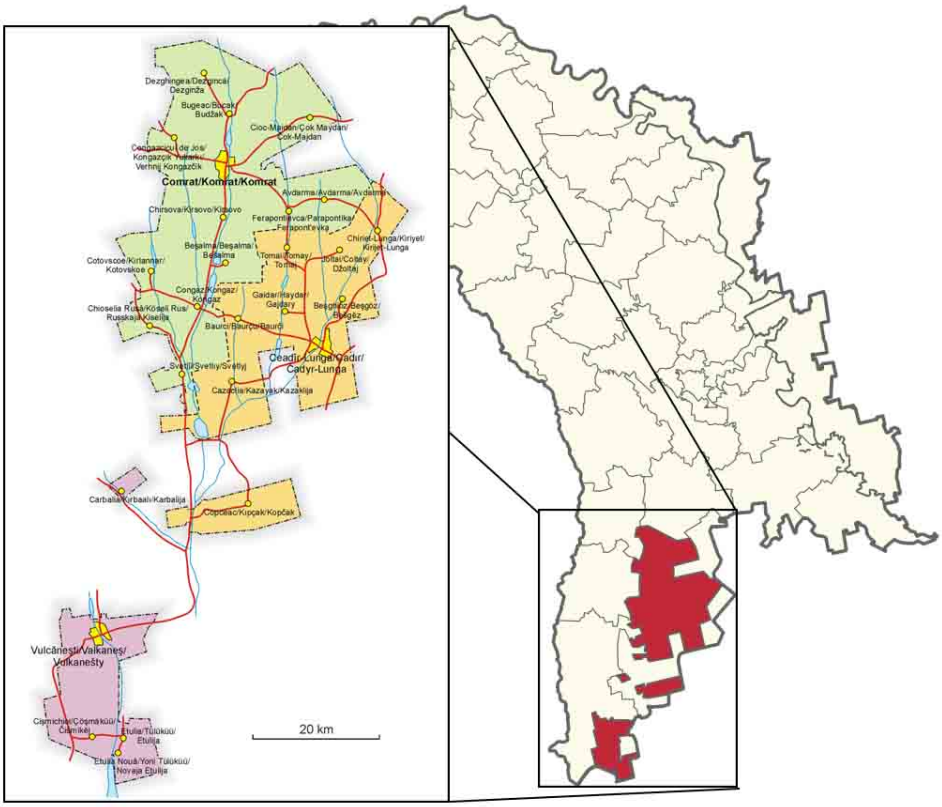
cooperare germană
DEUTSCHE ZUSAMMENARBEIT

MINISTERUL AGRICULTURII, DEZVOLTĂRII REGIONALE ŞI MEDIULUI

Sweden
Sverige

Modernization of the Local Public Services in the Republic of Moldova



Project Concept
(report on walk-through energy audit)

Public Medical Sanitary Institution (hospital), Vulcanesti

May 2018

GUVERNUL ROMÂNIEI

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC
Agenția Elvețiană pentru Dezvoltare și Cooperare

giz

Published by:

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered office:

Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 40
53113 Bonn, Germany
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-11 15

E info@giz.de
I www.giz.de

Authors:

Sergiu Robu, Kyriakos Argyroudis, Ion Melestean, Tatiana Mosent

Developed by:

Consortium **GFA – Consulting Group** – BCI Business Consulting Institute.-MM Mott Macdonald

Prepared for:

The project 'Modernization of local public services in the Republic of Moldova' (MLPS) is implemented by the German Development Cooperation through GIZ in partnership with the Ministry of Agriculture, Regional Development and Environment of the Republic of Moldova and is financially supported by the German Ministry of Economic Cooperation and Development (BMZ), the European Union, the Swedish Government, the Romanian Government, and the Swiss Agency for Development and Cooperation (SDC).

Project Partners:

Ministry of Agriculture, Regional Development and Environment of the Republic of Moldova
North, Center, South and ATU Gagauzia Regional Development Agencies

Comrat, May 2018

Project Concept (report on the walk-through energy audit)

Institution: Public Medical Sanitary Institution (hospital), Vulcanesti city

Visited on: 16.02.2018

Address: 37 Lenin street, Vulcanesti city

Contacts:
- Name, surname: Gheorghiev Mihail
- Tel: 0293 36608
- Other contact data: srvulcanesti@mednet.md

Content

List of the tables

List of the photos

Foreword

The main goal of the project concept is to increase the efficiency of the energy resources use at the regional level in ATU Gagauzia through the implementation of energy-saving measures and technologies in public buildings.

