Feasibility Study

Public-private Partnership establishment for the development of biomass-based heat supply service to LEOVA district public buildings

Chisinau 2013

THE TITLE OF THE INVESTMENT:

" Public-private Partnership establishment for the development of biomass-based heat supply service to LEOVA district public buildings"

BENEFICIARY:

Leova District Council

Implementator:

I.M. AVENSA Consulting S.R.L.

www.avensa.ro

angela.cascaval@avensa.ro

Experts team:

manager, business development expert, PPP **– Cascaval Angela**

design engineer in heating, ventilation, conditioning, audit in energetics **- Bajura Larisa**

design engineer **- Carabinovici Olesea**

finance expert, cost-benefit analysis expert **- Basceaus Oana**

business development finance consultant **- Golban Ana**

lawyer **– Iordanca- Rodica Iordanov**

C O N T E N T

ABBREVIATIONS

MEBP – Moldova Energy and Biomass Project

FS – Feasibility Study

SR – South Region

PPP – Public-Private Partership

DC **–** District Council

EE **–** Economic Entity

EO – Economic operators

PI – Public institutions

PA – Public acquisitions

TS – Boiler plant

TA – Thermal Agent

NG – Natural gas

Gcal – gigacalories

N O T I O N S

Feasibility Study (FS)-the analysis of the viability of public-private partnership project containing main characteristics of the public-private partnership objective basing on the technical, economic and financial analysis of the planned investment;

Boiler plant –an installation or a group of installations for producing thermal energy;

Biomasa – biodegradable fraction of products, waste or residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and food waste. (*the defenition is insluded in European Directive 2003/30/E*);

Public-Private Partnership (PPP)-a long-term contact concluded between public and private sector to carry out public-related activities, founded on the capacities of each partner in sharing accordingly resources, risks and benifits;

Public-private partnership project dossier- a set of documents related to public-private partnership project starting from the initiation phase and within the project implementation phase;

Public partner-a public legal person or an association of legal persons who establishes public-private partnership relation;

Private partner-a private legal person or a natural person and/or an association of such persons, who become, under legal terms, a partner within public-private partnership;

Public-private partnership project-a group of activities implemented wholly or partially with own or donor financial resources, based on the public-private partnership and resulting in public property or services of national or local interest.

Public-private partnership subject-state-run property or the property belonging to administrative-territorial unit, including the property of autonomous territorial unit of Gagauzia, public works and services of local and national interest for public-private partnership;

Press release-an offical document published by the public partner in terms of initiation of implementation of public-private partnership project in conformity with provisions of *„Regulations on standard procedures and general conditions for selecting a private partner")* approved by Government Decree nr.476 of July 04, 2012)

I General data:

1) Goal and objectives of the Feasibility Study (FS)

The Feasibility Study aims to idetify and analyse the investment opportunities **in the establishment of public-private partnership to provide the thermal energy to the public institutions from Leova district with biomass-based Boiler plants including biomass pelleting.**

The Feasibility Study analyses all available information to see if „component parts" can function in such a way as to yeild a viable concept from both technical and economic point of view.

The Feasibility Study objectives are as follows:

- substantiation the need for insvestment;
- identification of possible forms of partnership creation;
- identification of possible legal forms of the project implementation;
- demonstration of the project financial durability;
- presenting of main investment technical characteristics;
- presenting the main investment economic characteristics which provide rational and efficient use of the capital and the material expenses in a mode that meets the economic and social requirements;
- estimating the investment project implementation costs via Indicative Estimate ????/

2) Public partner-related data

Public Partner is represented by the Local Public Administration of Leova district –Leova District Council situated in the South Region of the Republic of Moldova.

South Region

General description-embraces 8 districts- Basarabeasca, Cahul, Cantemir, Causeni, Cimislia, Leova, Stefan-Voda, Taraclia, occupying 24% from the territory of the Republic of Moldova,
As compared to other regions of the country, the South Region has the lowest industrialisation grade. The earth is one of the main natural resources, the farmland constitues 74% from all total areas. The Region annually provides within 40-50% from the national production of grapes, circa 30.3 % of cereal production, 15-20% of sunflower production.

Proportion of the population constitues 15% from the total population of the Republic of Moldova. The natural increase in the Region shows moderate level of decline being the lowest compared to other regions of the country. The density of the population is on average 75 persons/ $km^{2,}$ the lowest density compated to other regions.

