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Performance assessment of pilot ESCO projects in partner cities. Successful experience of the implementation of ESCO projects.

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The report was prepared within the framework of the project «Removing Barriers to Increase Investment in Energy Efficiency in Public Buildings in Ukraine through the ESCO Modality in Small and Medium Sized Cities», which is financed by the Global Environment Facility and implemented by the United Nations Development Program (UNDP) in Ukraine.

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Welcome speech of Head of the State Agency for Energy Efficiency and Energy Saving of Ukraine, Hanna Zamazeyeva, to the UNDP brochure on energy services in Ukraine

Hanna Zamazeeva

Head of the State Agency for Energy Efficiency and Energy Saving of Ukraine

Ladies and Gentlemen!

Despite all the challenges, Ukraine is paving its way towards energy independence and sustainable economic development.

Like the entire civilized world, we chose a modern vector - thanks to energy efficiency and all its possibilities, of which ESCO is one of the tools.

State Agency on Energy Efficiency and Energy Saving, as a government body that implements state policy in the field of energy efficiency, took a direct part in the introduction of the energy service in Ukraine, and today we are working on its development.

Energy service is a unique tool that allows modernization of numerous schools, kindergartens, hospitals, and other public institutions by attracting private investments without any budget costs.

ESCO mechanism is more relevant than ever for the country and our community, for which rebuilding and creating conditions for a high-quality, comfortable life is critically important.

There are obvious prospects for effective interaction of both business and authorities. The reasons are the following.

The potential of the energy service market is enormous. In Ukraine, there are more than 70,000 public buildings that need thermal modernization.

The state budget spends more than 400 million dollars a year to pay energy bills for central executive authorities, while municipalities spend 14 times more.

From 20% to 50% of such costs can be reduced by ESCO projects. According to preliminary calculations, the implementation of ESCO projects only in the governmental buildings in the first year will allow to reduce budget costs by at least 100 million dollars, and at the scale of municipalities - it reaches 1.6 billion dollars per year.

In addition to the significant savings, communities also receive comfort and, most of all, save funds for other socially significant projects during reconstruction.

The total volume of the ESCO market in Ukraine is estimated by experts at more than 8.5 billion dollars.

In order to use the full potential of the market, we are working on improving the legislation. Thus, the creation of favorable conditions for lending to ESCO companies will facilitate access to financing and, as a result, will allow for the multiplication of projects in different parts of the country.

I invite all to the partnership! The synergy of the united efforts of the government and business in the energy service is an investment in energy independence and economic prosperity of Ukrainian communities.

Hanna Zamazeeva
Head of the State Agency for Energy Efficiency and Energy Saving of Ukraine

Welcome speech of Resident Representative of UNDP Ukraine, Jaco Cilliers, to the UNDP brochure on energy services in Ukraine

Dear readers,

I am honored to present this report to you. The need for energy efficiency and security cannot be overstated in pursuing sustainable development. This is particularly crucial for Ukraine, a nation with abundant potential and resources, especially during the ongoing war.

Energy Service Companies (ESCOs), aligned to enhance energy efficiency, have proven powerfully effective. These companies are versed in conceptualizing and actualizing energy-saving projects, retrofitting, conserving energy, outsourcing energy infrastructure, generating power, and providing energy-efficient solutions.

Understanding the significance of this, the United Nations Development Programme (UNDP) is dedicated to supporting the Ukrainian government in fostering the growth of the ESCO market.. As part of our joint efforts, we have pinpointed pilot cities and collaborated intensely with them to roll out ESCO initiatives. Our ultimate goal is to cultivate a robust ESCO market in Ukraine, one that not only enhances energy efficiency and security but also catalyzes increased investments and employment opportunities within the regions.

Jaco Cilliers

Resident Representative, UNDP Ukraine

The initial results of these pilot projects have been encouraging, and this report offers a comprehensive review of their performance. More crucially, it highlights the potential that can be harnessed with the nationwide embrace of the ESCO model within Ukraine. As you delve into the report, you will find an exploration of both the successes achieved and challenges faced by these pilot projects and valuable insights for shaping future initiatives.

With that in mind, I invite you to peruse, reflect on, and apply the conclusions drawn in this report to spark dialogues, stimulate thought, and, most vitally, ignite action. Collectively, we can guarantee that energy security and efficiency become more than just targets but a reality for everyone in Ukraine. I am optimistic that the joint efforts exerted by the government, civil society, the business sector, and global partners, like the UNDP, can propel Ukraine toward elevating energy efficiency and enhanced security.

Best Wishes,

Jaco Cilliers
Resident Representative, UNDP Ukraine

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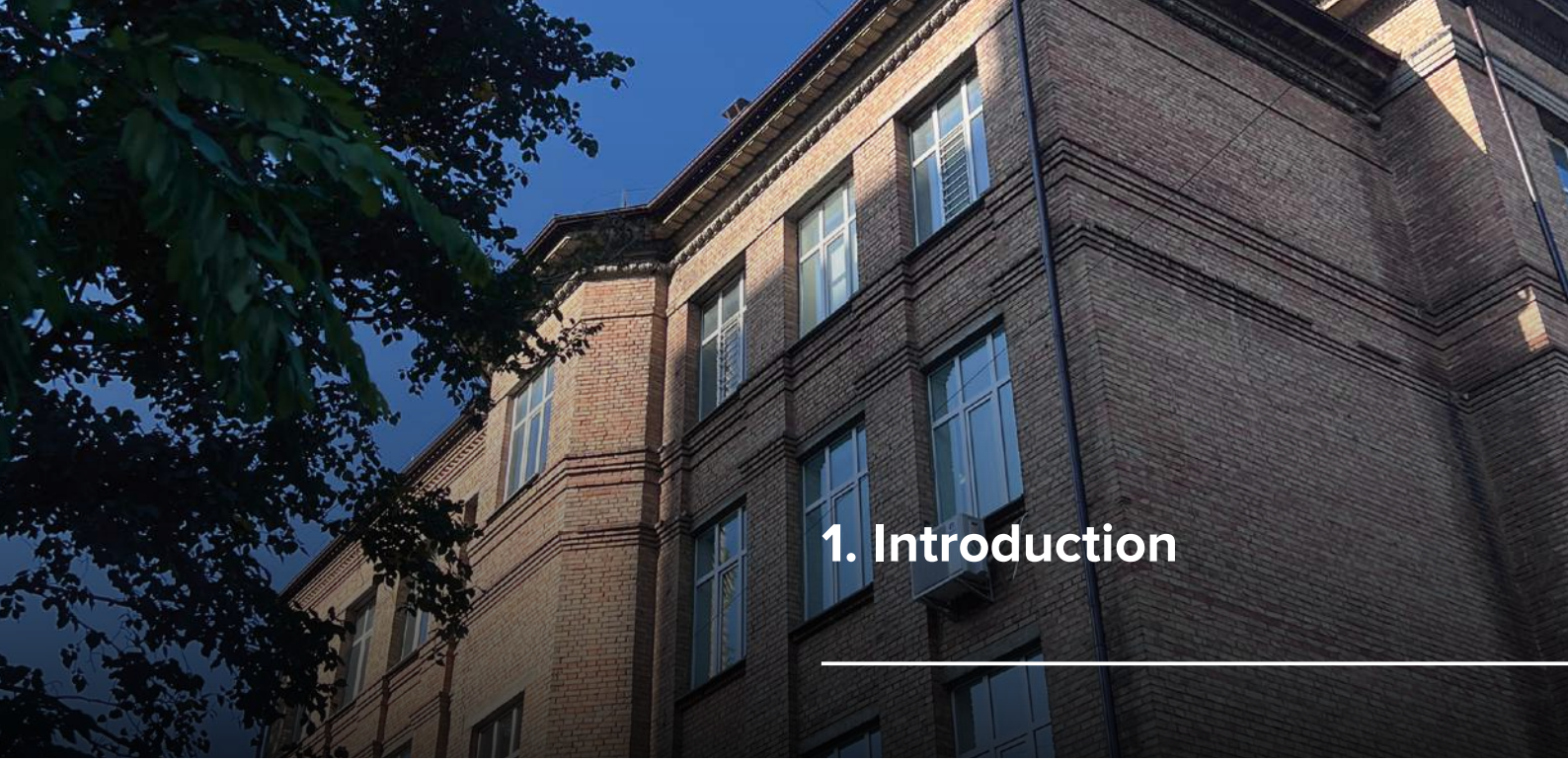


1. Introduction

In the summer of 2023, the GEF/ UNDP Project «Removing barriers to increase investment in energy efficiency in public buildings in Ukraine through the ESCO modality in small and medium sized cities» conducted a review of 53 energy service contracts that were concluded in 2019 in 10 partner cities: Odesa, Slavutych, Drohobych, Dubno, Pervomaiskyi, Korosten, Severodonetsk, Nizhyn, Savran, Borodianka.

In 2018-2019, with the support of the Project, new models of energy service in public buildings were introduced and implemented in the cities, in particular among 53 ESCO contracts:

- **37 projects** used the **classical** energy service model, where all energy efficiency measures were implemented by ESCO;
- **16 projects** used the model of **advanced ESCO partnership**, where energy efficiency measures were implemented by both parties (a city and an ESCO company), and the future savings were distributed according to the depth of energy modernization implemented by the parties.

The total **price** of the concluded **53 ESCO contracts** constituted **55.69 million UAH.**

52 projects were aimed at the modernization of heat supply systems and implementation of remote energy monitoring of buildings, 1 project - at the modernization of the outdoor lighting network.

As of July 2023:

- **26 ESCO contracts have been successfully completed;**
- 15 ESCO contracts are active and energy service services are provided;
- 10 ESCO contracts are suspended and services are not provided due to hostilities;
- 2 ESCO contracts are suspended and services are not provided due to legal issues (see the description below).

Owing to ESCO contracts, partner cities have been able to save 5.6 thousand GCal of thermal energy and 6.5 million kWh of electrical energy over 4 years. The average annual CO_2 reduction for 2019-2022 is 1241 tons of CO_2 per year.

Project specialists conducted a comprehensive assessment of the effectiveness and efficiency of pilot projects, taking into account the planned and actual savings of fuel and energy resources during the implementation of the contracts between 2019 and 2022.

The assessment of achievement of planned energy performance targets by each facility has identified the following:

- Under 26 ESCO contracts (49% of the contracts concluded), the actual energy and fuel savings exceeded the planned indicators, including due to efficient weather-dependent regulation and increasing tariffs for heat supply for public institutions. Therefore, the contracts ended prematurely;
- Under 2 ESCO contracts (4% of the contracts concluded), energy services (i.e. energy and fuel savings) are still being provided, where the average annual actual savings of fuel and energy resources exceed the planned indicators by 2%;
- 13 ESCO contracts (24% of the contracts concluded) did not reach the planned energy performance indicators mainly due to:
  - non-compliance by heat supply organizations with heat supply temperature schedules;
  - ESCO companies have formed an imperfect schedule for managing the energy service facility;
  - non-compliance with sanitary conditions, namely indoor air temperature indicators, at energy service facilities prior to the implementation of energy efficiency measures;
  - incomplete and improper implementation of energy efficiency measures within the "advanced partnership" model mainly by local authorities (ESCO customers).
- 9 ESCO contracts (19% of the contracts concluded) were stopped due to damage to energy service facilities as a result of Russia's large-scale aggression against Ukraine;
- 1 ESCO contract for outdoor lighting in the city of Slavutych was temporarily suspended due to Russia's large-scale aggression against Ukraine in February 2022. Currently, the project has been restored, and energy services are provided.
- 2 ESCO contracts (4% of the contracts concluded) in Borodianka and Savran were suspended due to non-fulfilment by local authorities of their obligations under the "advanced partnership" model, and are under the judicial review.

Below is the detailed information on 5 examples that are most successful among the above mentioned in the use of energy service in public buildings.

2. Performance assessment of pilot ESCO projects in partner cities

Nizhyn, Chernihiv region (Annex 2.1)

On 31 July 2018, the Memorandum on Partnership and Action Plan were signed between the UNDP Ukraine and the Nizhyn City Council.

Owing to the supportive position of local authorities 5 open tenders for the purchase of energy services were announced and ESCO contracts were signed between 5 and 7 February 2019.

All energy service facilities are educational institutions in the city.

- Projects at three facilities were implemented according to the classical model. ESCO companies implemented measures to install individual heating stations and a remote energy monitoring system;
- Projects at two facilities were implemented according to the model of advanced ESCO-partnership. The customer carried out measures to replace wooden windows and entrance doors with energy-efficient ones, insulation of the roofs of the buildings was carried out. ESCO companies implemented measures to install individual heating stations and a remote energy monitoring system.

Assessment of performance and efficiency of ESCO projects:

At two facilities, planned indicators were not achieved, mainly for the following reasons:

- non-compliance by heat supply organizations with heat supply temperature schedules;
- failure to comply with sanitary conditions (indicators of indoor air temperature) at the energy service facility before the implementation of energy efficiency measures;
- incomplete or improper implementation of energy efficiency measures at the energy service facility by project participants.

At three facilities, the contracts were completed prematurely due to exceeding of the planned fuel and energy resource savings indicators, as well as due to increased tariffs for heat supply.

The actual annual average savings of fuel and energy resource at five facilities is 623 GCal per year, which is one percent higher than the planned indicators of contracts for the city.

Slavutych, Kyiv region (Annex 2.2)

The Memorandum on Partnership and Action Plan between the UNDP Project and Slavutych City Council were signed on 28 August 2019.

As of October 2018, 5 classical ESCO contracts were signed in the city of Slavutych, and energy services were provided since 1 October 2018.

Taking into account the successful experience of the implementation of the previous contracts, the city of Slavutych expressed interest in the implementation of pilot projects using the model of advanced ESCO partnership at other facilities engaging private investments to modernize the outdoor lighting system through the ESCO modality.

In 2019, three ESCO contracts were signed with the participation of educational institutions of the city, including:

- projects at two facilities were implemented according to the classical model. The ESCO company implemented measures to install individual heating station and a remote energy monitoring system;
- the project at one facility was implemented according to the model of advanced ESCO partnership. The customer took measures to replace wooden windows and entrance doors with energy-efficient ones. The ESCO company implemented measures to install an individual heating station and a remote energy monitoring system.