The objectives of the concept project are:

- *identification of energy saving potential for the specific institution;*
- *facilitation of the decision-making process of the responsible authorities and financial organizations when considering the possibility of investment.*

Specific objectives are:

- *Development and implementation of pilot projects for demonstration of the application of innovative energy efficiency in public buildings;*
- *Informing and training of local stakeholders on energy efficiency issues;*
- *Increase the involvement of the local public authorities and population in the initiatives related to energy efficiency sector;*
- *Developing of a monitoring and replication mechanisms to ensure the reproduction of project results in ATU Gagauzia and in entire country.*

1. Introduction

Rayon Hospital in Vulcanesti city is a Public Medical Sanitary Institution aimed at treating patients and providing specialized medical care in stationary conditions.

The capacity of the hospital is 85 beds. The hospital serves the population of the whole district. The working stuff consists of 68 employees.

The complex consists of two main blocks and several auxiliary ones. In the main 5-storey block, several departments are concentrated, with the exception of the department of infectious diseases, which occupies a separate one-level building. The main hospital block was built in 1981.

Photo 1 Main block of the hospital in Vulcanesti, east side view

Photo 2 Department of infectious diseases, south façade

Photo 3 PMSI hospital in Vulcanesti (Orto photo), Scale 1:1000 . Source – www.geoportal.md.

Parts of the hospital complex (mentioned in photo 3):
1 – main hospital block;
2 – department of the infectious diseases;
3 – hospital food service block;
4 – storage;
5 – boiler house (approximatively location).

Also, in the northern part of the territory there is a laundry, but the building is not in use, has not been repaired for a long time and is being destroyed.

2. Energy Consumption

The electricity consumption was 204 MWh in 2014 with a small increase to 214 MWh in 2016. Between 2014 and 2016, the average electricity demand was 210 MWh per year. It is observed a consumption of electricity of 48 kWh/m2, and this is average value for a hospital.
Gas consumption decreased from 84000 m3 in 2014 to 81000 m3 in 2016, or an average consumption of 82300 m3 of gas per year, or approximatively 200 kWh/m2 per year, this is average value for a hospital.

Table 1 Energy consumption

Energy	unit	consumption		
		2014	2015	2016
Electricity	kWh	204100	210800	214000
Gas	$м^3$	84000	82000	81000

3. General data on the studied building

3.1 Heating system

The building is heated by a gas boiler house, which is located in the western part of the territory - block 5. The thermal agent is going through underground insulated pipes directly into the main block.
The boiler house was built in 2011, it is equipped with 3 boilers. It is supposed that the boiler house gives out the exceeded capacity, as it was built before the major refurbishment of the first floor of the building was carried out, and also considering the current reparation works of the second floor. Internal heating networks and radiators are old type on 3rd, 4th and 5th floors in the main block and in the block 2, but on the renovated floors the heating networks and radiators have been replaced with new pipes and aluminum radiators.

3.2 Hot water supply system

Hot water is available in all departments and it is produced by electric boilers.

3.3 Fresh water supply and sanitation system

The buildings are supplied with fresh water from the urban water supply system, sewerage system is connected to urban sanitation system.

3.4 Electricity consumption system

The electricity supply is provided by the local distributor of electricity.

3.5 Natural gas supply system

The source of natural gas supply in boiler house and kitchen is city's natural gas distribution system.

3.6 Previously implemented energy efficiency projects

In 2009, the flat roof was covered with pitched roof with metal tiles coverage.

In 2011 the boiler house was built.

During 2014-2015 the first floor of the main block was completely refurbished, including installation of new windows and doors.

In 2017, the capital refurbishment of the second floor of the main block started.

3.7 Planned projects for the coming years

In the near future, the project of capital refurbishment of the second floor in the main black will be finalized.

4. Data on the proposed project

4.1 Description of the current situation

Main block of the hospital resembles the L-shape in spatial arrangement, where the basic part consist of 5 floors, basement floor, technical level and the annex is one floor. The block 3 is rectangular shaped and has no basement. The block 2 is also rectangular in shape, accommodates only a few chambers, is the earliest construction of the complex.