Fig. 1 The map of the Republic of Moldova delimitating the South Region

Development of infrastructure

The South Region has a developed network and extended and divercified range of roads and access roads of intra and interregional type. The total length of public roads in South Region is 22.3 % from the total length of the country. There are roads in the Region linking all urban centres.

Share of public utility infrastructure in the South Region is below the national average. In general, cities have greater extent of public utility infrastructure compared to the rural localities. The differences are explained at the level of water supply, sewerage, roads, natural gas, etc.

Gas supply network in the region is expanding every year, but compared to the national rate, the regional indices are low. In 2005 the share of gasified residential houses was 34.22%. The highest level was recorded in Taraclia (84.2%), and **the lowest level was recorded in Leova district (2.8%)**

Leova district is situated in the South-West of the Republic of Moldova, at a distance of 100 km from the capital city of the country, Chisinau city. It is neighbouting with: Hincesti district in the North, Cimislia district and administrative-territorial unit Gagauzia in the East, Cantemir district in the South, Romania (Vaslui county) in the West.

Fig. 2 map of Leova district

Total Area of the district is 76.5 thousand ha, including:

- Arable farmland - 37,1 thousand ha;
- Forests - 10,1 thousand ha;
- Pastures - 13,6 thousand ha;
- Area under water - 1,6 thousand ha.

Agricultural sector has a significanr proportion in the

district economy. Thus, the following companies activate: 7 agricultural production cooperatives, 25 companies with limited liabilities, 4 joint-stock companies, 5 joint-ventues, over 1000 **agricultural farms.**

There are 39 localities in the district including 2 towns: Leova and Iargara, 23 communes and 14 villages. [1]

District population within the last three years is presented in the table below: [2]

Table 2.1. Stable population of Leova district, *thousands of inhabitants*:

	Year		
	2011	2012	2013
Leova district	53,8	53,6	53,3
Urban area	*15,7*	*15,6*	*15,5*
Rural area	*38,1*	*38,0*	*37,8*

Thus, according to the aforestated table out of the total population of Leova district in 2013 the urban population is 29,08 %, rural population -70,92%. This suggests that the district population is mostly rural.

Also, the table shows the trend of depopulation of the country, a phenomenon that involves many adverse consequences.

Infrastruture development

In Leova district the towns have public utilities infrastructure- *water supply, sewerage, roads, natural gas, etc* –a higher degree compared to the rural localities.

The situation in the region in *„providing heat from renewable resources*"has improved in recent years. Thus, due to the financial support of the Project EU-UNDP „Moldova Biomasss and Energy Project "currently in Moldova 5 biomass-based Boiler plants (straw, briquettes, pellets) were installed in the public institutions from the following localities: *Tomaiul Nou, Seliste, Cazangic, Sarata Noua*.

Tomaiul Nou village s a locality situated at the latitude 46.6227m, longitude 28.5527m and altitude 120 m over the sea level. This locality is administrated by Leova town. According to 2004 census the population is 419 inhabitants. Direct distance from Chisinau city is 51 km.

Seliste village is situated at the latitude 46.5263m, the longitude 28.4313m and altitude 44m over the sea level. This locality is administrated by Cazangic village. According to 2004 census the population is 298 inhabitants. Direct distance from Leova town is 20 km. Direct ditance from Chisinau city is 67 km.

[1] sursa: http://www.primaria.md/p/125
[2] sursa: http://www.statistica.md

Cazangic village is situated at the latitude 46.5094, longitude 28.4366 and altitude 51 m over the sea level. This locality is administrated by Leova town. According to 2004 census the population is 961 inhabitants. Direct distance from Leova town os 20 km. Direct distance from Chisinau city is 68 km.

Sarata Noua village is situated at the latitude 46.4908, longitude 28.3899 and 49 m over the sea level. The locality is administrated by Leova town. According to 2004 census the population is 1 476 inhabitants. Direct distance from Leova town is 15 km. Direct distance from Chisinau city is 73 km.

In conclusion:

Leova district is characterised by:

- **the lowest ratio of localities connected to natural gas network from the South Region**
- **over 60% of district total area is occupied by farmland (48%) and forests (13%) what confirms the opportunity of biomass utilisation.**

3) Legal person-related data who elaborates the Feasibility Study

The present Feasibility Study is developed with the financial support of **UNDP via the Moldova Energy and Biomass Project**

The Designer of the Feasibility Study is:

AVENSA

Joint venture AVENSA CONSULTING CLL

26, Barbu Lautaru street, Ungheni town, MD 3600, Ungheni district.