In March 2020, the Executive Committee of the Slavutych City Council took the decision to launch the first ESCO project in Ukraine to modernize the outdoor (street) lighting system according to the classical model.

In September 2020, the active phase of the project began in terms of replacing lighting equipment with the supplies that are energy efficient. The UNDP project provided significant institutional support for the implementation of this project.

Assessment of performance and efficiency of ESCO projects:

Planned indicators were not achieved at two facilities, mainly due to the following reasons:

- non-compliance by heat supply organizations with heat supply temperature schedules;
- failure to comply with sanitary conditions (air regime) at the energy service facility before the implementation of energy efficiency measures;
- hydraulic imbalance of the heating system of the building, including due to different heat supply modes;
- temporary suspension of the provision of energy services (March-October 2022) for the outdoor lighting system due to hostilities.

At one facility, the contract was completed prematurely due to the achievement of the planned indicators of fuel and energy resource saving, as well at the account of the increased tariffs for heat supply.

The actual average annual savings of fuel and energy resources for four facilities is 617 GCal per year, which is nine percent less than the planned indicators of contracts for the city.

Odesa, Odesa region (Annex 2.3)

Odesa is the second city in Ukraine in terms of the total number of concluded energy service contracts.

During 2018, the local council twice approved the essential terms of ESCO contracts, which in turn showed the city's high readiness to implement new tools for energy modernization of public institutions.

The Memorandum on Partnership between the UNDP Project and Odesa City Council was signed on 6 October 2018.

In February 2019 tenders for the purchase of energy services were conducted and ESCO contracts were signed for 15 city facilities.

All energy service facilities are educational institutions in the city.

Projects at twelve facilities were implemented according to the classical model. ESCO companies implemented measures to install individual heating station and a remote energy monitoring system;

Projects at three facilities were implemented according to the model of advanced ESCO-partnership. The customer carried out measures to replace wooden windows and entrance doors with energy-efficient ones, insulation of building facades and roofs was performed. ESCO companies implemented measures to install individual heating stations and a remote energy monitoring system.

Assessment of performance and efficiency of ESCO projects:

For two facilities, the planned indicators were not achieved, mainly for the following reasons:

- non-compliance by heat supply organizations with heat supply temperature schedules;
- poor schedules for managing the operation of facilities.

At 12 facilities, the contracts ended prematurely due to exceeding the planned indicators of fuel and energy resource savings and at the account of increased tariffs for heat supply.

For one facility, services are provided with the achievement of the planned indicators of savings of fuel and energy resources.

The actual average annual savings of fuel and energy resources at 15 facilities is 2,130 GCal per year, which is four percent higher than the planned indicators of contracts for the city.

Drohobych, Lviv region (Annex 2.4)

As a result of the previous rapidf energy audits of public buildings in the city of Drohobych, the UNDP Project and the Drohobych City Council signed a Memorandum on Partnership and an Action Plan of 18 October 2018.

In February-March 2019 six ESCO contracts were signed, which allowed ESCO companies to start implementing energy efficiency measures under the contracts in-between heating seasons, and ensure proper preparation of the facilities for the new heating season.

Four facilities are educational institutions.

Two facilities are medical institutions of the health care system:

- Projects at five facilities were implemented according to the ESCO factoring model. ESCO companies implemented measures to modernize heating systems and remote energy monitoring systems in the buildings;
- One project (children's hospital) was implemented according to the model of advanced ESCO partnership. The customer carried out measures for the overhaul of the building and insulation of the facades. The ESCO company implemented measures to install an individual heating station and a remote energy monitoring system.

Assessment of performance and efficiency of ESCO projects:

Planned indicators were not achieved at four facilities, mainly for the following reasons:

- non-compliance by heat supply organizations with heat supply temperature schedules;
- peculiarities of heating systems in the buildings (imbalanced premises);
- failure to comply with sanitary conditions (indoor air temperature) at the energy service facility before the implementation of energy efficiency measures;
- temporary failure of installed equipment.

At two facilities, the contracts ended prematurely due to exceeding the planned indicators of savings of fuel and energy resources, as well as at the account of increased tariffs for heat supply.

The actual average annual savings of fuel and energy resources at six facilities is 617 GCal/year, which is two per cent less than the planned indicators of contracts for the city.

Korosten, Zhytomyr region (Annex 2.5)

In accordance with the Memorandum between UNDP and the Korosten City Council, projects were proposed for implementation at four facilities in the city. The implementation of energy service contracts started in October 2019.

All energy service facilities are educational institutions in the city.

- Projects at three facilities were implemented according to the classical model. ESCO companies implemented measures to establish a system of weather-dependent mode regulation and remote energy monitoring;
- One project at the facility (Child Development Centre No. 18) was implemented according to the model of advanced ESCO partnership. The customer implemented measures for the overhaul of the facade and fencing structures. The ESCO company implemented measures to install a system of weather-dependent mode regulation and remote energy monitoring.

Assessment of performance and efficiency of ESCO projects:

For one project, the planned indicators were not achieved at the facility, mainly for the following reasons:

- non-compliance by heat supply organizations with heat supply temperature schedules;
- peculiarities of the heating system in the building.

At two facilities, the contracts ended prematurely due to exceeding the planned indicators of fuel and energy resource savings and at the account of increased tariffs for heat supply.

At one facility, services are provided that exceed the planned indicators of fuel and energy resource saving.

The actual average annual savings of fuel and energy resources at four facilities is 396 GCal per year, which is two per cent higher than the planned indicators of contracts for the city.

Pervomayskyi, Kharkiv region (Annex 2.6)

The Memorandum between the Pervomayskyi City Council and the UNDP Project provided for one project at the educational institution to implement the energy service contract based on the model of advanced ESCO partnership in secondary school No. 7.

The customer undertook to insulate the mansard floor and replace the windows in the building.

The ESCO company implemented measures to install an individual heating station and a remote energy monitoring system.

Assessment of performance and efficiency of ESCO projects:

For this project, the planned indicators were not achieved, mainly for the following reasons:

- Implementation of energy efficiency measures at the facility at the expense of the customer of the energy service was not fully carried out, only replacement of windows was performed;
- The heat meter at the entrance to the building did not operate correctly in 2019-2022. In 2023 the heat meter was verified, and the actual saving of heat consumption in 2023 exceeded the planned indicator under the contract.

The actual average annual savings of fuel and energy resources at the facility is 110 GCal per year, which is eight per cent less than the planned indicators of the contract.

Dubno, Rivne region (Annex 2.7)

The UNDP project joined the process of involving investors to the energy efficient modernization of public buildings in Dubno in February 2018.

All energy service facilities are educational institutions in the city.

- Six projects at the facilities were implemented based on the ESCO factoring model. The ESCO company implemented measures to establish a system of weather-dependent mode regulation and remote energy monitoring;
- The local authorities greatly contributed to the acceleration of the process of contracts implementation.
- The UNDP project supported the implementation of online monitoring of energy resources.

Assessment of performance and efficiency of ESCO projects:

At all six facilities the contracts ended prematurely due to exceeding the planned indicators of fuel and energy resource savings and at the account of increased tariffs for heat supply.

The actual average annual savings of fuel and energy resources at six facilities is 308 GCal per year, which is five per cent higher than the planned indicators of contracts for the city.

The significant overfulfilment of the planned savings indicators is due to the fact that before the implementation of energy efficiency measures, there were no means for heat metering at the energy service facilities. As a result, 15-20 per cent of the savings are the result of excessive costs charged by the heat supply organization in the absence of metering units (i.e. the company charged using the estimation method).

Severodonetsk, Luhansk region (Annex 2.8)

The Memorandum between the local government and the UNDP Project provided for a comprehensive approach to the implementation of energy service contracts at 10 facilities in the city.

All energy service facilities are educational institutions.

- Seven projects were implemented according to the classical model. ESCO companies implemented measures to install modular individual heating stations and installed a remote energy monitoring system;
- Three projects were implemented according to the model of advanced ESCO partnership. Individual heating stations were installed by the customer using funds from the public budget. The ESCO company implemented an energy monitoring system and ESCO energy management at the facilities.

Assessment of performance and efficiency of ESCO projects (2019 - February 2022):

Actual average annual savings of fuel and energy resources at 10 facilities in the city amounted to 1370 GCal per year, which exceeded the planned indicators of the contracts by six per cent.

At all 10 facilities, the provision of services under contracts has been suspended due to Russia's large-scale aggression against Ukraine in February 2022.

The condition of the facilities is currently unknown, as there is no connection with the energy monitoring system.

Borodyanka, Kyiv region (Annex 2.9)

The Memorandum on Partnership and Action Plan between the UNDP Project and the Borodianka Town Council were signed on 17 May 2018 and provided for the implementation of one energy service contract based on the advanced ESCO partnership model in secondary school No. 2.

The conducted energy audit allowed to finally determine the list of energy efficiency measures that the school building needs.

After additional negotiations and the presentation of investment indicators, it was determined that the ESCO company will implement an individual heating station and a remote energy monitoring system, and the customer of the energy service confirmed its contribution in the form of replacement of windows with energy-saving ones and insulating and repairing the roof of the building.

Taking into account all indicators and the distribution of energy efficiency measures between the ESCO company and the Customer, the fixed percentage of the Contractor was 31%, which in turn is one of the lowest in Ukraine.

Assessment of performance and efficiency of the ESCO project:

In general, the planned savings indicators were not achieved at the energy service facility, the actually achieved savings constituted 32 per cent or 291 GCal between October 2019 and April 2021, which is 18 per cent lower than the planned indicator under the contract.

The preliminary assessment showed that the main reasons for failure to achieve the planned indicators were:

- The Customer has not implemented any energy efficiency measures at the expense of the public budget;
- In 2021 the Customer turned off the energy efficient equipment that was provided by the ESCO company and refused to pay under the contract in connection due to liquidation of the Customer as a result of the administrative and territorial reform.

Savran, Odesa region (Annex 2.10)

In 2016, the first-ever ESCO agreement in Ukraine was signed in Savran, and on 7 August 2018 Memorandum on Partnership and Action Plan were signed between the UNDP Project and the Savran District Administration, Odesa region.

As a result of the previous successful experience, the Savran Administration in a very short time determined the facility for the implementation of the advanced ESCO partnership model and approved the main levels of coal consumption.

The Kontseba secondary school was selected to implement the project.

The implementation of energy efficiency measures at the expense of the Customer was planned to be carried out during 2019, specifically measures to insulate the roof and facade of the building.

In turn, the ESCO company had to implement an accounting system for heat generation and partial modernization of the heating system.

Assessment of performance and efficiency of the ESCO project:

The peculiarity of this project is the unprecedented case when the customer of the energy service refused to fulfil his financial obligations under the contract from the first month of service provision.

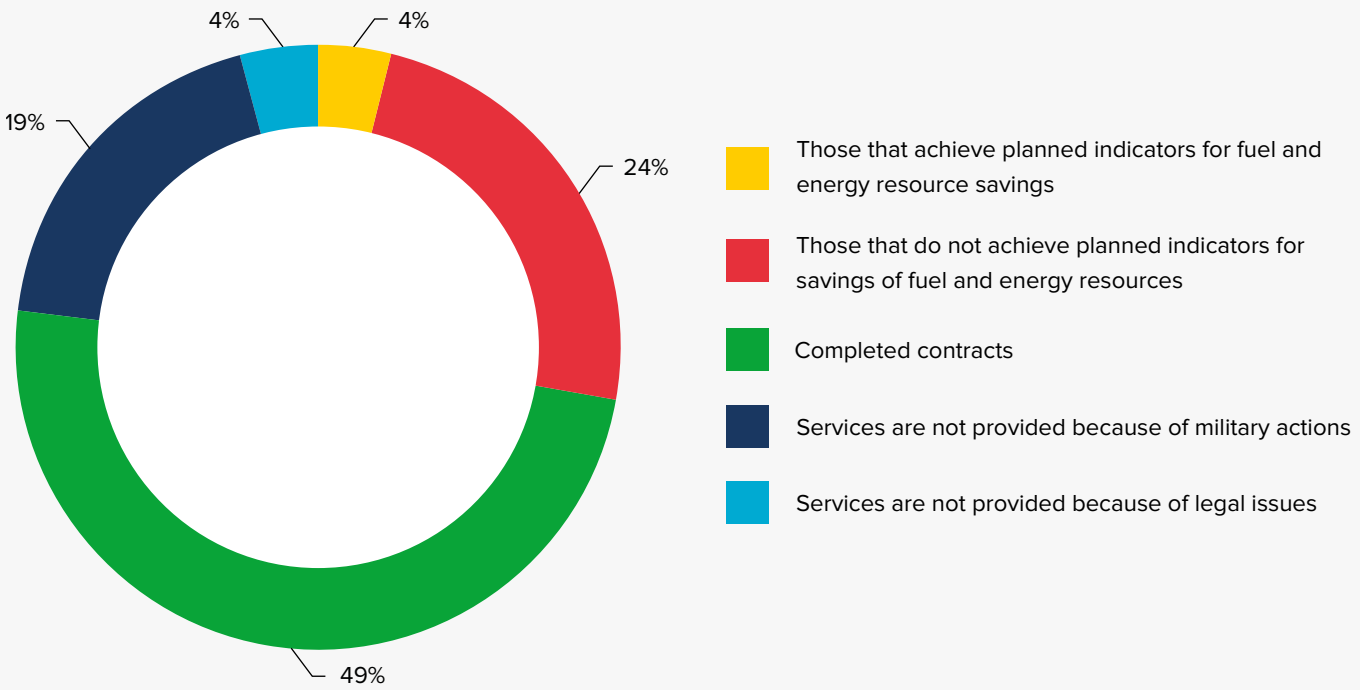
This project is not successful due to various factors:

- The ESCO company did not return the investment and received only financial losses under the project;
- The customer of the energy service stopped paying the investor under three other ESCO contracts that were launched in 2016-2018.
- All four ESCO contracts became the subject of court proceedings (the only existing contracts for which the dispute was not resolved within a pre-trial procedure);
- The analysis of court cases showed that the ESCO company provided supporting documents regarding the fulfilment of all obligations under the contracts, therefore the investor's claims under four ESCO contracts were granted in 2021;
- As of July 2023, the ESCO company has not yet received repayment of debts under the energy service contracts due to liquidation of the Customer, resulting from administrative and territorial reform.

