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Ukraine

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Recommendations on stimulating energy efficiency measures and RES in the residential sector in wartime for the Ukrainian authorities and international partners

Authors:
Vadym Lytvyn
Dmytro Levytskyi

HEINRICH BÖLL STIFTUNG
KYIV
Ukraine

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ANNOTATION

The analytical report "Recommendations on stimulating energy efficiency measures and RES in the residential sector in wartime for the Ukrainian authorities and international partners" was prepared within the framework of the project "Recommendations on stimulating energy efficiency measures and renewable energy sources in the residential sector in wartime for the Ukrainian authorities and international partners" with the support of the Heinrich Boell Foundation, Kyiv Office – Ukraine.

This paper contains practical recommendations for state and local authorities, as well as for end-users of energy, that could significantly improve the efficiency of energy use and reduce the country's dependence on energy.

The opinions, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the Heinrich Boell Foundation, the Kyiv Office – Ukraine and the German government.

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CONTENT

INTRODUCTION

Given the shortage of energy resources in Ukraine and their high cost on world markets, multiplied by military risks, the issue of efficient energy use and the availability of alternative sources is crucial for the country's survival.

Unfortunately, even under such conditions, energy consumption in the housing and utilities sector remains high, and integrating alternative and renewable energy sources (RES) has not grown beyond individual pilot projects.

This report focuses on recommendations for central and local governments, as well as for end-users of energy, that could significantly improve the efficiency of energy use and reduce the country's dependence on energy imports.

The focus is on priority steps that are usually organizational in nature and do not require significant capital investments, and can be implemented by reallocating funds currently spent on subsidies and compensation for tariff differences.

1.1.Overview of the situation in the energy sector in the context of improving the energy efficiency of residential buildings

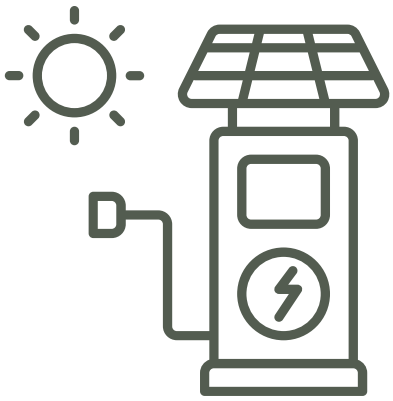
1.1 Electricity supply sector

Russia's military aggression has destroyed a significant part of the generating capacities and elements of the power system responsible for transmitting and distributing electricity to consumers.

The residential sector holds a significant place in the energy balance. Before the full-scale war, this included consumers with electric heating (which was widely introduced in a number of cities) and consumers using electricity for hot water (almost all over Ukraine). In effect, this further increased the vulnerability of consumers in the event of energy infrastructure destruction.

This was largely facilitated by an unbalanced tariff policy that motivated using more expensive electricity (if the full cost of electricity without subsidies is considered) rather than relatively inexpensive district heating systems and alternative fuels.

Another challenge was the massive construction of industrial and private solar power plants under the green tariff, which, given the time-varying solar revenues, also introduced some imbalance into the power system, often leading to situations where significant solar power plant capacities were shut down due to excessive generation, while the state had to pay for ungenerated electricity. In addition to the need to compensate for the difference in tariffs for household consumers and the market value of electricity, this increases the burden on the state budget due to the need for direct budgetary injections or a shortfall in profits from state-owned energy generating companies.



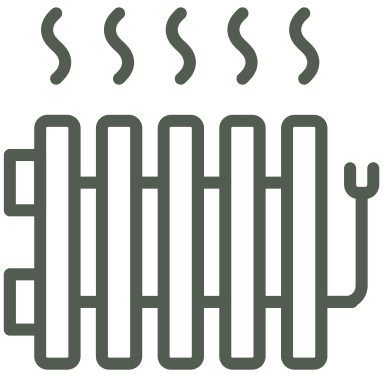
The housing and utilities sector is outside the electricity market and cannot influence the alignment of daily schedules (thereby reducing the price on the electricity market), despite the significant potential for this, for example, the possibility of energy accumulation (heat storage) for hot water supply needs for already installed capacitive water heaters.

There is significant potential for distributed generation with the installation of rooftop solar power plants (SPPs) for a building's own needs with hybrid inverters and storage systems that could insure household consumers in the event of a power outage. However, tariff policy has long discouraged introducing such systems (quite widespread solar stations under the "green tariff" cannot generate electricity without external power supply, so they cannot be classified as autonomous sources). As a result, gasoline and diesel generators with very high energy costs and low environmental friendliness have become the main backup method.