Joint Venture AVENSA CONSULTING CLL.,

72/3, Columna steet, Chisinau city

tel/fax: 00373 23623742 and 00373 23620176, tel-fax: 00373 22 545711,

fiscal code 1006609001454

www.avensa.ro

Experts team:

Cascaval Angela- manager, business development expert, Public-Private Partnership.

Bajura Larisa- design engineer of heating, ventilation, conditioning systems, an audit in energetics.

Carabinovici Olesea- design engineer

Basceaus Oana- finance expert, cost-benefit analysis expert.

Golban Ana- financial consultant, business development.

Iordanca- Rodica Iordanov - a lawyer

II Description of general framework of Public-Private Partnership Project implementation :

1) Title of the Public-Private Partnership (PPP) Project

The theme of the Public-Private Partnership Project:

Public-private Partnership establishment for the development of biomass-based heat supply service to LEOVA district public buildings

2) Brief presentation on the existing state with elucidation of major defficiencies of current situation resulting in need for the investment including when required the tables, graphical maps, charts, drawings, pictures, etc, explaining the current state and need for the investment.

National level

Assuming that Republic of Moldova has no its own energy resources-import covers 98%[3] of the required energy, as well as the Republic of Moldova is a largely an agrarian country, we can conclude that it can provide a part of the energy resources from its own sources using agricultural waste and biomass available.

As a result, the development of the alternative energy resources (AER) continues to be a very burning issue. This problem solution firstly neccesitates large volumes of biomass- industrial-scale renewable energy, processing of which permits obtaining required quantities of biofuel.

Therefore, development of safe alternative energy sources creation (AES) was and remains very actual, and problem solution requires, first of all, search for the volumes of biomass –renewable energy on industrial scale processing of which permits to obtain the required quantity of biofuel.

A significant contribution to the development of the above sector is done by the UNDP Moldova Energy and Biomass Project, launched in 2011, which „aims help in creating secure, competetive and durable energy production system from renewable sources, in particular, from agricultural waste-based biomass". Also, it assumes the role „to increase the energy consumption from renewable sources mainly in public institutions and households from rural communities".

As main outcomes to be achieved , the **Moldova Energy and Biomass Project** aims:

- Installation of 130 biomass-based heating systems in the public institutions of the rural communitites;

[3] Source: "**ENERGY STRATEGYof the Republic of Moldova up to 2030"**

- Active involvement of local agrarian entrepreneurs in the production, store and delivery to beneficiary of biomass-based fuel.

Up to date very good indicators for the abovementioned outcome had been achieved. Thus, about 120 fuel-burning Boiler plants [4] from renewable resources were installed in the pre-school and secondary institutions in all regions of the Republic of Moldova **with the financial support of the Moldova Energy and Biomass Project ”-***the number of the Boiler plants (TS) with regional breakdown is given in the figure stated below.* The above indicator represents the ratio of 92% of the total proposed as the outcome of the project.

Fig. 2.1. The number of the Boiler plants installed in the Republic of Moldova by regions [6(2)]

According to the technical parameters of the Boiler plants (TS), the requirements are stipulated as far as the fuel quality used is concerned. But up to present the beneficiaries of the biomass-based Boiler plants encounter many difficulties in their operation:

Among the main bottleneck issues provided by the biomass-based Boiler plants beneficiaries (including those from Leova district) are as follows:

- ☐ *lack of reliable information in terms of biofuel quality acquired*-it is due to the fact that the quality standards were recently approved for the pellet production sector which is on the incipient phase. Also, the reliable information can not be obtained because of lack of the **laboratory for performing analysis required for fuel quality confirmation**.
- ☐ *poor knowledge and competences of the staff* in proper management of the thermal systems resulting in trouble operation of the Boiler plants.
- ☐ *bottleneck issues in the storage of fuel (security, record keeping)* -needs increased staff
- ☐ *problems with providing sufficient quantities required throughout the total heating period of the year*-even if the annual purchase contracts are signed. There will be the risk for the economic entity not to have the contracted quantity for the delivery schedule, and the beneficiaries have no large storage facilities rooms to meet the storage conditions requirements.

Biomass-based existing Boiler plants are provided with required fuel purchased from the local producers.