Annex 1. Information on the current status of energy service contracts

Annex 1. Information on the current status of energy service contracts signed with the support of UNDP Ukraine

N°	Name	Number	Percentage, %
1	Number of partner cities	10	-
2	Total number of concluded contracts	53	100%
3	Active contracts, including those that:	15	28%
3.1	Achieve planned indicators for fuel and energy resources	2	4%
3.2	Do not achieve planned indicators for savings of fuel and energy resources	13	24%
4	Completed contracts	26	49%
5	Services are not provided, including:	12	23%
5.1	Services are not provided because of military actions	10	19%
5.2	Services are not provided because of legal issues	2	4%



Annex 2.1. Assessment of performance and efficiency of ESCO projects, the city of Nizhyn

Annex 2.1. Summarised assessment of performance and efficiency of ESCO projects in the city of Nizhyn, Chernihiv oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	General secondary education school of I–III levels No. 16	Classic ESCO	Installation of the modular individual heating station and remote energy monitoring system	1 305,2	5	20%	80%	October 2019	The contract was completed in February 2022	729,7	25%	182,4	29%	208,5	326,3	938,7	63,0	Planned savings are exceeded
2	General secondary education school of I–III levels No. 9 (main building)	Advanced ESCO partnership	Installation of the modular individual heating station and remote energy monitoring system, replacement of windows and roof insulation	2 693,5	11	14%	86%	October 2019	Energy efficiency services are provided	219,7	57%	125,2	45%	99,0	438,5	445,6	29,9	Planned savings are not achieved
3	General secondary education school of I–III levels No. 9 (physical culture and health complex)	Advanced ESCO partnership	Installation of the modular individual heating station and remote energy monitoring system, replacement of windows	615,5	6,5	27%	73%	October 2019	The contract was completed in April 2022	193,1	35%	67,6	46%	88,7	227,6	399,4	26,8	Planned savings are exceeded
4	General secondary education school of I–III levels No. 1	Classic ESCO	Installation of the modular individual heating station and remote energy monitoring system	636,9	5	10%	90%	October 2019	The contract was completed in November 2021	318,1	25%	79,5	48%	152,3	70,8	685,8	46,1	Planned savings are exceeded
5	Gymnasium No. 3	Classic ESCO	Installation of the modular individual heating station and remote energy monitoring system	980,4	5	20%	80%	October 2019	Energy efficiency services are provided	552,3	25%	138,1	13%	74,3	245,1	334,6	22,5	Planned savings are not achieved
										2 012,9		**592,8**		**622,9**	**1 308,3**	**2 804,1**	**188,3**	

*FER - fuel and energy resources

Continuation of annex 2.1

Total number of concluded contracts	5
Total value of ESCO contracts, thousand UAH	6 231,5
Private investments involved in implementation of ESCO projects, thousand UAH	2 530,0
Completed contracts	3
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	2 0 2
Actual average savings of fuel and energy resources per year for the five city facilities, GCal/year	622,9
Total exceeding of planned indicators for the five city facilities	1%
Customer's fund savings during the energy service contracts, thousand UAH	1 308,3
Customer's fund savings after the energy service contracts expire, thousand UAH/year	2 804,1
CO_2 emissions reduction, for 1 year of operation of the five facilities, tons	188,3

Annex 2.2. Assessment of performance and efficiency of ESCO projects, the city of Slavutych

Annex 2.2. Summarised assessment of performance and efficiency of ESCO projects in the city of Slavutych, Kyiv oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	General secondary education school of I–III levels No. 1	Advanced ESCO partnership	Installation of the modular individual heating unit and remote energy monitoring system, replacement of windows and doors	2 840,4	6,1	79%	21%	October 2019	Energy efficiency services are provided	1 162,4	35%	406,8	26%	297,2	10685,3	1 231,5	89,9	Planned savings are not achieved
2	General secondary education school of I–III levels No. 3	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	2034,6	6,1	20%	80%	October 2019	The contract was completed in February 2023	876,0	25%	219,0	25%	219,0	492,6	907,6	66,2	Planned savings
3	City-wide library and information centre	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	795,7	6,4	15%	85%	October 2019	Energy efficiency services are provided	304,3	25%	76,1	7%	22,3	140,4	92,2	6,7	Planned savings are not achieved
4	Street lighting	Classic ESCO	Street lighting system retrofit	7593,8	15	0%	100%	September 2020	Energy efficiency services are provided	240,1	59%	141,9	33%	78,3	0,0	511,0	23,7	Planned savings are not achieved
										2 582,8		**843,8**		**616,8**	**11 318,3**	**2 742,4**	**186,5**	

Continuation of annex 2.2

Total number of concluded contracts	4
Total value of ESCO contracts, thousand UAH	13 264,5
Private investments involved in implementation of ESCO projects, thousand UAH	5 268,0
Completed contracts	1
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	3 0 3
Actual average savings of fuel and energy resources per year for the four city facilities, GCal/year	616,8
Total exceeding of planned indicators for the four city facilities	-9%
Customer's fund savings during the energy service contracts, thousand UAH	11 318,3
Customer's fund savings after the energy service contracts expire, thousand UAH/year	2 742,4
CO_2 emissions reduction, for 1 year of operation of the four facilities, tons	186,5

Annex 2.3. Assessment of performance and efficiency of ESCO projects, the city of Odesa

Annex 2.3. Summarised assessment of performance and efficiency of ESCO projects in the city of Odesa as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Special educational complex No. 241 "Voloshky"	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	825,1	9,5	15%	85%	November 2019	The contract was completed in January 2023	354,9	24%	85,2	37%	129,6	145,6	449,3	39,2	Planned savings are exceeded
2	Specialised school of I level No. 96	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	506,8	6,0	6%	94%	November 2019	The contract was completed in January 2023	320,0	25%	80	25%	80	32,3	277,3	24,2	Planned savings
3	General secondary education school of I–III levels No. 20	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	586,9	6,0	6%	94%	November 2019	The contract was completed in January 2023	373,4	25%	93,4	25%	93,4	37,5	323,6	28,8	Planned savings
4	General secondary education school of I–III levels No. 46	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	783,8	6,0	6%	94%	November 2019	The contract was completed in December 2022	500,1	25%	125,0	25%	125,0	50,0	433,5	37,8	Planned savings
5	Special educational complex "Gymnasium No. 7"	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1230,0	6,5	15%	85%	November 2019	The contract was completed in February 2022	774,6	25%	193,6	36%	279,5	217,1	968,9	84,5	Planned savings are exceeded
6	Special educational complex "Gymnasium No. 2"	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	803,8	6,0	6%	94%	November 2019	The contract was completed in February 2022	516,2	25%	129,1	29%	148,8	54,4	515,9	45	Planned savings are exceeded

Annex 2.3. Summarised assessment of performance and efficiency of ESCO projects in the city of Odesa as of July 2023 (continuation)

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
7	General secondary education school of I–III levels No. 63	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	833,6	6,5	20%	80%	November 2019	The contract was completed in January 2023	555,7	25%	138,9	27%	149,3	208,4	517,6	45,1	Planned savings are exceeded
8	General secondary education school of I–III levels No. 44	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1 384,7	8,5	15%	85%	November 2019	Energy efficiency services are provided	650,0	25%	162,5	25%	162,5	244,4	563,4	49,1	Planned savings
9	Specialised school of I-III levels No. 17	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1133,2	6,5	15%	85%	November 2019	The contract was completed in February 2023	717,6	25%	179,4	27%	190,9	200,0	661,9	57,7	Planned savings are exceeded
10	Lyceum "Prymorskyi"	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	514.3	6.0	6%	94%	November 2019	The contract was completed in March 2022	325.1	25%	81.3	32%	104.7	37.2	362.8	31.6	Planned savings are exceeded
11	Specialised school of I-III levels No. 84	Advanced ESCO partnership	Insulation of the façade and roof, replacement of windows and doors, installation of the modular individual heating unit and remote energy monitoring system	684.1	8.0	60%	40%	November 2019	The contract was completed in January 2023	592.7	30%	177.8	37%	220.9	1,026.2	765.9	66.8	Planned savings are exceeded

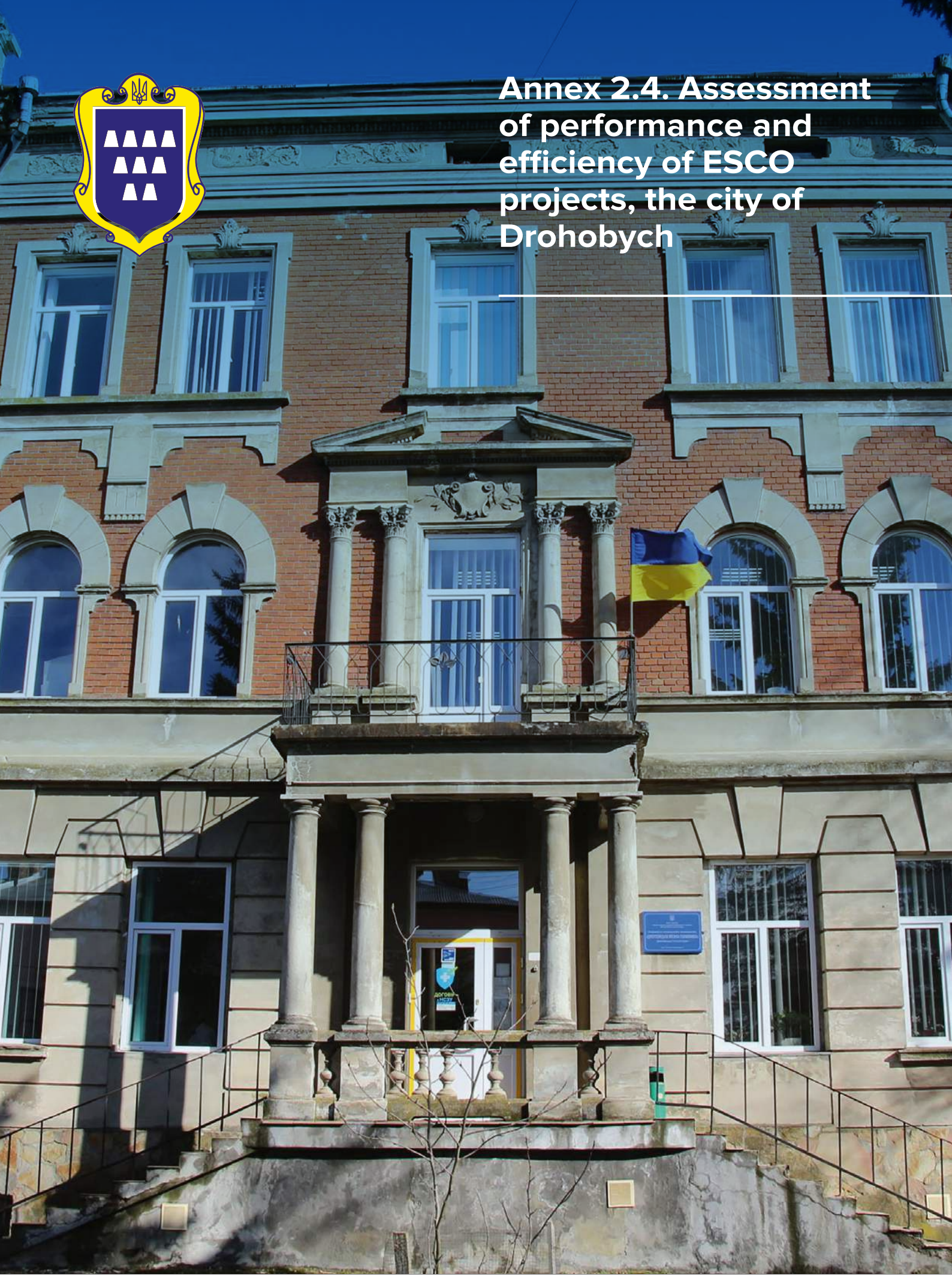
Annex 2.3. Summarised assessment of performance and efficiency of ESCO projects in the city of Odesa as of July 2023 (continuation)

N°	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
12	General secondary education school of I–III levels No. 122	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	764.7	6.5	17%	83%	November 2019	Energy efficiency services are provided	497.7	25%	124.4	20%	97.4	156.6	337.7	29.5	Planned savings are not achieved
13	Specialised school of I-III levels No. 86	Advanced ESCO partnership	Insulation of the façade and roof, replacement of windows and doors, installation of the modular individual heating unit and remote energy monitoring system	791.7	8.0	45%	55%	November 2019	The contract was completed in April 2022	497.3	30%	149.2	46%	226.4	678.5	784.8	68.5	Planned savings are exceeded
14	Specialised school of I level No. 263	Advanced ESCO partnership	Insulation of the façade and roof, replacement of windows and doors, installation of the modular individual heating unit and remote energy monitoring system	278.5	8.0	50%	50%	November 2019	The contract was completed in March 2022	232.3	25%	58.1	32%	73.9	280.4	256.4	22.4	Planned savings are exceeded
15	Preschool educational institution "Nursery school" No. 287	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	732.5	9.3	5%	95%	November 2020	Energy efficiency services are provided	272.3	25%	68.1	17%	47.4	38.6	164.2	14.3	Planned savings are not achieved
										7 180,0		**1 846,0**		**2 129,6**	**3 407,0**	**7 383,2**	**643,9**	

Continuation of annex 2.3

Total number of concluded contracts	15
Total value of ESCO contracts, thousand UAH	11 853,8
Private investments involved in implementation of ESCO projects, thousand UAH	4 015,6
Completed contracts	12
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	3 1 2
Actual average savings of fuel and energy resources per year for the fifteen city facilities, GCal/year	2129,6
Total exceeding of planned indicators for the fifteen city facilities	4%
Customer's fund savings during the energy service contracts, thousand UAH	3 407,0
Customer's fund savings after the energy service contracts expire, thousand UAH/year	7 383,2
CO_2 emissions reduction, for 1 year of operation of the fifteen facilities, tons	643,9

Annex 2.4. Assessment of performance and efficiency of ESCO projects, the city of Drohobych