The difficulty of selling surplus electricity has also discouraged installing cogeneration units (both gas and biofuel) in district heating systems, which could have become local sources of electricity for critical community infrastructure.

1.2. Heat supply sector

The uncontrolled transition to so-called "individual" gas or electric heating has led to a significant reduction in the efficiency of centralized heating systems, and in some cities to a complete decline. Even more problematic is hot water supply, which in most cases is provided by individual electric boilers.



Where district heating has been preserved, more than 80% of consumers live in apartment buildings. The main fuel is natural gas, which is supplied at a reduced cost (the so-called Public Service Obligation). At the same time, other fuels are not subsidized, which makes it impossible to attract investment in alternative sources (primarily biomass) and energy efficiency measures. This is compounded by the lack of working capital for modernization due to the lack of compensation for the "difference in tariffs."

The procedure for connecting new (private) heat-generating capacities to a district heating network is complex and non-transparent. Direct sale of heat energy by its producer to the consumer is complicated (almost impossible) if the sale is mediated by heat networks owned by a third party (usually a municipal heating company).

This discourages private investment in heat generation, and with it the use of more efficient technologies (including renewable energy) and the dispersion of heat generation during the war.

1.3. Household energy consumers

Low tariffs have resulted in an almost complete lack of motivation to improve energy efficiency and replace scarce energy resources with alternative ones. This is the case even in private manor houses, where substitution is relatively easy. Instead, heating and hot water are provided mainly by natural gas or electricity (direct heating), and solar panels, if installed, were primarily for selling electricity at a green tariff, not for personal consumption.

Even such seemingly quick payback measures as weather control (individual heating stations) and insulating pipelines in basements and attics are not used, although these measures alone can reduce the need for heat energy for buildings connected to district heating systems by 10-20% with a payback period of 1-3 years, if the full cost of heat energy is taken into account.

2.Overview of stimulation programs for energy efficiency and renewable energy in the residential sector

Given the long payback periods at current tariffs, the government is more interested in measures to improve energy efficiency and RES on the consumer side, as this reduces the amount of subsidies to cover the difference in tariffs. Accordingly, co-financing programs should be a priority.

There have been several notable co-financing programs for the housing sector in Ukraine.

1) Warm Loans: reimbursed part of the cost of materials and equipment for condominiums and individual owners (including individual houses) and was aimed at reducing energy consumption.

2) IQ-energy: funded by the European Bank for Reconstruction and Development (EBRD) and operated similarly to the "warm loans", repaying a portion of a loan for purchasing materials and work for energy efficiency measures.

The advantage of these programs was the relatively simple and quick procedure for obtaining compensation. The main disadvantages were the lack of a mechanism for verifying the savings achieved by the program beneficiaries and the limited amount of funding. Unfortunately, both programs are currently not funded.

3) Energy Efficiency Fund: compensates a part of the costs for implementing energy efficiency measures (up to 50%, depending on the scope of modernization). The fund's advantages include a relatively stable funding mechanism at the expense of donors and the state budget and increased control over the quality of work. The disadvantages include bureaucratic procedures that lead to a significant extension of project implementation time and, as a result, lost savings. The procedure for verifying the savings achieved is also not yet properly developed.

4) Local support programs that provide compensation for part of the costs for condominiums to implement energy efficiency measures:

- Performance part of the work;
- Repaying a portion of a loan for the measures;
- Repaying part of the interest on a loan for the measures.

The advantage of these programs is the relative simplicity of participating in them and the rapid implementation of measures. The disadvantages include limited funding from local budgets.

In general, the availability of support programs can significantly encourage people to implement energy efficiency measures. And the more of them there are, the more efficiently they work, in some cases allowing them to be combined.
Another conclusion is that funding for relatively simple and quick payback measures should be carried out with a simplified procedure, such as for individual heating points, thermal insulation, partially modernizing heating and hot water systems, replacing windows and doors in common areas, and installing solar panels with storage systems for the building's own needs. This would allow projects to be implemented within 3-6 months and start generating savings as soon as possible.

A very important conclusion is the need to measure the savings achieved, which immediately provide an understand of the savings to both end users and the state budget by reducing compensation for the difference in energy costs. Therefore, one element of the projects should be an automated energy monitoring system that collects data about actual energy consumption and determines the savings achieved, taking into account influencing factors such as outdoor temperature or the length of the heating season.