4.2 Building proprieties (constructive part)

The foundation of the main hospital block consists of prefabricated reinforced concrete blocks; the frame of the building is stabilized horizontally by a grid of 6 x 6 m of reinforced concrete columns. The basement walls are built up from prefabricated concrete blocks, the external walls of the floors consist of reinforced concrete prefabricated slabs (thickness 300 mm), the partitions walls are tiled from bricks or gypsum panels, each level is covered with prefabricated reinforced concrete slabs.

The block 2 is built up from small limestone blocks, the 3rd block is built up from bricks.

4.3 Windows and doors

In the main hospital block on the first two floors, all the windows and doors are replaced by PVC structures with double glazed windows (also partly at other doors). The rest of the windows are wooden with double frame and double glazing.

Table 2 Windows in the main hospital block

	Wooden constructions	PVC constructions	Total
Quantity	95 pcs.	83 pcs.	178 pcs
Surface	178 m^2	156 m^2	334 m^2

Photo 4 Windows on the west facade

4.4 Roof

The roof on the main hospital block is pitched, covered with metal tiles and insulation membranes, the wooden framework is in perfect technical conditions (according to the words of the workers). The works are high-quality done, the roof is not leaking. The rainwater collection system is provided. Similar roof is installed on the block 3. Block 2 has pitched roof, roofed with corrugated asbestos-cement sheets, technical condition – satisfactory.

Photo 5 Roof of the block 3

4.5 Heating system

The building is heated by its own gas boiler house. In the boiler house there are 3 boilers, all in working order. The boiler room was renewed in 2012, but the heat load was calculated for a larger volume, since the first and second floors of the building were refurbished only in 2016 - 2017. It is supposed that the boiler house gives out the exceeded capacity also considering the current repair of the second floor. External heating networks are going underground. Internal heating networks and radiators in the part of the building where repairs have not yet been carried out are old, on the renovated floors the heating networks and radiators have been replaced.

4.6 Ventilation system

The centralized ventilation system in the building does not work. Natural ventilation works, but some channels are blocked (estimation shows 70% of natural ventilation efficiency).

4.7 Hot water supply

For preparation of hot water, electric boilers are used. They are installed in each department, total amount: 16 pieces with a capacity of 1.5 kW and a volume of 80 liters (average). The possibility of producing and supplying hot water from the boiler house is not provided.

4.8 Lighting system

Incandescent lamps are used for lighting in not renovated part of the main block. In the refurbished part of the building, fluorescent lamps are installed.

Table 3 Characteristics of lighting devices in the main hospital block

	Quantity	Power
Incandescent lamps	1300 pcs.	100 W
Fluorescent lamps	900 pcs.	40 W

5. Project Concept

Note: the proposed measures are related only to the main hospital block (№1).

5.1 Description of the proposed energy efficiency measures

The consultants propose the following list of measures for the thermal rehabilitation of the building:

- Technical level

Experts suggest the **thermal insulation of the technical level floor**. The proposed material is XPS (10 cm thickness) and insulation membranes. After the installation, the insulation layer should be covered with a protective layer of cement screed.

Annual energy savings= **112 MWh/y**
Estimated investment = **38 777 €**

- Basement

Experts propose the thermal insulation of the basement ceiling. The proposed material is XPS (10 cm thickness). It is necessary to provide for the preliminary replacement of communications that pass under the ceiling of the basement, in order to avoid additional more difficult to repair work.

Annual energy savings = **106 MWh/y**
Estimated investment = **30 160 €**

- Hot water supply

It is recommended to provide preparation and supply of hot water: install solar panels on the roof of the building to provide shower rooms with hot water. The maximum demand for hot water in accordance with the standards per day: 85 beds x 90 liters = 7650 liters.

Annual energy savings = **61,5 MWh/y**
Estimated investment = **81 800 €**

- Lighting system

Replace the existing lighting with LED lamps. In special rooms where special lighting is necessary, provide for general lighting and local, portable. In the corridors, motion sensors for automatically turn off the lighting in the absence of moving should be installed.

Annual energy savings= **208 MWh/y**
Estimated investment = **22 880 €**

- Windows and doors

Replace obsolete windows and doors with PVC constructions with double-glazed windows, keeping the dimensions of the openings. In the northern part of the building energy-efficient glass Low-E could be installed. Ensure embedding of slopes using insulating membranes. External (tin) and internal sills (plastic) should be installed.

