes of heat supply for populated areas and prepare middle-term programmes of municipal infrastructure development.
In addition the draft law of the Ministry proposes:

**Article 14. Energy Certification of Existing Buildings**

1. Energy certification of existing buildings shall include determination of actual performance of energy efficiency of existing buildings and their compliance with minimum requirements to energy efficiency of buildings, as well as development of recommendations on improving energy efficiency of buildings.

2. Energy certification of existing buildings shall be held upon request of a building owner or their authorized body (person).

3. Technical and economic feasibility of recommended energy saving and energy efficiency efforts shall be attached to an energy certificate of the existing building.
Article 15. Unified State Register of Building Energy Certificates

1. In order to systematize data on energy efficiency of buildings and control compliance with the legislation in the sphere of energy efficiency of buildings, a Unified State Register of Building Energy Certificates (hereinafter referred to as the Register of certificates) shall be established.

2. The Register of certificates shall be compiled by the central body of executive power on ensuring implementation of state policy in the sphere of efficient use of energy resources and energy saving.

3. Building energy certificates shall be submitted to the Register of certificates by experts on energy efficiency of buildings.

4. The procedure for keeping the Register of certificates shall be approved by the Cabinet of Ministers of Ukraine.

5. Submitting a building energy certificate to the Register of certificates is subject to the fee in the amount and according to the procedure established by the Cabinet of Ministers of Ukraine.

6. For ensuring open access of natural persons and legal entities to the Register of certificates, it shall be placed on the official web-site of the central body of executive power on ensuring implementation of state policy in the sphere of housing and municipal services.

1. Natural persons who have higher technical education in energy/construction sphere, work experience not less than three years, professional development by means of training on energy efficiency of buildings in higher education institutions, who have successfully passed the examination, got a document on postgraduate education and have been included to the State Register of Experts on Energy Efficiency of Buildings as prescribed by legislation of Ukraine can be experts on energy efficiency of buildings.
Article 17. State Register of Experts on Energy Efficiency of Buildings

1. The central body of executive power on ensuring implementation of state policy in the sphere of housing and municipal services shall keep the State Register of Experts on Energy Efficiency of Buildings (hereinafter – the Register of experts).

2. The procedure for keeping the Register of experts shall be approved by the Cabinet of Ministers of Ukraine.

3. Inclusion to the Register of experts is subject to the fee in the amount and according to the procedure established by the Cabinet of Ministers of Ukraine.

4. For ensuring open access of citizens and legal entities to the Register of experts, it shall be placed on the official web-site of the central body of executive power on ensuring implementation of state policy in the sphere of housing and municipal services.

1. State statistical monitoring in the sphere of energy efficiency of buildings shall be performed according to the Law of Ukraine “On State Statistics”.
Article 23. State Fund on Promotion of Energy Efficiency in Residential Buildings

1. For the purpose of financial provision of implementing the state policy in the sphere of energy efficiency of buildings the State Fund on Promotion of Energy Efficiency in Residential Buildings (hereinafter – the Fund) shall be established.

2. The Fund is specialized state financial institution founded by the state represented by the Cabinet of Ministers of Ukraine.
CHAPTER VI
INFORMATIONAL PROVISION IN THE SPHERE OF ENERGY EFFICIENCY OF BUILDINGS

CHAPTER VII
LIABILITY FOR VIOLATING LEGISLATION IN THE SPHERE OF ENERGY EFFICIENCY OF BUILDINGS
Hints on Energy Saving in Buildings
Hints on energy saving

The only way to reduce heating costs is to consume less heat

Where to start?

Apartments:
1. Heat insulation of wall behind radiators
2. Insulation of windows and entrance doors
3. Ventilation

Baseline:
1. Doors
2. Openings
3. Insulation of pipes of hot and cold water supply and heating

Technical floors and roofs:
1. Insulation of pipes (if any)
2. Openings and windows
3. Roof elements

Building entrances:
1. Entrance doors
2. Insulation of windows
3. Entrances to roof or attic
Wall Insulation
(thermal modernization of a residential building)

14 Korolia Daniila Str., Ivano-Frankovsk
Wall Insulation  
(thermal modernization of a residential building)
Hints on energy saving

Installation of Heat Meters

City of Rovno, “Zhytlovyk” HOA
Hints on energy saving

Roof Improvement

Ivano-Frankovsk
We are open for cooperation and suggest uniting the efforts of our countries within the framework of INOGATE ESIB PROJECT
Thank you for attention!

Oleg Khusnutdinov,  
Head of Department  
of Foreign Economic Affairs  
and International Cooperation  
of the Ministry of Housing  
and Municipal Services of Ukraine,  
Doctor of Philosophy in  
Public Administration.  
38 044 207 19 29  
oirgo@ya.ru