In addition, several co-financing systems are needed to complement each other, allowing for a better product. And the main effectiveness criterion should be the overall reduction in budget expenditures as the difference between the funds spent on co-financing and program administration and the reduction in energy costs.

3.Legal Aspects of Using RES in Apartment Buildings

As noted, multi-apartment residential buildings have significant potential for energy saving and introducing RES (primarily solar panels, solar collectors, and heat pumps). However, implementing such projects in apartment buildings is complicated due to the ownership structure and decision-making process in these buildings.

According to part 2 of Article 382 of the Civil Code of Ukraine, all owners of apartments and non-residential premises in an apartment building are co-owners (right of joint co-ownership) of the common property of the apartment building, which includes the building's engineering equipment serving more than one apartment, auxiliary premises and common areas, and load-bearing and enclosing structures (including roof ceilings, exterior walls, etc.). This means that none of the co-owners is entitled to dispose of the common property of an apartment building independently, without the consent of the other co-owners. Similarly, third parties, such as managers, local governments, etc., are not entitled to dispose of the common property without the consent of the co-owners, including making any decisions about implementing any RES projects.

An apartment building may be managed by:

- Co-owners directly;
- A building manager elected by co-owners or a local self-government body;
- An association of co-owners of an apartment building, i.e., a homeowners association (HOA).

The first two kinds of management stipulate that a meeting of co-owners must be held in order to intervene in the common property (including to install solar panels, solar collectors, and heat pumps) and collect additional funding (contributions) from co-owners for the project. Even if a building manager manages the building, a co-owners meeting still must to be held as the manager's powers are usually limited to the day-to-day maintenance of the building and in no way provide for the unilateral imposition of additional costs on the co-owners.

Even if a third party (an "investor") implements a project at its own expense to further use the generated electricity or heat for its own purposes, the co-owners' consent is required.

Ignoring these legal provisions can lead to the "investor" losing invested funds and equipment and can discredit the project, which, unfortunately, has already been demonstrated in some cases.

The third form of building management, an HOA, also requires a general meeting of the association. However, it provides for a permanent executive body, a board, that ensures the meetings are held and decisions are implemented. From the point of view of co-owners, the advantage of implementing projects within an HOA is that it has the status of a legal entity and its own bank account, which gives the association complete control over the funds contributed by co-owners and allows it to hire and control contractors independently.

Calculations indicate that the potential of RES for generating heat and electricity in an apartment building does not exceed the building's (co-owners') own needs for these types of energy (provided that equipment is available to accumulate excess energy to "smooth out" the gap in time and volumes of generation and consumption). Therefore, the best scenario is to implement projects that cover the building's needs. Buildings with condominiums are best suited for this purpose.

At the same time, an HOA is not a "panacea" for solving all financial, organisational, and legal issues. As a non-profit organisation with a special legal nature, an HOA has a clearly defined purpose and subject of its activities, and the supply of heat and electricity to third parties is not among them.

Therefore, it is crucial to clearly define the ultimate goal of projects in apartment buildings and choose the appropriate legal form.

- If the goal is to cover the common needs of the building, the project owner can be an HOA (decided at a general meeting), and the equipment must be the common property of the co-owners.
- If the goal is to cover the needs of individual apartment owners, the project and equipment owners must be apartment owners with the consent of an HOA general meeting or a meeting of co-owners (in a building where no HOA has been established).
- If the purpose is to cover the needs of third parties ("investors"), the project and equipment owners must be persons with the consent of an HOA general meeting or a meeting of co-owners (in a building where no HOA has been established).

Regardless of which approach is used, it is also necessary to comply with the requirements of urban planning legislation. The requirements for installing solar panels, solar collectors, heat pumps, and energy storage equipment in an apartment building are as follows:

- The work is classified as major repairs, as it involves interfering with load-bearing and/or enclosing structures and changes the loads on them (see clause 3.7 of State Building Code (DBN) A.2.2-3:2014 "Composition and Content of Design Documentation for Construction", as amended);
- It is mandatory to develop and approve project documentation (see the Laws "On Architectural Activity" and "On Regulation of Urban Development"), but obtaining urban planning conditions and restrictions is not required (see Order of the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine No. 289 of 06.11.2017);
- Obtaining technical specifications is not required if the generated electricity and heat is to be used by the HOA exclusively for its own (house-wide) needs but is required if the approach involves selling energy to third parties or "to the grid";
- A construction permit is required, and the law does not currently provide for any exceptions.