Annual energy savings= **21 MWh/y**

Estimated investment = **35 180 €**

- Additional measures

Boiler house and heating system

Replacement of old radiators is proposed. New radiators should be equipped with thermostatic regulators. After the implementation of the remaining energy efficiency measures, the heat load should be recalculated and the installed capacity of the boilers in the boiler house should be reconsidered.

Ventilation system

The ventilation system should ensure the optimal temperature and the flow of fresh oxygen in the departments. Since the building is a medical institution, sanitary norms suppose a specially designed centralized ventilation system. The needed equipment could be installed on the technical floor.

5.2 Preliminary assessment of energy saving potential

The calculation of the preliminary final energy consumption for heating is based on a simplified calculation methodology according to the "Energetische Bewertung von Bestandsgebäuden"; provided by the German Energy Agency. The thermal conductivity of the building elements was estimated based on Moldavian standards and norms and on Consultants experiences.

The preliminary final energy consumption for heating and the estimated saving potential were calculated based on a reference climate, a standard indoor temperature and a basic air ventilation rate.

Note: the results do not necessarily reflect the actual energy consumption of the buildings due to the current poor heating/ventilation comfort in the buildings (e.g. shortened heating period, reduced indoor temperature, poor/no ventilation, etc.).

Table 4 The proposed energy efficiency measures and their characteristics

Proposed measures	Surface, m^2	Annual energy savings, MWh/y	Annual energy savings in €	Investments, €	Reduction of emissions t/CO_2 per year	Payback period, years
Thermal insulation of the technical level floor	1090	112	4 010	38 777	22	12,4
Insulation of the basement ceiling	1090	106	3 781	30 160	21	10,2
Thermal insulation of the external walls	3024	356	12 712	358 598	71	36,1
Replacement of the windows and doors	178	21	746	35 180	4	60,4
Installation of the solar panels		61,5	8 800	81 800	13,53	11
Replacement of the lighting devices		208	8 580	22 880	45,76	1,9
Total		**864,5**	**30 629**	**567 395**	**177,29**	**27,9**

6. Financial analysis

The estimation of the required investment costs was based on the Consultant's experiences (specific investment costs per refurbished element). The Consultant did not request/receive offers from potential supplier's/construction companies. All costs incl. VAT.
The total investment costs were estimated to around **11,63 mln MDL** (**567 395 EURO**)[1].
The share of the energy relevant investments of the total investment is around 50 %.
When considering only the energy relevant investment the payback period is 27,9 years.

7. Preliminary project implementation plan

The description of the steps necessary to implement the described recommendations can be divided into 3 main stages: the development of energy audit of the building, preparation for the implementation of the project and the implementation process itself.

Each stage includes the following actions:

A. Development of energy audit of the building:

- Decision-making on financing of energy audit
- Development of the task of energy audit
- Tender & Energy Audit Contract
- Energy audit
- Designing a design task

B. Preparing for project implementation:

- Decision-making on investment
- Tender for the development of technical documentation
- Development of technical documentation, approval, tender documents
- Tender for project implementation
- Evaluation of offers, contract
- Coordination of the work plan

C. Implementation of the project:

- Preparation of the working field
- Thermal insulation of the technical level floor
- Insulation of the basement ceiling
- Thermal insulation of the external walls
- Replacement of the windows and doors
- Installation of the solar panels
- Replacement of the lighting devices
- Staff training, documentation

Upon completion of the implementation of these measures, the building can be put into operation.

The approximate timeframe for the project implementation plan is given in the annex 1.

Recommendations for bringing the building in line with sanitary standards

[1] Exchange rate: 1 EURO = 20,50 MDL (average value for 2017).

One of the main conditions for the implementation of the energy efficiency project is to bring the hospital building in line with the main provisions of Government Decision Nr.663 of 23.07.2010. This normative act approved the Sanitary Regulations on Hygienic Rules for Public Health Institutions, which establishes requirements for the placement, arrangement, equipment and maintenance of health facilities. In particular, the regulations establish a number of requirements that directly affect the energy efficiency of buildings. These requirements are related to the water supply and sewerage system, the heating and ventilation system, and the building lighting system.

Following requirements (as minim) must be respected by hospital, and should be included in the task for energy audit and task for design.