Annex 2.4. Summarised assessment of performance and efficiency of ESCO projects in the city of Drohobych, Lviv oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Specialised school of I-III levels No. 2	ESCO factoring	Heating system retrofit and installation of the remote energy monitoring system	1 368,8	6	15%	85%	March 2019	Energy efficiency services are provided	573,0	25%	143,2	20%	117,3	241,6	475,0	35,5	Planned savings are not achieved
2	Ivan Franko general secondary education school of I–III levels No. 1	ESCO factoring	Heating system retrofit and installation of the remote energy monitoring system	1227,5	5,5	15%	85%	November 2019	The contract was completed in January 2023	536,2	24%	128,7	33%	176,7	216,6	715,5	53,4	Planned savings are exceeded
3	Stebnyk general secondary education school of I–III levels No. 18	ESCO factoring	Heating system retrofit and installation of the remote energy monitoring system	1 395,2	5,5	15%	85%	March 2019	Energy efficiency services are provided	613,5	25%	153,4	16%	96,8	246,2	392,2	29,3	Planned savings are not achieved
4	General secondary education school of I–III levels No. 14	ESCO factoring	Heating system retrofit and installation of the remote energy monitoring system	797,3	6,5	15%	85%	March 2019	Energy efficiency services are provided	435,3	16%	69,7	9%	39,1	140,7	158,4	11,8	Planned savings are not achieved
5	Drohobych city polyclinic	ESCO factoring	Heating system retrofit and installation of the remote energy monitoring system	1 048,7	6,5	10%	90%	March 2019	Energy efficiency services are provided	347,0	25%	86,7	22%	77,8	116,5	315,0	23,5	Planned savings are not achieved
6	Drohobych city children hospital	Advanced ESCO partnership	Installation of the modular individual heating unit and remote energy monitoring system. Major repair of the building	965,0	6	15%	85%	November 2019	The contract was completed in May 2023	545,2	20%	109,0	20%	109,0	170,3	441,6	33,0	Planned savings
										3 050,1		**690,7**		**616,7**	**1 131,9**	**2 497,6**	**186,5**	

Continuation of annex 2.4

Total number of concluded contracts	6
Total value of ESCO contracts, thousand UAH	6 802,4
Private investments involved in implementation of ESCO projects, thousand UAH	1 897,1
Completed contracts	2
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	4 0 4
Actual average savings of fuel and energy resources per year for the six city facilities, GCal/year	616,7
Total exceeding of planned indicators for the six city facilities	-2%
Customer's fund savings during the energy service contracts, thousand UAH	1 131,9
Customer's fund savings after the energy service contracts expire, thousand UAH/year	2 497,6
CO_2 emissions reduction, for 1 year of operation of the six facilities, tons	186,5

Annex 2.5. Assessment of performance and efficiency of ESCO projects, the city of Korosten

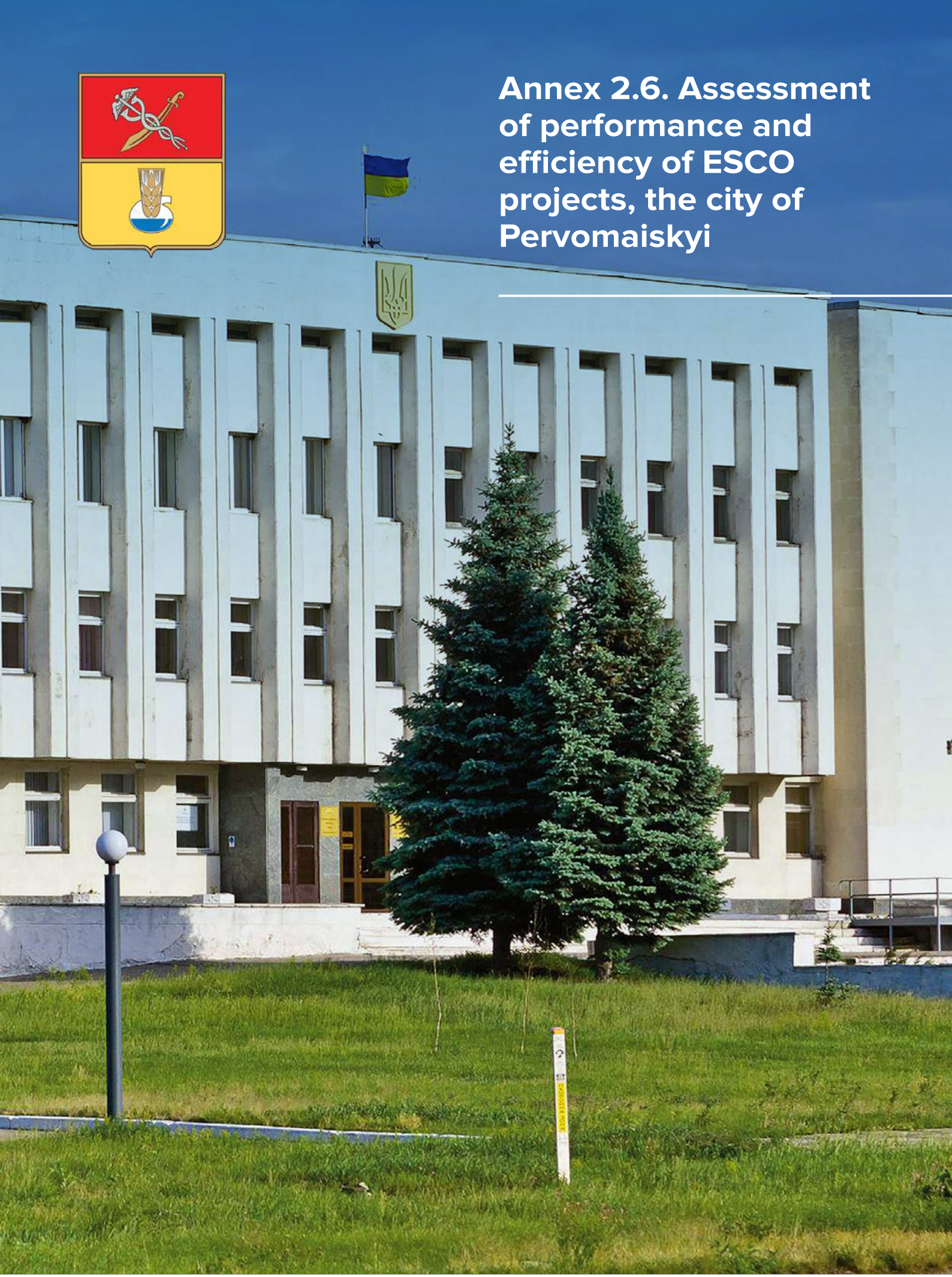
Annex 2.5. Summarised assessment of performance and efficiency of ESCO projects in the city of Korosten, Zhytomyr oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	City collegium	Classic ESCO	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	641.3	5	10%	90%	November 2019	Energy efficiency services are provided	489.3	20%	97.9	22%	110.0	71.3	370.8	33.3	Planned savings are exceeded
2	Child development centre No. 18	Advanced ESCO partnership	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system, and façade insulation	491.3	7.5	58%	42%	November 2019	The contract was completed in February 2023	319.6	30%	95.9	45%	144.0	678.4	441.5	43.6	Planned savings are exceeded
3	General secondary education school of I–III levels No. 1	Classic ESCO	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	534.8	4.6	10%	90%	November 2019	The contract was completed in April 2023	407.2	20%	81.4	20%	81.4	59.4	249.6	24.6	Planned savings
4	General secondary education school of I–III levels No. 9	Classic ESCO	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	558.0	4.6	10%	90%	November 2019	Energy efficiency services are provided	426.0	20%	85.2	14%	60.2	62.0	285.2	18.2	Planned savings are not achieved
										1642,1		**360,4**		**395,6**	**871,1**	**1 347,1**	**119,6**	

Continuation of annex 2.5

Total number of concluded contracts	4
Total value of ESCO contracts, thousand UAH	2 225,4
Private investments involved in implementation of ESCO projects, thousand UAH	857,6
Completed contracts	2
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	2 1 1
Actual average savings of fuel and energy resources per year for the four city facilities, GCal/year	395,6
Total exceeding of planned indicators for the four city facilities	2%
Customer's fund savings during the energy service contracts, thousand UAH	871,1
Customer's fund savings after the energy service contracts expire, thousand UAH/year	1 347,1
CO_2 emissions reduction, for 1 year of operation of the four facilities, tons	119,6

Annex 2.6. Assessment of performance and efficiency of ESCO projects, the city of Pervomaiskyi



Annex 2.6. Summarised assessment of performance and efficiency of ESCO projects in the city of Pervomaiskyi, Kharkiv oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	General secondary education school of I–III levels No. 7	Advanced ESCO partnership	Installation of the modular individual heating unit and remote energy monitoring system	1,258.5	6	23%	77%	January 2020	Energy efficiency services are provided	661.2	25%	165.3	17%	109.5	375.9	401.8	33.1	Planned savings are not achieved
										661,2		**165,3**		**109,5**	**375,9**	**401,8**	**33,1**	

Continuation of annex 2.6

Total number of concluded contracts	1
Total value of ESCO contracts, thousand UAH	1 258,5
Private investments involved in implementation of ESCO projects, thousand UAH	372,8
Completed contracts	0
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	1 0 1
Actual average savings of fuel and energy resources per year for the one city facility, GCal/year	109,5
Total exceeding of planned indicators for the one city facility	-8%
Customer's fund savings during the energy service contracts, thousand UAH	375,9
Customer's fund savings after the energy service contracts expire, thousand UAH/year	401,8
CO_2 emissions reduction, for 1 year of operation of the one facility, tons	33,1

Annex 2.7. Assessment of performance and efficiency of ESCO projects, the city of Dubno

Annex 2.7. Summarised assessment of performance and efficiency of ESCO projects in the city of Dubno, Rivne oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Preschool educational institution No. 3	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	323.2	7.5	10%	90%	January 2019	The contract was completed in December 2021	128.4	18%	23.1	21%	27.1	35.9	94.9	8.2	Planned savings are exceeded
2	Preschool educational institution No. 4	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	279.1	7.5	10%	90%	January 2019	The contract was completed in February 2021	129.8	15%	19.5	26%	33.3	31.0	116.6	10.1	Planned savings are exceeded
3	General secondary education school of I–III levels No. 3	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	347.8	7.5	10%	90%	January 2019	The contract was completed in December 2021	210.0	15%	31.5	15%	31.5	38.6	110.4	9.5	Planned savings
4	General secondary education school of I–III levels No. 1	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	528.3	7.5	10%	90%	January 2019	The contract was completed in January 2022	161.5	18%	29.1	30%	48.7	58.7	170.7	14.7	Planned savings are exceeded

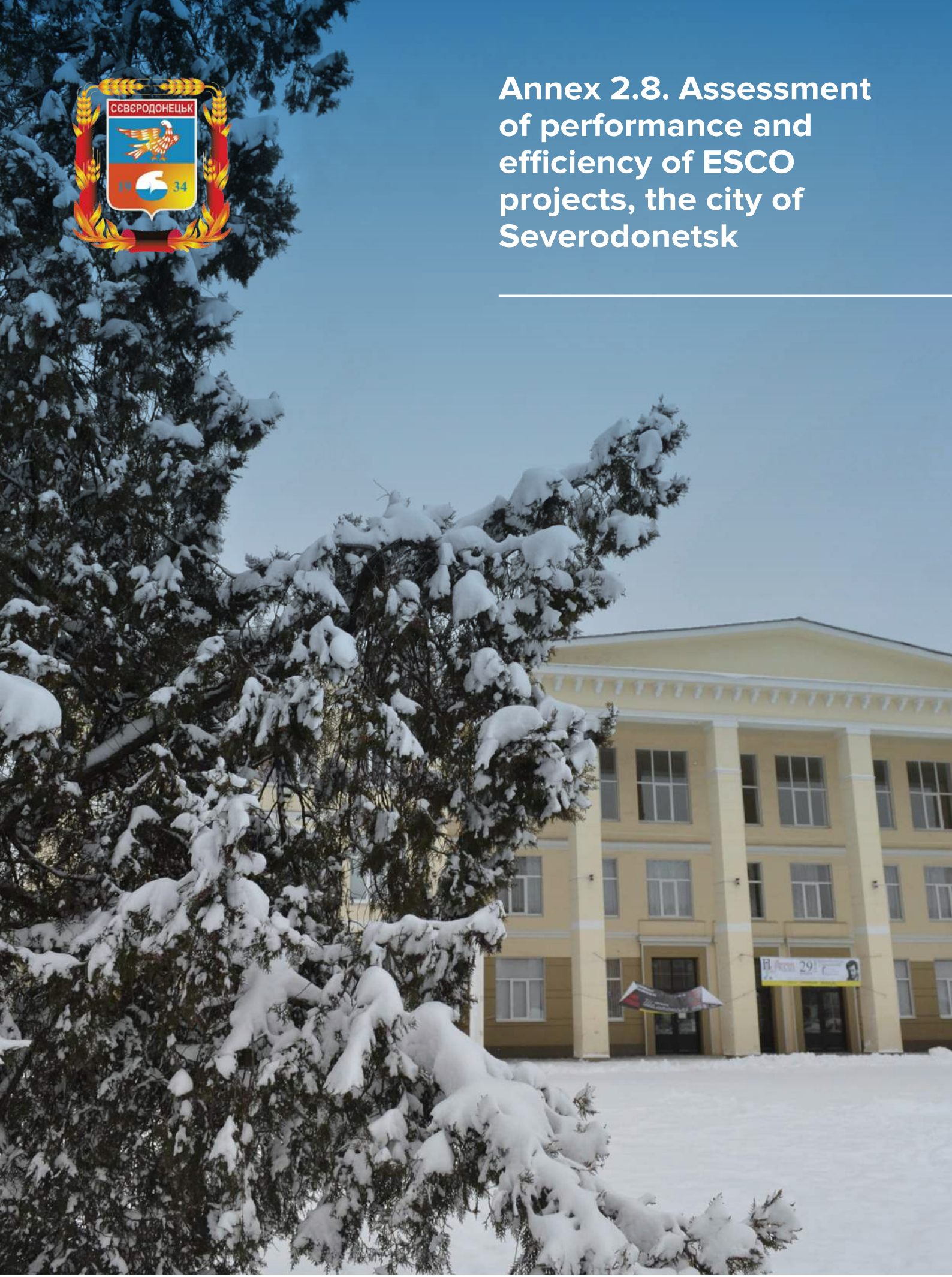
Annex 2.7. Summarised assessment of performance and efficiency of ESCO projects in the city of Dubno, Rivne oblast as of July 2023 (continuation)