Let us consider the latter position in more detail, as it can be simplified.

Part two of Article 34 of the Law "On Regulation of Urban Development" allows the Cabinet of Ministers of Ukraine (CMU) to determine the list of construction work that does not require documents to perform them and after which the object is not subject to commissioning. Approved by CMU Resolution #406 of 7 June 2017, this does not include any items that could be considered as the installation of solar panels, solar collectors, heat pumps, and energy storage equipment on apartment buildings. Therefore, to reduce the required permits, it seems appropriate to supplement the list with the installation of solar panels, solar collectors, heat pumps, and energy storage equipment on apartment buildings. Relevant proposals are presented in Annex 1 of this report.

4. Recommendations for accelerating the implementation of measures and improving energy efficiency in the residential sector.

4.1. Governmental authorities

- Take into account that the main beneficiary of the measures on the consumer side is the state budget of Ukraine, given that, out of the current subsidies to cover the difference in tariffs and subsidies, the money saved by the consumer corresponds to 2-4 UAH saved in the state budget.
- Simplify procedures as much as possible for implementing quick payback measures to improve energy efficiency and use alternative energy sources for one's own needs.
- Introduce measuring of actual savings achieved as a result of the measures in order to calculate budgetary savings and adjust programs to improve their efficiency.
- Create several alternative support programs, rather than being limited to the Energy Efficiency Fund, which will allow them to improve their quality and efficiency (including by reducing administration costs).
- Implement energy efficiency projects in apartment buildings only with the consent (decision) of the co-owners.
- Support communities that have local co-financing programs, given that the central budget will be the main beneficiary of the programs.
- Simplify procedures for connecting RES to electricity and heat networks.

4.2. Local government bodies

- Implement energy efficiency measures for residential buildings only on the basis of co-financing and in accordance with their priority.
- Implement energy efficiency projects in apartment buildings only with the consent (decision) of the co-owners.
- Ensure analysis of the actual reduction in energy consumption in residential buildings where measures have been implemented.
- Encourage heat supply companies to participate in programs to reduce energy consumption on the consumer side (including via energy service contracts) and to improve the efficiency and reliability of heat generation.

- Create energy efficiency centres in cities that would conduct ongoing public education on energy efficiency measures, help prepare applications for co-financing, and monitor the quality of work.

4.3. Donors

- Direct efforts to increase the institutional capacity of communities to prepare and implement energy efficiency measures.
- Pilot co-financing projects in different regions on the main quick-impact measures with mandatory ongoing monitoring of the results achieved, and create demonstration centres at these facilities to familiarize themselves with technical and organizational solutions.

4.4. Financial institutions, including international ones

- Develop financing programs for energy efficiency measures jointly with the state, which could provide compensation or co-financing in the amount of actual savings achieved, thereby reducing payback periods and increasing demand.

5. The impact of energy efficiency and renewable energy projects on Ukrainian energy markets.

The key problem with implementing energy efficiency measures and renewable energy projects is that, in most cases, they are implemented without analysing their impact on energy markets and their mutual influence. This is especially true for projects from different sectors, such as heat and electricity, when some measures contradict others. For example, switching to electric heating without analysing the capacity of electricity supply systems and the cost of energy resources on the market. This was partly due to non-market energy tariffs and decision-making based on short-term benefits without analysing the long-term consequences. A similar situation was observed with the introduction of the green tariff, which significantly increased the share of green generation, but at the same time, the reliability of energy supply increased slightly due to the inability of the plants to operate without external power supply.

Therefore, the following conditions should be taken into account for the impact on energy markets, namely the electricity market, gas market, and heat market (if established):