Hot water demand

- The newly-built, rebuilt and functioning ones must be provided with aqueduct, sewerage and centralized hot water.
- For newly built or rebuilt facilities, a backup system for hot water supply will be provided in the event of damage or performing the current system repair.
- A sanitary block will be provided for one, maximum two salons of the medical sections in the newly built or reconstructed institutions.
- Each surgery section of hospital must be equipped with a shower for the staff/doctors, one shower cabin for 4 surgery rooms.
- In patient section, obstetric and pediatric wards have to be fitted with sanitary filters for staff, with changing rooms and a shower (not less than a cabin for 5 people).
- Shower cabins for staff are based on the calculation: at least one cabin to 10 people in the infectious diseases and tuberculosis departments, and in the other sections - at least one cabin to 15 persons, operating during the maximum number of nurses.

Ventilation system

- The premises of the institutions, except for the operating rooms, besides the mechanical ventilation system (+filters) will also have natural ventilation.
- The relative humidity of the air shall not exceed 60%, the velocity of air movement - 0,15 m / sec.
- The volume of air exfoliated in the salon for a patient will be at least 80 m3 / h.

Electricity demand for lighting

- For illumination of salons (except for children's and psychiatric wards), combined wall lamps (general and local lighting) installed next to each bed.
- In every section of the medical institutions must be a reserve system of artificial illumination, in case of emergency disconnection.
- In order to disinfect air and surfaces in institutions, ultraviolet lamps must be installed.

Area per bed

The regulations establishes as well the standard of area per bed: The area of a box for one bed should have no less than 22 m2.

Calculation of area of the stationary room with 2 or more beds

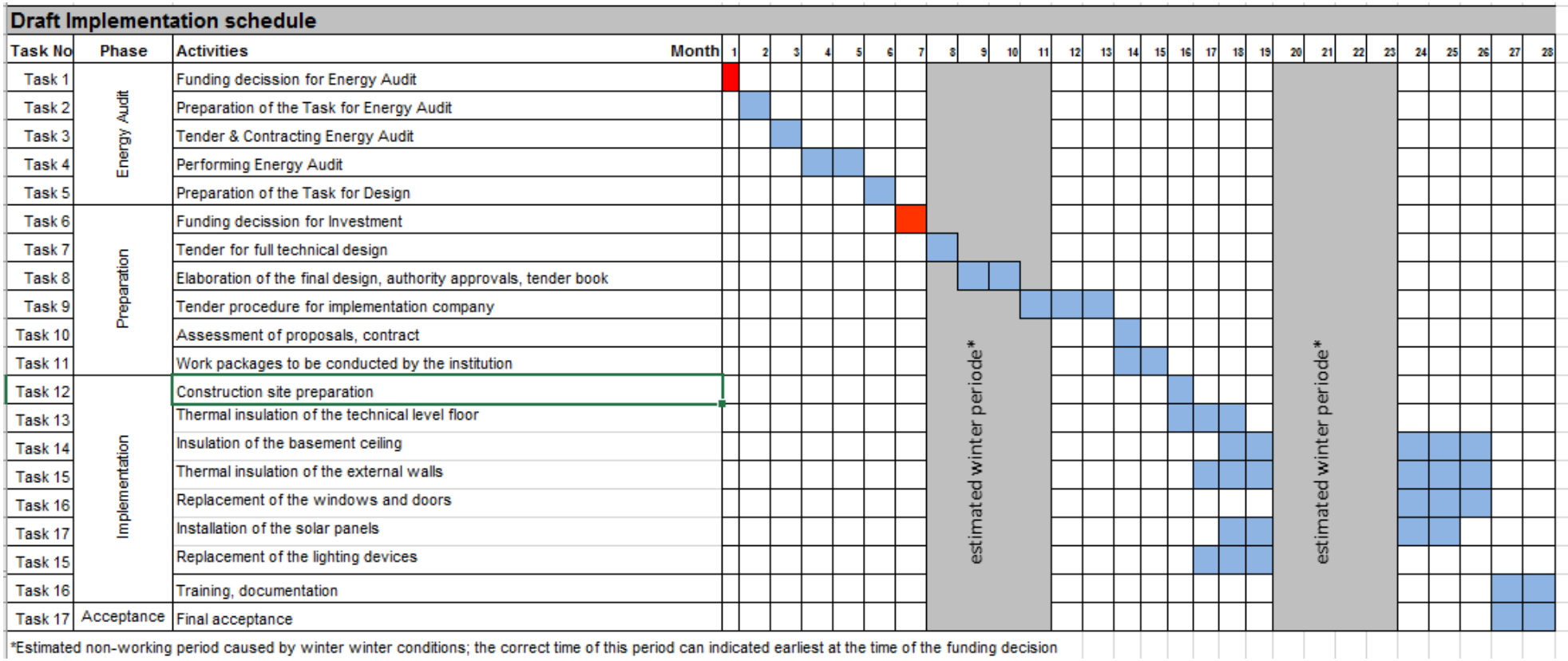
Section of	Area (minim), m² per bed
Infectious and tuberculosis for adults	8,0
Tuberculosis MDR / XDR	13,0
Infectious and tuberculosis for children: - Without places for mothers - with the presence of mothers during the day - with the permanent presence of mothers	 7,0 8,0 10,0
Traumatology - Orthopedics (including rehabilitation treatment), combustion, radiological: - for adults and children's lounges with day-to-day attendance of mothers - for children with the permanent presence of mothers	 10,0 13,0
Intensive and postoperative therapy	13,0
Somate for children: - Without places for mothers - with the presence of mothers during the day - with the permanent presence of mothers	 6,0 7,5 9,5
Psycho-neurological and narcological: - of general type - of insulin and narcotics	 6,0 7,0
Psychiatry for children: - of general type - of supervision	 5,0 6,0
For newborns	3,0
Other in salons with 2 or more beds	7,0
Other in salons with one bed	9,0