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
5	Combined type preschool education institution No. 6	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	1,128.2	6.5	10%	90%	January 2019	The contract was completed in January 2021	610.6	15%	91.6	20%	119.7	125.4	419.5	36.2	Planned savings are exceeded
6	Educational complex "School-Gymnasium"	ESCO factoring	Installation of the system for weather-based regulation of heat transfer medium and remote energy monitoring system	545.5	6.5	10%	90%	January 2019	The contract was completed in December 2021	253.6	18%	45.7	19%	47.7	60.6	167.1	14.4	Planned savings are exceeded
										1 493,7		**240,4**		**307,8**	**1 079,2**	**1 347,1**	**93,1**	

Continuation of annex 2.7

Total number of concluded contracts	6
Total value of ESCO contracts, thousand UAH	3 152,1
Private investments involved in implementation of ESCO projects, thousand UAH	1030,0
Completed contracts	6
Active contracts, including those that: • Achieve planned indicators for fuel and energy resources • Do not achieve planned indicators for savings of fuel and energy resources	0 0 0
Actual average savings of fuel and energy resources per year for the six city facilities, GCal/year	307,8
Total exceeding of planned indicators for the six city facilities	5%
Customer's fund savings during the energy service contracts, thousand UAH	350,2
Customer's fund savings after the energy service contracts expire, thousand UAH/year	1079,2
CO_2 emissions reduction, for 1 year of operation of the six facilities, tons	93,1

Annex 2.8. Assessment of performance and efficiency of ESCO projects, the city of Severodonetsk



Annex 2.8. Summarised assessment of performance and efficiency of ESCO projects in the city of Severodonetsk, Luhansk oblast as of July 2023

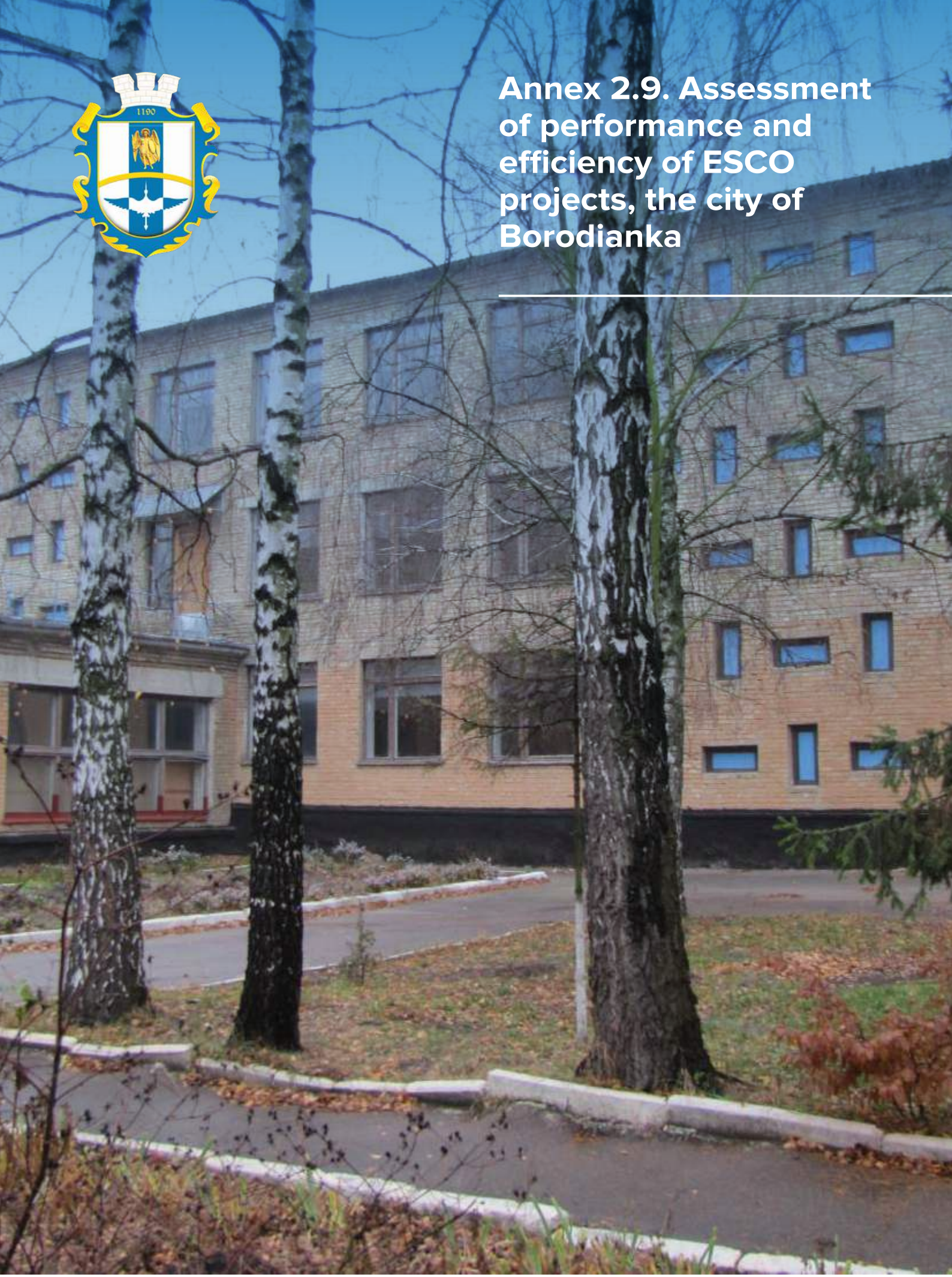
N°	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Humanitarian and aesthetics gymnasium	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	990.5	8	10%	90%	November 2019	Services are not provided because of military actions	353.0	25%	88.3	38%	133.1	76.1	No information available	40.2	Planned savings are exceeded
2	General secondary education school of I–III levels No. 1	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1,045.8	7	12%	88%	November 2019	Services are not provided because of military actions	398.6	25%	99.6	31%	124.1	108.6	No information available	37.5	Planned savings are exceeded
3	Combined type preschool educational institution No. 38 “Rosynochka”	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1,091.5	7	12%	88%	November 2019	Services are not provided because of military actions	462.1	25%	115.5	36%	166.5	121.9	No information available	50.4	Planned savings are exceeded
4	General secondary education school of I–III levels No. 5	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1,051.4	7	10%	90%	November 2019	Services are not provided because of military actions	392.0	25%	98.0	42%	163.6	109.4	No information available	49.5	Planned savings are exceeded
5	Combined type preschool educational institution No. 19 “Lastivka”	Advanced ESCO partnership	Retrofitting of the modular individual heating unit and installation of the remote energy monitoring system	285.5	6	72%	28%	November 2019	Services are not provided because of military actions	342.4	25%	85.6	6%	21.1	117.6	No information available	6.4	Planned savings are not achieved

Annex 2.8. Summarised assessment of performance and efficiency of ESCO projects in the city of Severodonetsk, Luhansk oblast as of July 2023 (continuation)

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
6	Centre for children's and youth creativity	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	931.8	7.5	10%	90%	November 2019	Services are not provided because of military actions	335.3	25%	83.8	26%	85.9	45.6	No information available	26.0	Planned savings are exceeded
7	General secondary education school of I–III levels No. 13	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	1,033.8	6.5	10%	90%	November 2019	Services are not provided because of military actions	385.4	25%	96.4	31%	119.5	74.9	No information available	36.1	Planned savings are exceeded
8	General secondary education school of I–III levels No. 15	Advanced ESCO partnership	Retrofitting of the modular individual heating unit and installation of the remote energy monitoring system	291.2	6.4	72%	28%	November 2019	Services are not provided because of military actions	348.8	25%	87.2	21%	74.2	329.3	No information available	22.4	Planned savings are not achieved
9	General secondary education school of I–III levels No. 10	Advanced ESCO partnership	Retrofitting of the modular individual heating unit and installation of the remote energy monitoring system	281.8	6.4	72%	28%	November 2019	Services are not provided because of military actions	337.5	25%	84.4	37%	124.3	581.8	No information available	37.6	Planned savings are exceeded
10	General secondary education school of I–III levels No. 8	Classic ESCO	Installation of the modular individual heating unit and remote energy monitoring system	2,227.1	5.8	15%	85%	November 2019	Services are not provided because of military actions	1,123.1	25%	280.8	32%	357.4	293.8	No information available	108.1	Planned savings are exceeded
										4 478,1		**1 119,5**		**1 369,7**	**1 859,2**	**0,0**	**414,2**	

Continuation of annex 2.8

Total number of concluded contracts	10
Total value of ESCO contracts, thousand UAH	9 230,4
Private investments involved in implementation of ESCO projects, thousand UAH	3 144,2
Completed contracts	0
Services are not provided because of military actions	10
Actual average savings of fuel and energy resources per year for the ten city facilities, GCal/year	1369,7
Total exceeding of planned indicators for the ten city facilities	6%
Customer's fund savings during the energy service contracts, thousand UAH	350,2
Customer's fund savings after the energy service contracts expire, thousand UAH/year	1 859,2
CO_2 emissions reduction, for 1 year of operation of the ten facilities, tons	414,2



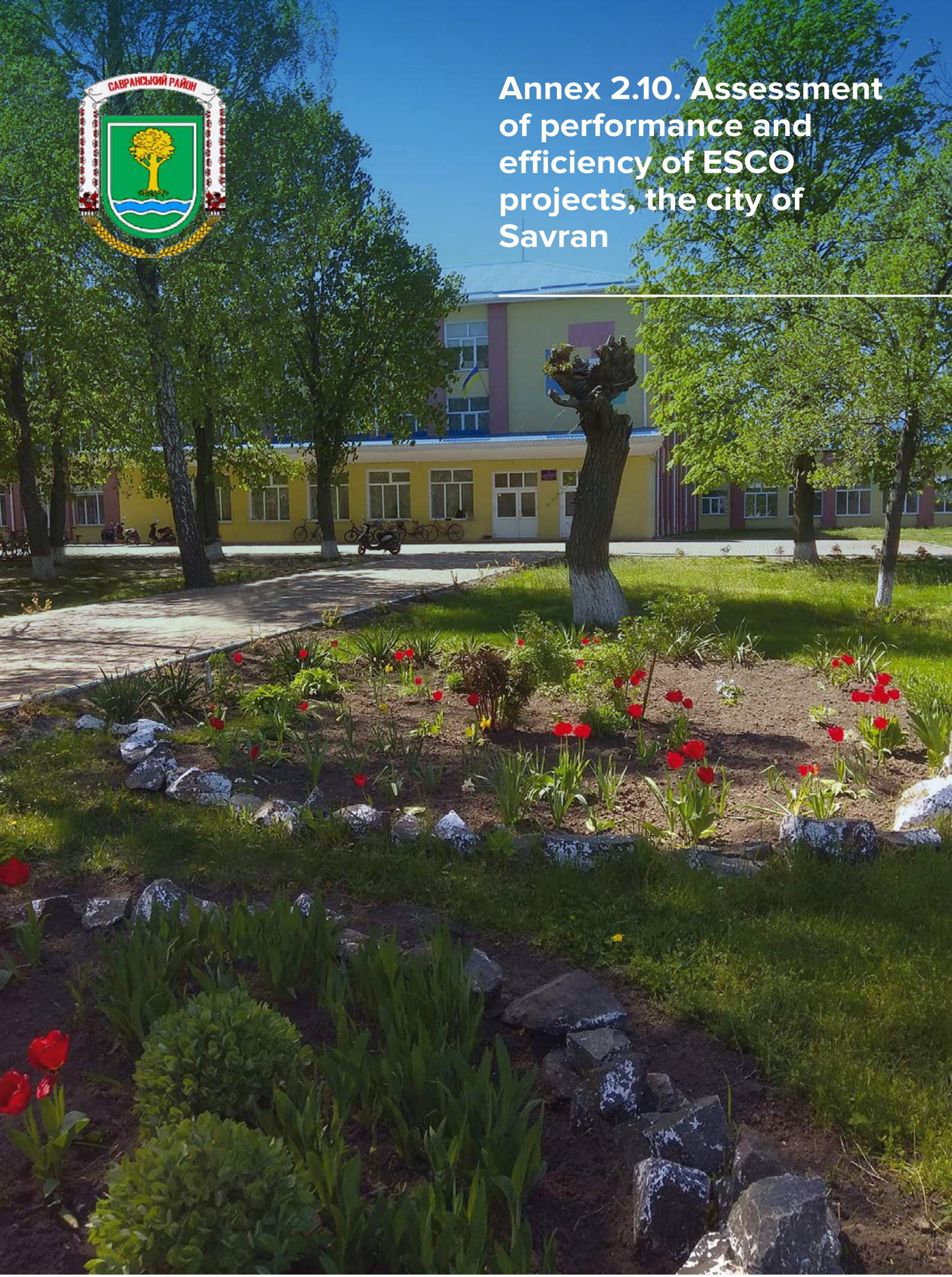
Annex 2.9. Assessment of performance and efficiency of ESCO projects, the city of Borodianka

Annex 2.9. Summarised assessment of performance and efficiency of ESCO projects in the city of Borodianka, Kyiv oblast as of July 2023

№	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Secondary school No. 2	Advanced ESCO partnership	Installation of the modular individual heating unit and remote energy monitoring system	1,106.3	7.5	69%	31%	October 2019	Services are not provided because of legal issues	678.2	50%	339.1	28%	193.2	351.4	No information available	58.4	Planned savings are not achieved
										678,2		**339,1**		**193,2**	**351,4**	**0,0**	**58,4**	

Continuation of annex 2.9

Total number of concluded contracts	1
Total value of ESCO contracts, thousand UAH	1 106,3
Private investments involved in implementation of ESCO projects, thousand UAH	320,0
Completed contracts	0
Services are not provided because of legal issues	1
Actual average savings of fuel and energy resources per year for the one city facility, GCal/year	193,2
Total underachievement of planned indicators for the one city facility	-22%
Customer's fund savings during the energy service contracts, thousand UAH	375,9
Customer's fund savings after the energy service contracts expire, thousand UAH/year	351,4
CO_2 emissions reduction, for 1 year of operation of the one facility, tons	58,4