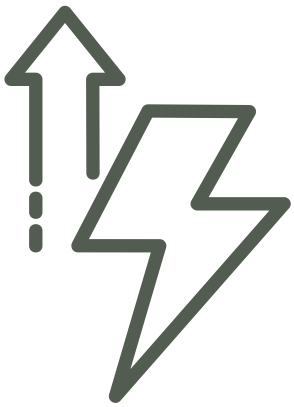
- The greatest potential for reducing energy consumption in the buildings sector is during the winter period for heating needs, due to the regulation of heat supply at the building level.
- Installing control systems at the inlets of residential buildings requires simultaneously modernizing the boiler automation system (in particular, installing frequency converters on circulation pumps).
- There is significant potential for accumulating thermal energy for hot water supply in residential buildings with already installed or additional capacitive electric heaters, as well as through large heat accumulators in buildings or at heat supply sources (it is estimated that about 10-20 GWh can be accumulated this way, while the cost of the battery would be an order of magnitude lower than electric ones).
- The greatest potential for using alternative energy sources in residential development is available in the summer: solar panels, air-to-water heat pumps (including for air conditioning systems), and solar collectors.
- The potential of rooftop solar power plants for multi-apartment buildings, as a rule, does not exceed the need for hot water supply and will not significantly affect the consumption of electricity from the grid. Moreover, it will reduce evening peaks for preparing hot water in electric boilers.
- The availability of gas storage facilities allows for significant accumulation of energy for the winter period (at a much lower cost than in winter). Biomass can be accumulated in a similar way. This makes it possible to effectively combine heat production from solar energy and heat pumps in the summer and from natural gas and biomass in the winter. This can be most effectively implemented for centralized heat supply systems.

- Existing industrial solar power plants are periodically shut down in the summer to balance the power system, with state needing to pay the full cost of ungenerated energy at a "green tariff." Using heat accumulators for hot water supply of commensurate capacity at boiler houses and combined heat and power (CHP) plants would allow for using this energy (provided that the cost of energy is lower than that of natural gas or biomass), thus reducing the state's losses from paying the green tariff.

Based on these conditions, the following recommendations can be made for participants to have a positive impact on power systems processes.

- Develop incentive tariff setting that would minimize gas consumption in the summer and allow for the maximum use of the capacities of already installed and new solar stations (simplifying the sale of off-balance solar generation capacities at a minimum cost).
- Introduce incentives for solar stations installation projects only if the generated energy is used for its own needs and if storage systems and hybrid inverters are used.
- Develop a system to compensate for the "difference in tariffs" for producers of thermal energy from alternative sources (primarily biofuels) to reduce the share of gas in heat production.
- Develop systems to encourage using storage systems to equalize the schedules of the power system in addition to the "night tariff" for households.
- Stimulate the development of centralized heat supply systems, including centralized hot water supply, which would allow using the benefits of accumulation and load management.
- Develop a system of incentives for energy companies that would allow them to earn money on consumer savings, based on the principle of energy service.

6. Materials with detailed instructions on how to implement energy efficiency measures



Over the past year and a half, a lot of useful materials have been developed to help choose the best way to improve energy efficiency, environmental friendliness, and reliability of energy supply. Unfortunately, they are largely scattered, so we tried to find the most relevant materials and briefly describe them to simplify the process for both community and central government leaders and ordinary residents.

Below is a selection of materials that will help in choosing the most optimal technical solutions for improving energy efficiency, using renewable sources, and finding (or creating) a mechanism for financing the solutions.

6.1. Financial indicators of projects to improve energy efficiency and use of renewable energy sources for the residential multi-apartment sector and recommendations for their incentive program

Category finance, technical solutions 

Target audience local authorities, central government

Short description

An analysis of the effectiveness of energy efficiency projects in the multi-apartment residential buildings sector for commercial and subsidized tariffs. The analysis identifies the main beneficiaries of projects aimed at reducing energy consumption and replacing traditional sources with alternative ones, and proposes models for stimulating projects with cash flow calculations for the most popular energy saving measures.

The main conclusion of the report

The state budget is the main beneficiary of implementing energy efficiency measures on the consumer side, so co-financing programs from the state are beneficial and should be increased. **Link to the article**

6.2. How much does "cheap" electricity and gas cost for households and how to reduce spending

Category finance 

Target audience local authorities, central government

Short description

An analysis of the cost of electricity and gas for households, explaining why the cost of energy resources for households is several times lower than for the commercial sector, how low tariffs affect the welfare of citizens and the state budget, and mechanisms and justifications for reducing the negative impact.

The main conclusion of the report

Ukrainians are already paying the full cost of energy, but a larger share is indirectly paid through taxes and services not received, and they cannot influence this share. In order to reduce dependence on imported energy and increase end user motivation to save, the state should introduce incentive mechanisms in the energy efficiency sector, which ultimately would lead to lower costs for both citizens and the state.