It is important to underline that all possible inconsistencies, according to Resolution Nr. 663 of 23.07.2010 on the approval of the Sanitary Regulations on Hygienic Rules for Public Health Institutions (Published on 07/30/2010 in Official Monitor No. 131-134 Article No: 746) and other normative documents should be taken into account at a later stage of development of the task on energy audit and project design task. Before the implementation of the proposed energy efficiency measures, the building should be brought into the line with the Sanitary Regulations on Hygienic Rules for Public Health Institutions.

8. Conclusion

As a result of the proposed measures, the expected **energy savings will be 864,5 MWh/y**. Due to this saving, it is estimated that **emissions will decrease** by **177,29 t/CO_2 per year**.

Annex 1


Draft Implementation schedule
Task No
Phase
Activities
Month
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Task 1 Energy Audit Funding decission for Energy Audit
Task 2 Preparation of the Task for Energy Audit
Task 3 Tender & Contracting Energy Audit
Task 4 Performing Energy Audit
Task 5 Preparation of the Task for Design
Task 6 Preparation Funding decission for Investment
Task 7 Tender for full technical design
Task 8 Elaboration of the final design, authority approvals, tender book
Task 9 Tender procedure for implementation company
Task 10 Assessment of proposals, contract
Task 11 Work packages to be conducted by the institution
Task 12 Implementation Construction site preparation
Task 13 Thermal insulation of the technical level floor
Task 14 Insulation of the basement ceiling
Task 15 Thermal insulation of the external walls
Task 16 Replacement of the windows and doors
Task 17 Installation of the solar panels
Task 15 Replacement of the lighting devices
Task 16 Training, documentation
Task 17 Acceptance Final acceptance
estimated winter periode*
estimated winter periode*
*Estimated non-working period caused by winter winter conditions; the correct time of this period can indicated earliest at the time of the funding decision

Annex 2

Анкета

по сбору данныхдля диагностического анализа сектора энергоэффективности в регионе АТО Гагаузии

01-13/67 от 30.10.17г

I. Общиеданные:

Названиенаселённогопункта / района: **Вулканешты**

Название публичного учреждения: **ПМСУ Вулканештская районная больница**

Собственности (АТЕ 1-го / 2-го уровня) -**2-го уровня**

Год строительства здания публичного учреждения: - **1981 года**

Тип строительного материала общественного здания: - Главный лечебный корпус

- □ Бетонные панели - **ДА**
- □ Котелец
- □ Кирпич
- □ Другой (укажите)

II. Энергетическая ситуация в общественных зданиях

Part A. Общие данные об здании:

Укажите пожалуйста значение для следующих показателей:

	Показатели	Единица измерения	Значение
1.	Количество административного персонала:	человек	28
2.	Количество рабочего персонала:	человек	40
3.	Количество пользователей / бенефициаров (дети / студенты / пациенты / клиенты)	человек	
4.	Общая площадь здания	$м^2$	5940
5.	Количество этажей здания	единицы	5 эт.(тех.этаж,подвал)
6.	Средняя высота каждого этажа	м	3м
7.	Общая площадь внешних стен здания	$м^2$	3024
8.	Количество окон	единицы	178
9.	Общая площадь окон	$м^2$	334
10.	Общая площадь крыши	$м^2$	1425
11.	Тип крыши:	плоская крыша или скатная крыша	Скатная