Annex 2.10. Assessment of performance and efficiency of ESCO projects, the city of Savran

Annex 2.10. Summarised assessment of performance and efficiency of ESCO projects in the city of Savran, Odesa oblast as of July 2023

N°	Name of the ESCO facility	ESCO model	Energy efficiency measures implemented	Contract cost, thousand UAH	Duration of the Contract, year	Fixed % for the Customer	Fixed % for the ESCO	Start of provision of energy efficiency services	Implementation status	Baseline level of consumption of FER, GCal/year	Annual savings of FER* under the contract of baseline consumption, %	Annual savings of FER under the contract, GCal/year	Actual annual savings of FER during the contracts, % (2019–2022)	Actual average savings of FER per year, GCal/year (2019–2022)	Customer's savings during the energy performance contract, thousand UAH	Customer's fund savings after the energy performance contract expires, thousand UAH/year	CO_2 emissions savings, tons per 1 year	Notes
1	Kontsebiv secondary education school	Advanced ESCO partnership	Modernization of the heating system, insulation of the facade	564,0	7,0	72%	28%	October 2019	Services are not provided because of legal issues	317,2	32%	101,5	32%	101,5	346,0	No information available	30,7	Planned savings
										317,2		**101,5**		**101,5**	**346,0**	**0,0**	**30,7**	

Continuation of annex 2.10

Total number of concluded contracts	1
Total value of ESCO contracts, thousand UAH	564,0
Private investments involved in implementation of ESCO projects, thousand UAH	150,0
Completed contracts	0
Services are not provided because of legal issues	1
Actual average savings of fuel and energy resources per year for the one city facility, GCal/year	101,5
Total underachievement of planned indicators for the one city facility	-22%
Customer's fund savings during the energy service contracts, thousand UAH 1.2 years (October 2019 – December 2020)	346,0
CO_2 emissions reduction, for 1 year of operation of the one facility, tons	30,7

Successful experience of the implementation of the energy service contract

Annex 3.1. Successful experience of the implementation of the energy service contract General education school No.1, the city of Nizhyn

Profile of the energy service facility:

Name:	General education school No.1
Location:	the City of Nizhyn, Hrebinky Str.,4
Heated Square Footage, m^2	1428
Heated space, m^3	5428
Basic level of consumption of fuel and energy resources, GCal per year:	318,1
Average recorded number of people temporarily staying at the energy service facility:	169
Gender impact of comfortable conditions for stay resulting from ESCO projects: • men • women	 63 106
Average indoor temperature (°C):	+18

Profile of ESCO contract:

Model:	Classic ESCO
Cost of the contract, UAH:	636 876
Contract term at the moment of signing:	5 years
Start of energy service provision:	October 2019
Actual contract term:	2 years and 1 month (ended in November 2021)
Fixed interest of the Customer:	10%
Fixed interest of ESCO:	90%

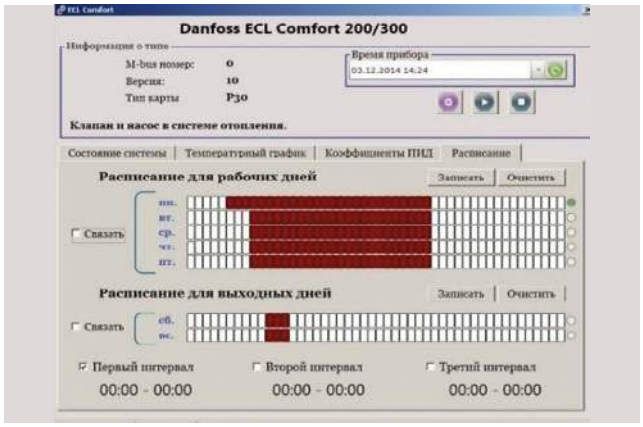
Implementation of energy-saving activities:

By ESCO-investor: Installation of weather-dependent heat carrier regulation and online dispatching (September 2019)

Picture 2. Heat carrier control nod

Picture 3. Control cabinet Danfoss

Picture 4. Scheme of the control nod



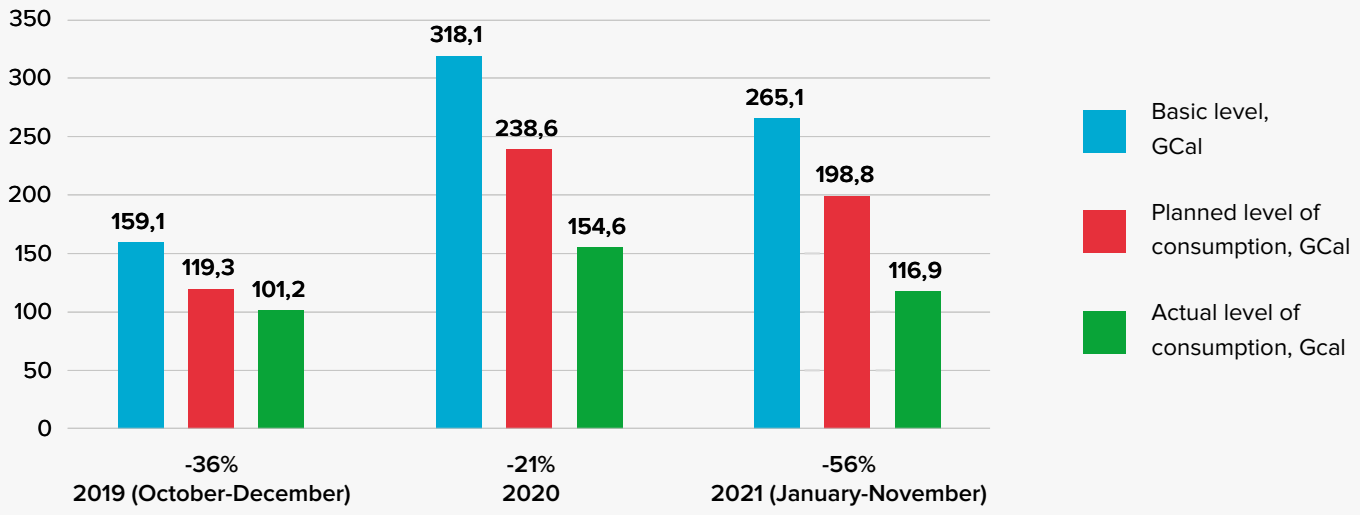
Picture 5. Mode operation map

Support of the UNDP Project: Conducting energy audit of the building, financing installation works, (June - September 2019)

Investments	UAH	USD (exchange rate of 2019)
Investment by the Customer:	-	-
Investment by the Contractor:	320 000	11 679
Investment by UNDP:	140 515	5 128
Total Investments:	**460 515 UAH**	**$16 807**

The effect from the implementation of energy efficiency measures:

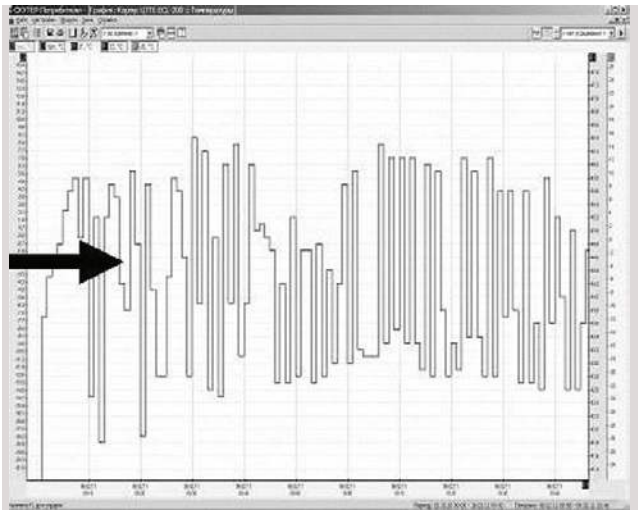
Fuel and energy resource savings	Under the energy service contract	Actual average annual savings during the contract implementation	2019 (October-December)	2020 p.	2021 (January-November)
Annual FER savings, %:	25%	48%	36%	51%	56%
Annual FER savings, GCal:	79,5	152,3	57,9	163,5	148,2



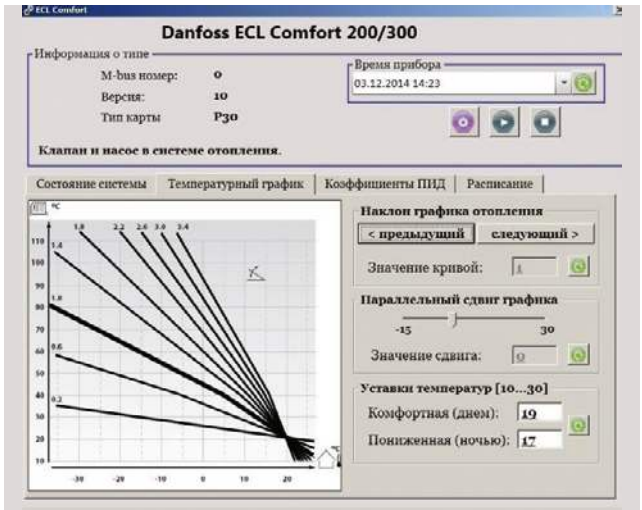
Picture 6. Thermal energy consumption, GCal

Savings for the Customer in monetary equivalent during the energy service contract:	70,8 thousand UAH
Savings for the Customer in monetary equivalent after the energy service contract:	685,8 thousand UAH per year
Average fuel and energy resource savings for 1 year of facility operation:	152,3 GCal
CO_2 emission reduction for 1 year of facility operation:	46,1 t per year
Specific heat energy consumption by the facility after the implementation of energy-saving measures	0,116 GCal/m^2*year

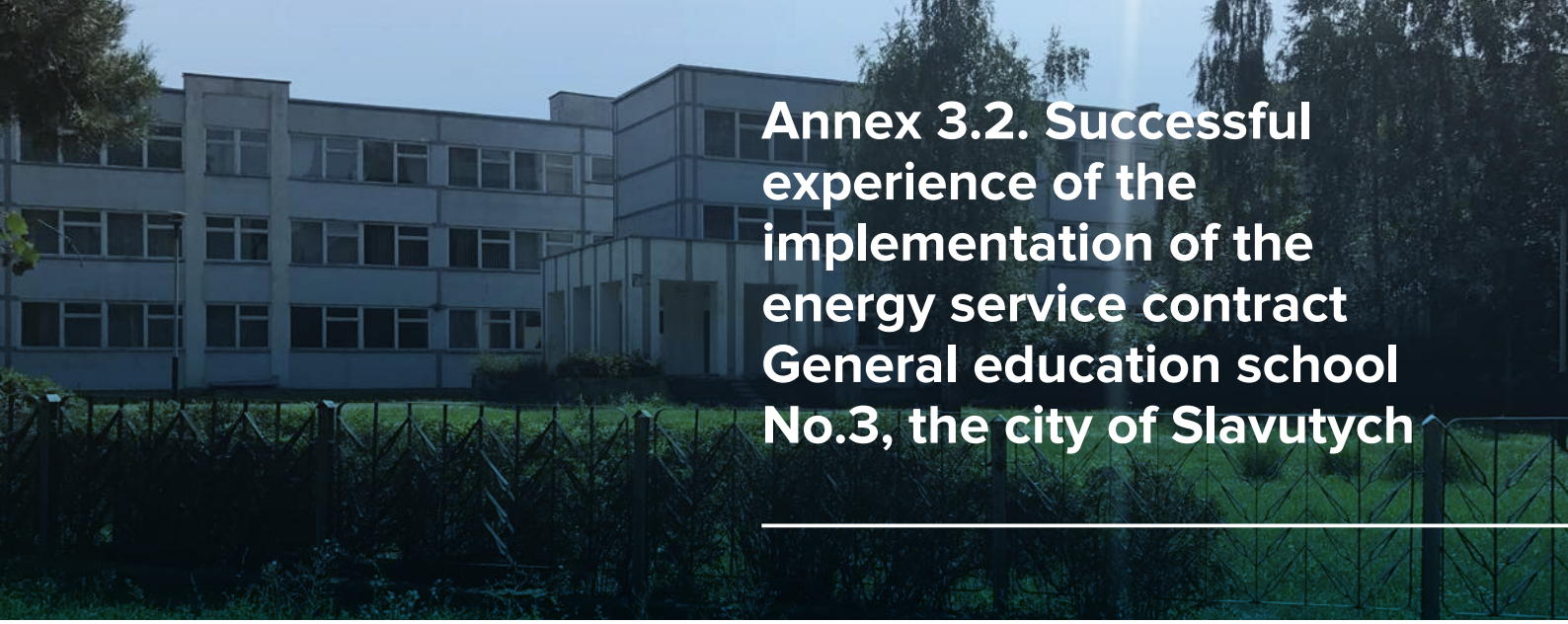
Facility Energy Monitoring System Danfoss ECL-Portal:



Picture 7. Weather-dependent heat carrier temperature regulation



Picture 8. Settings of heat carrier temperature control



Annex 3.2. Successful experience of the implementation of the energy service contract General education school No.3, the city of Slavutych

Profile of the energy service facility:

Name:	General education school No.3
Location:	the City of Slavutych, Nezalezhnosti Ave., 1
Heated Square Footage, m^2	8999
Heated space, m^3	31496
Basic level of consumption of fuel and energy resources, GCal per year:	318,1
Average recorded number of people temporarily staying at the energy service facility:	534
Gender impact of comfortable conditions for stay resulting from ESCO projects: • men • women	 198 336
Average indoor temperature (°C):	+18

Profile of ESCO contract:

Model:	Classic ESCO
Cost of the contract, UAH:	2 034 560
Contract term at the moment of signing:	6 years
Start of energy service provision:	October 2019
Actual contract term:	3 years and 4 months (ended in February 2023)
Fixed interest of the Customer:	20%
Fixed interest of ESCO:	80%

Implementation of energy-saving activities:

By ESCO-investor: Installation of 3 modular individual heating stations (IHS) (with the system of weather-dependent regulation and online dispatching), installation of new heat meters, and balancing the heating system (October 2019)