Link to the article

6.3.Analysis of technical solutions for the use of clean energy sources in multi-apartment buildings

Category technical solutions 

Target audience HOAs, ordinary citizens, local authorities, central government

Short description

: An analysis of the potential for using solar energy for multi-apartment buildings; in particular, the share of energy resources that can be covered by solar energy for the main types of apartment buildings (depending on the number of floors, type of heating units, and hot water source).

The main conclusion of the report

Although the sun cannot cover the full energy consumption of an apartment building, it can still replace a significant portion of it. Using solar energy for hot water heating, either directly or with heat pumps, is particularly promising. In combination with batteries and hybrid inverters, this system would also significantly increase the reliability of electricity supply for general building needs.

Link to the article

Link to the article

6.4.Legal challenges of using electricity from solar power plants in apartment buildings of condominiums. Proposals for acceptable legal instruments

Category legal aspects 

Target audience HOAs, ordinary citizens, central government

Short description

An analysis of the legal challenges to projects for installing SPPs in apartment buildings and the nuances of the legal status of condominiums, with recommendations on the permissible legal instruments for projects to install SPPs in apartment buildings, depending on the participants' goals and the use of electricity generated by SPPs.

The main conclusion of the report

According to current legislation, it is quite possible to use SPPs on apartment buildings for common building needs, to power the needs of individual apartments, and for sale to the grid. At the same time, it is crucial to clearly define the purpose of installing SPPs and choose the right organizational and legal approach that is consistent with the legal status of the project participants. To simplify implementing projects, it is advisable to make some changes to the legislation.

Link to the article

6.5. Analysis of the most effective technical solutions for the main types of apartment buildings

Category technical solutions

Target audience HOAs, ordinary citizens, local authorities, central government

Short description

: An analysis of the energy balance of a residential building and an assessment of the potential for improving energy efficiency, including calculations of the payback periods for the main energy efficiency solutions and recommendations for the order of implementation.

The main conclusion of the report

Without significant funds for comprehensive thermal modernization, it is necessary to massively implement quick payback measures (regulation, insulation of pipelines, etc.), which will allow gaining the necessary experience in project management and being better prepared to approach the stage of comprehensive thermal sanitation, in addition to quite significant savings that can reach 30%.

Link to the article

6.6. Draft decisions of local governments to stimulate implementing energy efficiency measures in residential apartment buildings with condominiums

Category financial solutions 

Target audience local authorities, condominiums

Short description

A summary of city co-financing programs for energy efficiency measures and templates for the necessary decisions and agreements that will help to quickly implement a program in a city.

The main conclusion of the report

Ukraine already has several very successful examples of financial incentive programs for co-owners of apartment buildings to implement energy efficiency measures, and sharing this experience will facilitate interaction between community residents and local authorities to improve energy security, efficiency, and environmental friendliness.

Link to the article

6.7.Creation of a revolving fund for green recovery «Green 3ReFund»

Category financial solutions 

Target audience local authorities, condominiums

Short description

Description of a mechanism for establishing a revolving fund to finance energy efficiency measures in communities' residential and public buildings in the form of a municipal institution or a municipal energy service company and the relevant sample documents.

The main conclusion of the report

Within the framework of the existing legislation, it is possible to implement mechanisms for financing energy efficiency measures on the basis of revolving funds, although this requires a sufficiently high level of staff qualification.

Link to the article

Link to the article

Annex 1.

Draft Resolution of the Cabinet of Ministers of Ukraine "On Amendments to the List of Construction Works that Do Not Require Documents Entitling to Perform Them and After Which the Object Is Not Subject to Commissioning"

CABINET OF MINISTERS OF UKRAINE
RESOLUTION
dated "__" _____ 202_ p. № ___
Kyiv

On Amendments to the List of Construction Works that Do Not Require Documents Entitling to Perform Them and After Which the Object Is Not Subject to Commissioning

The Cabinet of Ministers of Ukraine resolves:

The List of Construction Works that Do Not Require Documents Entitling to Perform Them and After Which the Object Is Not Subject to Commissioning, approved by Resolution of the Cabinet of Ministers of Ukraine No. 406 of 7 June 2017, shall be supplemented with paragraph 23-1 as follows:

"23-1. Works on the installation of photovoltaic panels, solar collectors, heat pumps, and equipment for them, for generating electricity, heating, hot water in the commissioned facilities, which, according to the class of consequences (liability), are classified as facilities with minor (CC1) and medium (CC2) consequences."

Prime Minister of Ukraine D. Shmyhal