Part B. Потреблениеэнергиизапоследние 2 года (по источнику):

Тип источника энергии	Ед. изм.	Потребление		
		2014	2015	2016
Электричество	кВтч	204,1	210,8	214,0
Дизель (исключить транспортные средства)	Литры	100	110	100

Натуральный газ	$м^3$	84	82	81
Уголь	тонны			
Биомасса (древесная щепа, гранулы и т. д.)	$м^3$	-		
Централизованное отопления	Гкал	-		
Другой (укажите) _____		-		

Part C. Энергетические системы

C.1. Тип отопления в здании центральное отопление?

a. Центральное отопление - **есть**

b. Электрические индивидуальные обогреватели для каждой комнаты

(Если «a» укажите ответы на вопросы 1.1, 1.2, 1.3, если «b» перейдите к вопросу № 2.

***1.1. Если есть, укажите тип** системы отопления:*

□ однотрубная система - **да**

□ двухтрубная система - **да**

1.2. Укажите тип используемого топлива:

□ Электричество

□ Натуральный газ - **да**

□ Уголь

□ Биомасса (древесная щепа, гранулы и т. д.)

1.3. Укажите мощность(Гкал) _____

C.2. Если используются отдельные обогреватели, какого типа они?

□ Электрические индивидуальные обогреватели - **да**

□ Электрические радиаторы

□ Кондиционер

□ Другие (укажите)_____

C.3. Существует ли в здании центральная система горячего водоснабжения или используется ли отдельныебойлера?

□ Центральная система горячего водоснабжения

□ Электрический бойлер - **да**

□ Нет горячей воды

□ Другой (укажите)_____

С.4. ***Есть ли в здании центральная система кондиционирования воздуха или используется отдельная система для каждогопомещения?***

- □ Центральная система кондиционирования (рабочая) **- R- рентгенкабинет**
- □ Центральная система кондиционирования (нерабочая)
- □ Индивидуальная система в каждомпомещении (рабочая) - **естественная**
- □ Индивидуальная система в каждомпомещении (нерабочая)
- □ Отсутствует вообще

С.5. Есть ли центральная система вентиляции:□ Да; или □ Нет.

Каковаона?

- □ Принудительный **- не работает**
- □ естественный поток **- работает на 70%**

С.6. Система внутреннего освещения:

Показатели	Ед. изм.	Значение
Количество ламп	единицы	2200
Тип ламп(светодиодные-LED, люминесцентные лампы, лампы накаливания)	тип	Лампы накаливан
Средняя мощностьламп	W	100
система автоматизации освещения	Да / нет	Нет

Part D. Описаниебойлеров

Количество бойлеров: - 16

Тип топлива, используемого для бойлеров: - электрические 1 бойлер – 1,5 кВт

- □ Электричество, Установленная мощность (кВтч): **- 24** эффективность **(%) - 70**
- □ Уголь, Установленная мощность (кВтч): _____ эффективность (%)____
- □ Газ, Установленная мощность (кВтч): _____ эффективность (%)____
- □ Мазут, Установленная мощность (кВтч): _____ эффективность (%)____
- □ Дизель, Установленная мощность (кВтч): _____ эффективность (%)____
- □ Биомасса, Установленная мощность (кВтч): _____ эффективность (%)____

Part E. Другие единицы потребления энергии

E.1. Духовки (кухни)

Количество духовок, используемых в здании - **1 единиц**

Тип потребляемой энергии:

□ Электричество - **да**

□ Газ

□ Другое (просьба указать)

E.2. Существует ли стационарные группы двигателей внутреннего сгорания, электрогенераторы?

Количество электрогенераторов: **- 1**

Установленная мощность электрогенераторов (кВт): **- 250**

Средние рабочие дни для электрогенератора в год: **- 12**

III. Просьба указать, есть ли проекты энергоэффективности, внедренные в течение последних 5 лет?(если таковые имеются)

Проект	Год внедрения	Донор	Стоимость, тыс. лей
-	-	-	-

Директор ПМСУ Вулканештской РБ А.Брынза