Picture 9. Modular IHS Danfoss N°1, N°2

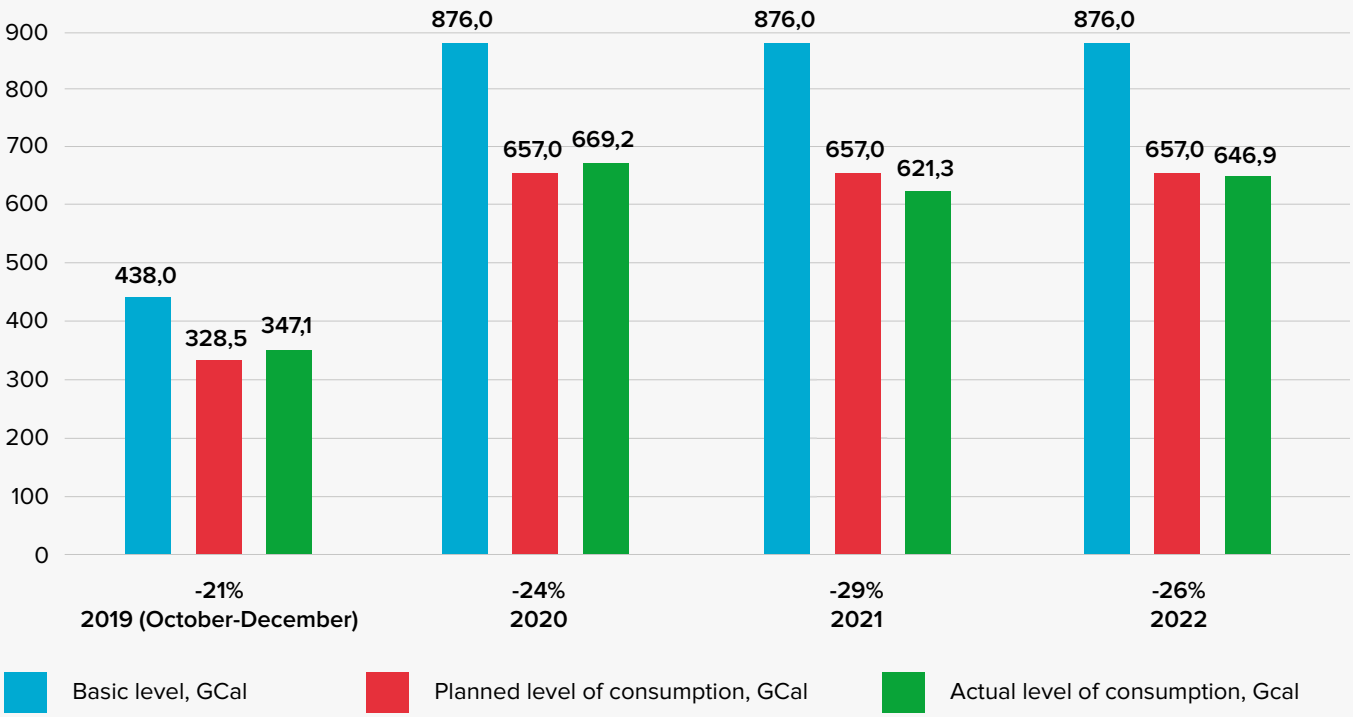
Picture 10. Modular IHS Danfoss N°3

Picture 11. Heat meter Sempal

Picture 12. Control cabinet for IHS SynergyData

Investments	UAH	USD (exchange rate of 2019)
Investment by the Customer:	-	-
Investment by the Contractor:	818 618	29 877
Investment by UNDP:	-	-
Total Investments:	**818 618 UAH**	**$29 877**

The effect from the implementation of energy efficiency measures:

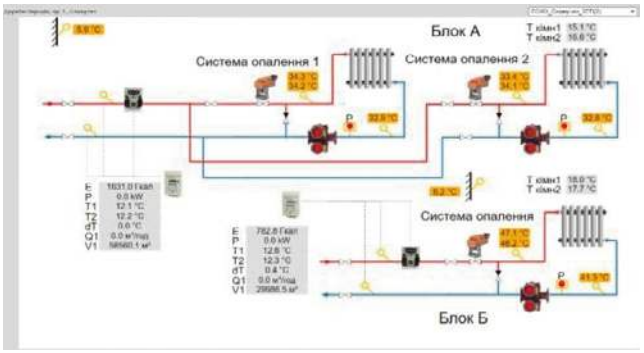


Picture 13. Thermal energy consumption, GCal

Fuel and energy resource savings	Under the energy service contract	Actual average annual savings during the contract implementation	2019 (October-December)	2020 p.	2021 p.	2022p.
Annual FER savings, %:	25%	25%	21%	24%	29%	26%
Annual FER savings, GCal:	219,0	219,0	91,0	206,8	254,7	229,2

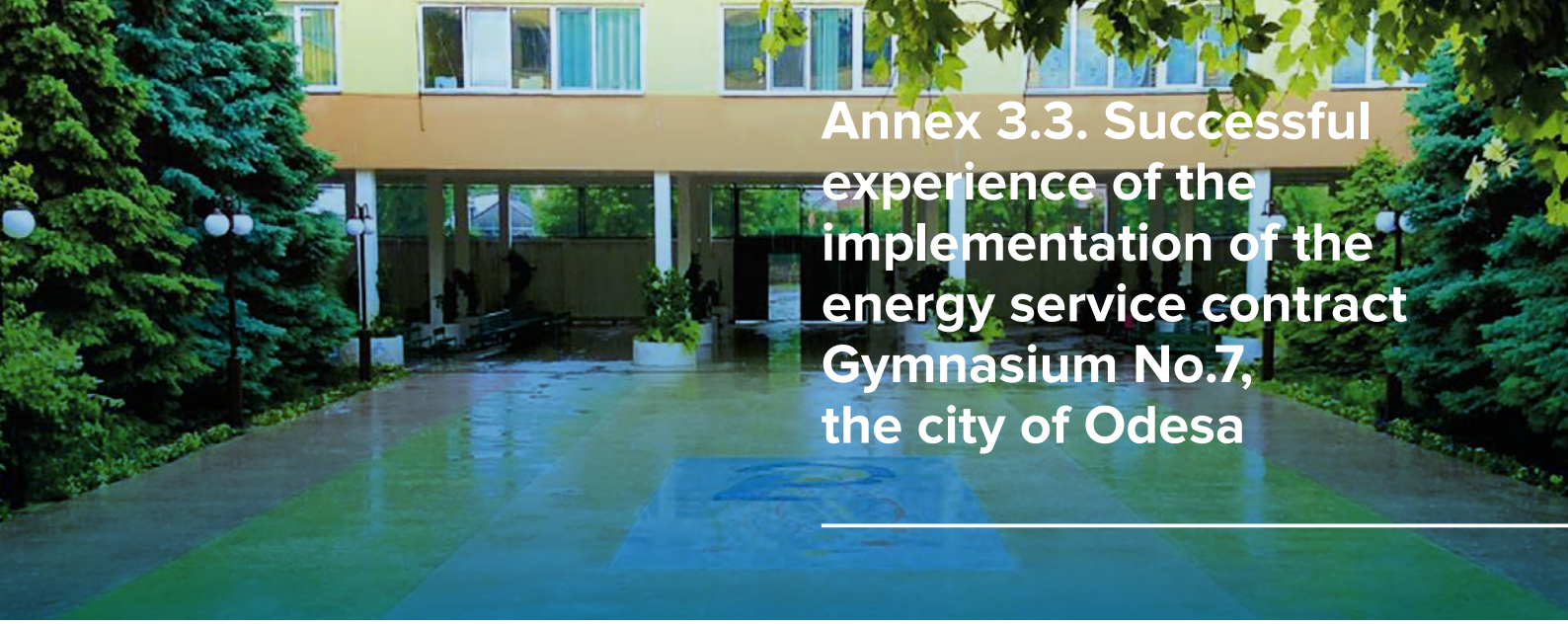
Savings for the Customer in monetary equivalent during the energy service contract:	492,6 thousand UAH
Savings for the Customer in monetary equivalent after the energy service contract:	907,6 thousand UAH per year
Average fuel and energy resource savings for 1 year of facility operation:	219 GCal per year
CO_2 emission reduction for 1 year of facility operation:	66,2 t per year
Specific heat energy consumption by the facility after the implementation of energy-saving measures	0,073 GCal/m^{2*}year

Facility energy monitoring system:



Picture 14. Scheme of IHS (Machinery Performance Online Monitoring)

Picture 15. Weather-dependent heat carrier temperature regulation



Annex 3.3. Successful experience of the implementation of the energy service contract Gymnasium No.7, the city of Odesa

Profile of the energy service facility:

Name:	Gymnasium No.7
Location:	the City of Odesa, Rostovska Str., 4a
Heated Square Footage, m^2	9715
Heated space, m^3	34004
Basic level of consumption of fuel and energy resources, GCal per year:	774,6
Average recorded number of people temporarily staying at the energy service facility:	1753
Gender impact of comfortable conditions for stay resulting from ESCO projects: • men • women	 651 1102
Average indoor temperature (°C):	+18

Profile of ESCO contract:

Model:	Classic ESCO
Cost of the contract, UAH:	1 230 019
Contract term at the moment of signing:	6,5 years
Start of energy service provision:	November 2019
Actual contract term	2 years and 3 months (ended in February 2022)
Fixed interest of the Customer	15%
Fixed interest of ESCO:	85%

Implementation of energy efficiency measures:

By the Customer:

- Overhaul of the facade (November 2018 - December 2020)
- Roof insulation (November 2018 - December 2020)
- Replacement of glazing constructions (November 2018 - December 2020)
- Overhaul was performed in several steps

Picture 16. Before reconstruction

Picture 17. During reconstruction

Picture 18. After reconstruction

By ESCO-investor: Installation of a modular individual heating station (IHS) (with the system of weather-dependent regulation and online dispatching), installation of a new heat meter (October 2019)

Picture 19. Heat meter Ultraheat

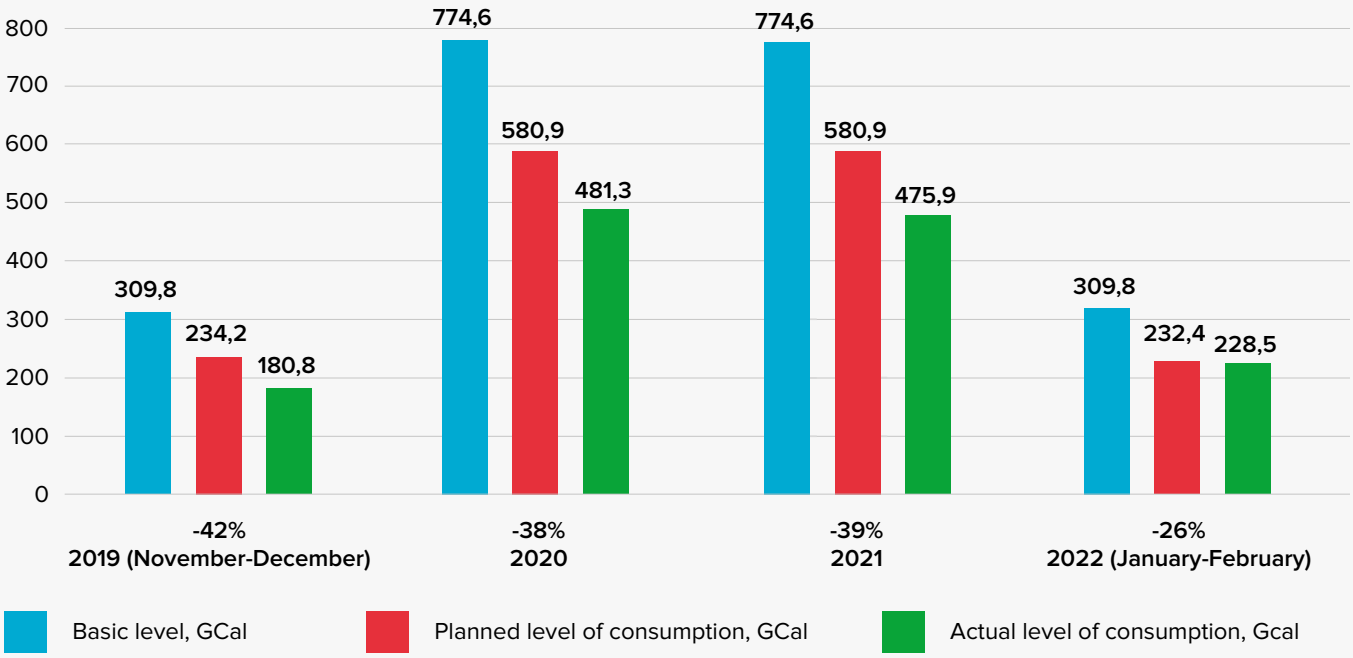
Picture 20. Modular IHS Danfoss

Picture 21. Control cabinet for IHS SynergyData

Investments	UAH	USD (exchange rate of 2019)
Investment by the Customer:	n/a	-
Investment by the Contractor:	314 871	11 492
Investment by UNDP:	-	-
Total Investments:	**314 871 UAH**	**$11 492**

The effect from the implementation of energy efficiency measures:

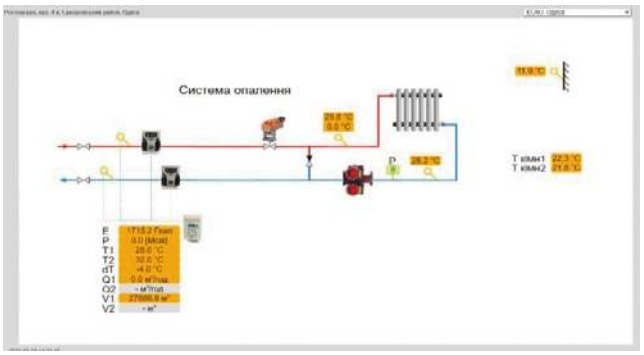
Fuel and energy resource savings	Under the energy service contract	Actual average annual savings during the contract implementation	2019 (November-December)	2020 p.	2021 p.	2022 (January-February)
Annual FER savings, %:	25%	36%	42%	38%	39%	26%
Annual FER savings, GCal:	193,6	279,5	129,1	293,2	298,6	81,3



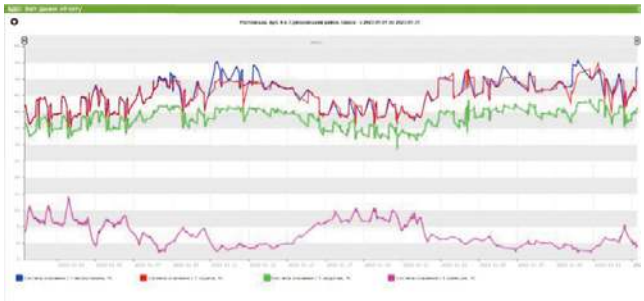
Picture 22. Thermal energy consumption, GCal

Savings for the Customer in monetary equivalent during the energy service contract:	217,1 thousand UAH
Savings for the Customer in monetary equivalent after the energy service contract:	968,9 thousand UAH per year
Average fuel and energy resource savings for 1 year of facility operation:	279,5 GCal per year
CO_2 emission reduction for 1 year of facility operation:	84,5 t per year
Specific heat energy consumption by the facility after the implementation of energy-saving measures	0,051 GCal/m^2*year

Facility energy monitoring system:



Picture 23. Scheme of IHS (Machinery Performance Online Monitoring)



Picture 24. Weather-dependent heat carrier temperature regulation

Annex 3.4. Successful experience of the implementation of the energy service contract Specialized school No.86, the city of Odesa

Profile of the energy service facility:

Name:	Specialized school No.86
Location:	the City of Odesa, Ac. Williams Str.,79
Heated Square Footage, m^2	11200
Heated space, m^3	30650
Basic level of consumption of fuel and energy resources, GCal per year:	497,3
Average recorded number of people temporarily staying at the energy service facility:	1225
Gender impact of comfortable conditions for stay resulting from ESCO projects: • men • women	 455 770
Average indoor temperature (°C):	+18

Profile of ESCO contract:

Model:	Advanced ESCO-partnership
Cost of the contract, UAH:	791 701
Contract term at the moment of signing:	8 years
Start of energy service provision:	November 2019
Actual contract term	2 years and 5 months (ended in November 2022)
Fixed interest of the Customer	45%
Fixed interest of ESCO:	55%

Implementation of energy efficiency measures:

By the Customer:

- Insulation of outer walls (November 2017 - November 2018)
- Insulation of combined coating (November 2017 - November 2018)
- Replacement of glazing constructions (November 2017 - November 2018)
- Replacement of door constructions November 2018) - November 2018)

Picture 25. Before reconstruction

Picture 26. After reconstruction

By ESCO-investor: Installation of 3 modular individual heating stations (IHS) (with the system of weather-dependent regulation and online dispatching), installation of a new heat meter (October 2019)

Picture 27. Heat meter Ultraheat

Picture 28. Modular IHS Danfoss

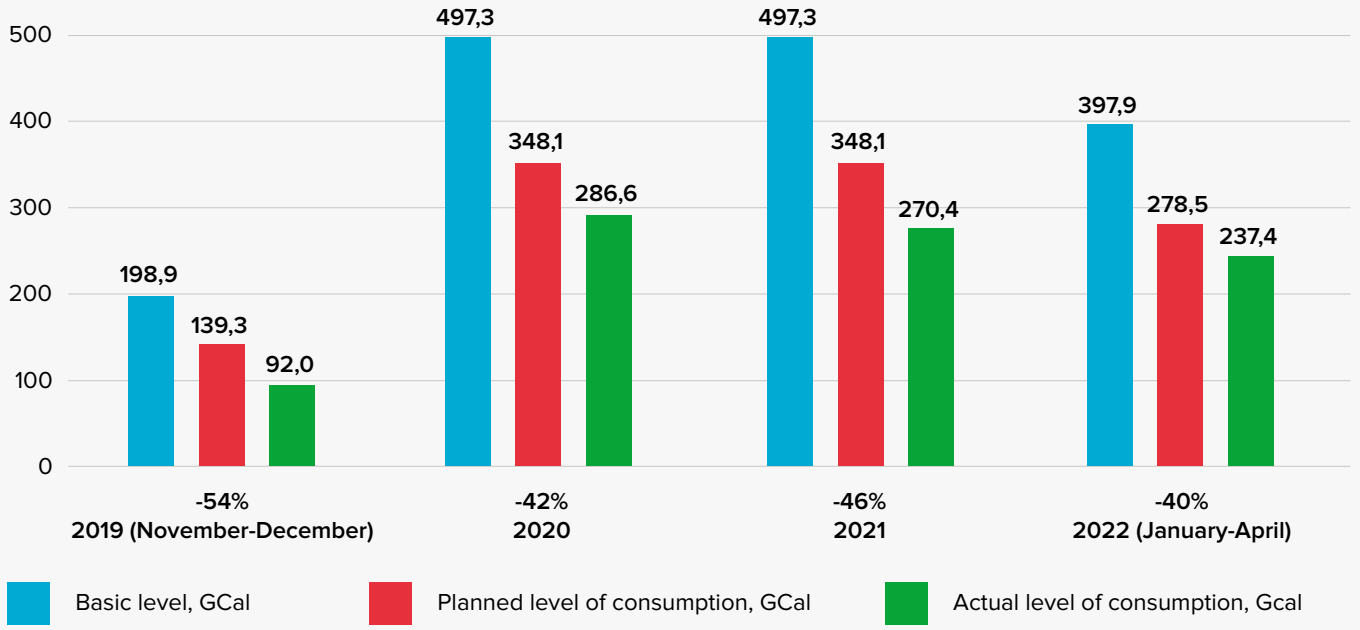
Picture 29. Control cabinet for IHS SynergyData

Support of the UNDP Project: Energy audit of the building, purchasing new heat meter (June - October 2019)

Investments	UAH	USD (exchange rate of 2019)
Investment by the Customer	12 852 381	469 065
Investment of ESCO:	336 661	12 287
Investment by UNDP:	171 119	6 245
Total Investments:	**13 360 161 UAH**	**$487 597**

The effect from the implementation of energy efficiency measures:

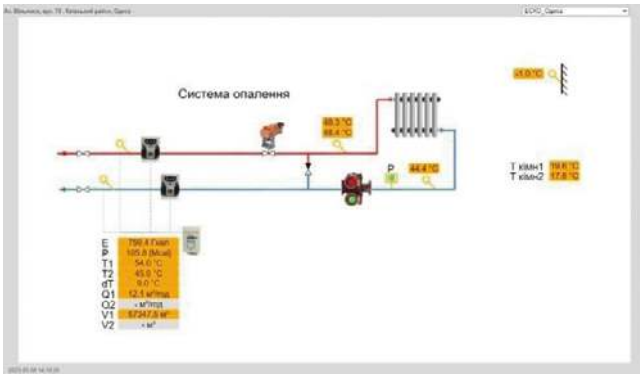
Fuel and energy resource savings	Under the energy service contract	Actual average annual savings during the contract implementation	2019 (November-December)	2020 p.	2021 p.	2022 (January-April)
Annual FER savings, %:	30%	46%	54%	42%	46%	40%
Annual FER savings, GCal:	149,2	226,9	106,9	210,7	226,9	160,4



Picture 30. Thermal energy consumption, GCal

Savings for the Customer in monetary equivalent during the energy service contract:	678,5 thousand UAH
Savings for the Customer in monetary equivalent after the energy service contract:	786,7 thousand UAH per year
Average fuel and energy resource savings for 1 year of facility operation:	226,9 GCal per year
CO_2 emission reduction for 1 year of facility operation:	68,6 t per year
Specific heat energy consumption by the facility after the implementation of energy-saving measures	0,024 GCal/m^2*year

Facility energy monitoring system:



Picture 31. Scheme of IHS (Machinery Performance Online Monitoring)

Picture 32. Weather-dependent heat carrier temperature regulation

Annex 3.5. Successful experience of the implementation of the energy service contract Child Development Centre No.18, the city of Korosten

Profile of the energy service facility:

Name:	Child Development Centre No.18
Location:	the City of Korosten, Danylo Halytskiy Str.,1
Heated Square Footage, m^2	1235
Heated space, m^3	3705
Basic level of consumption of fuel and energy resources, GCal per year:	319,6
Average recorded number of people temporarily staying at the energy service facility:	1225
Gender impact of comfortable conditions for stay resulting from ESCO projects: • men • women	 118 198
Average indoor temperature (°C):	+20

Profile of ESCO contract:

Model:	Advanced ESCO-partnership
Cost of the contract, UAH:	491 255
Contract term at the moment of signing:	7,5 years
Start of energy service provision:	November 2019
Actual contract term	3 years and 3 months (ended in February 2023)
Fixed interest of the Customer	58%
Fixed interest of ESCO:	42%

Implementation of energy efficiency measures:

By the Customer:

- Insulation of outer walls (November 2017-November 2018)
- Roof insulation (November 2017 - November 2018)
- Replacement of glazing constructions November 2018) - November 2018)
- Replacement of door constructions November 2018) - November 2018)

Picture 33. Before reconstruction

Picture 34. During reconstruction

Picture 35. After reconstruction

By ESCO-investor: Installation of the system of weather-dependent heat carrier regulation and online dispatching), installation of a new heat meter (October 2019)

Picture 36. Heat carrier regulation system and heat meter

Picture 37. Control cabinet SynergyData

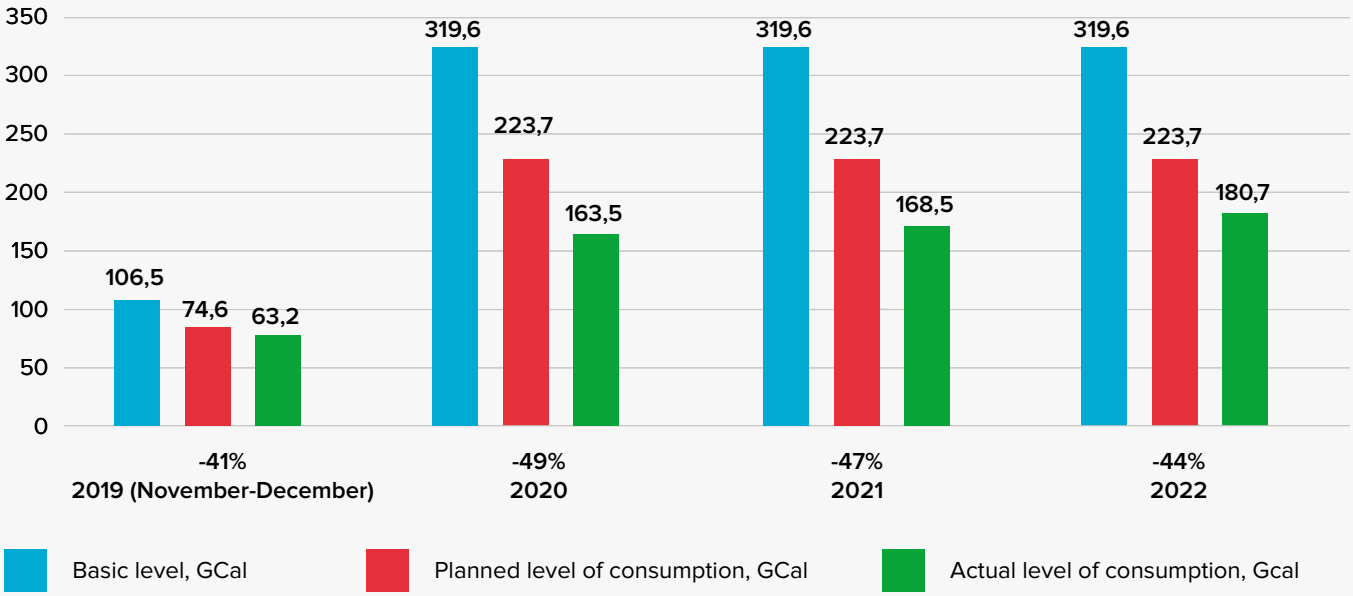
Picture 38. Temperature controller Belimo

Supporting the UNDP Project: Energy audit of the building (June- October 2019)

Investments	UAH	USD (exchange rate of 2019)
Investment by the Customer:	6 500 000	237 226
Investment by the Contractor:	197 488	7 208
Investment by UNDP:	56 538	2 063
Total Investments:	**6 754 026 UAH**	**$246 497**

The effect from the implementation of energy efficiency measures:

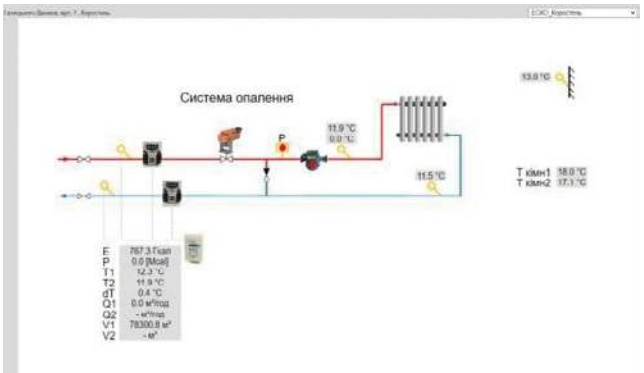
Fuel and energy resource savings	Under the energy service contract	Actual average annual savings during the contract implementation	2019 (November-December)	2020 p.	2021 p.	2022p.
Annual FER savings, %:	30%	45%	41%	49%	47%	44%
Annual FER savings, GCal:	95,9	144,0	43,3	156,0	151,0	139,3



Picture 39. Thermal energy consumption, GCal

Savings for the Customer in monetary equivalent during the energy service contract:	678,4 thousand UAH
Savings for the Customer in monetary equivalent after the energy service contract:	441,5 thousand UAH per year
Average fuel and energy resource savings for 1 year of facility operation:	144,0 GCal per year
CO_2 emission reduction for 1 year of facility operation:	43,6 t per year
Specific heat energy consumption by the facility after the implementation of energy-saving measures	0,142 GCal/m^2*year

Facility energy monitoring system:



Picture 40. Scheme of IHS (Machinery Performance Online Monitoring)

Picture 41. Weather-dependent heat carrier temperature regulation

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