The pellets production domain is in the sporadic development process. The branch is characterised by the lack of homogeneity as far as the producers’ technologies, geographical breakdown and biomass used in the production process are concerned. Also, there is no clear and reliable information regarding the final product quality-pellets/briquettes. It is due to the fact that in the Republic of Moldova the legislative and normative acts of biomass-based fuel production are on the

[4] source: http://www.biomasa.aee.md/img/docs/mebp_proiecte-de-incalzire_10-06-13_ro.pdf

development stage, and therefore it is difficult to assess the final product quality. Moreover, if the producers choose to sell their product within the country, they are not obliged to demonstrate the product quality and the type of raw material (biomass used). The survey conducted shows that majority of the producers are aware of the importance of the product quality and create the improvised laboratories to test the products. Also, the local producers provide the samples for the international clients who require quality confirmation and express their opinion on them[5].

The production of biofuel (pellets/briquettes) in the Republic Moldova according to Moldova Energy and Biomass Project data is performed by approximately 77 producers as shows the table below.

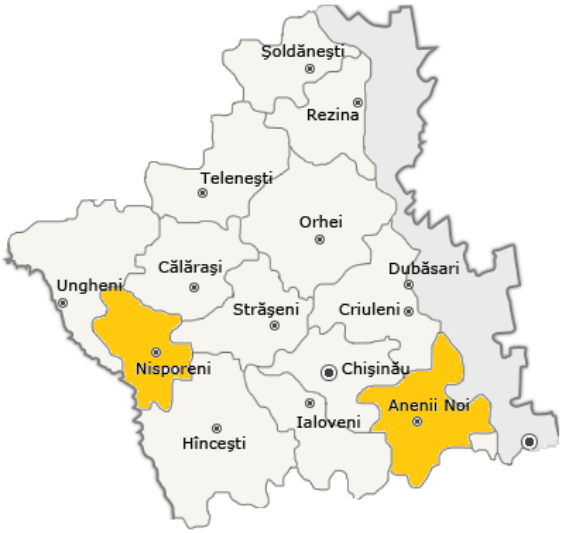
Table 2.1. List of producers by regions [6]

Localitaty	Number of producers	Type of fuel		Raw material	A map of the region
		Briquette t/year	pellet t/year		
North					
Sîngerei	3	2000 (x2); 250-300 kg/h	n/a	straw	
Falesti	1	4500	n/a	straw, shell of sunflower	
Otaci	1	n/a	2000	energy crops	
Glodeni	1	2000	n/a	straw	
Drochia	3	2000 – 4500	500	straw; sunflower;	
Floresti	2	4500	n/a	straw	
Rîscani	3	100 kg/h-4t/24h	n/a	wood waste straw	
Balti	4	24 kg/h - 1,5 t/h	40 t/day 1500	shell of sunflower; straw; wood waste	
Edinet	1	n/a	800 kg/h	straw	
Donduseni	1				
Soroca	2	120	8 t/h	straw, wood waste	
Briceni	1	2000	n/a	wood waste	
Ocnita	2	5000	11000	different	
Center					
Chisinau	11	10-20 t/day 120 - 5000	500 kg/h – 1000 t/year	different	

[5] Sursa: Studiu de piață privind soluțiile accesibile de încălzire pe bază de biomasă a gospodăriilor din mediul rural"

[6] Sursa : 1 - "Studiu de piață privind soluțiile accesibile de încălzire pe bază de biomasă a gospodăriilor", Chișinău 2012
2 - http://biomasa.aee.md/map-map-2/

Dubasari	2	250 kg/h - 1800	n/a	straw, shell of sunflower, wood waste
Straseni	3	1200	1250 500 kg/h	straw, shell of sunflower, wood waste
Orhei	2	600 kg/h - 4000	n/a	Field (wild) crops, wood waste
Hancesti	4	1000 (x2)	500 kg/h-	Wood, agro-waste
Telenesti	2	500kg/h	400-500kg /h	straw, agro-waste
Calarasi	2	150 kg/h 1000	n/a	wood
Criuleni	2	n/a	4500 300 kg/h	Wood waste, shell of sunflower, straw
Soldanesti	2	200 kg/h - 1500	3000	Wood waste, straw, others
Causeni	1	500	n/a	straw , agro-waste
Rezina	3	200-300 kg/h - 600	300 kg/h-1200	Wood waste, straw
Ialoveni	2	-	2,5 t/day 1000 1500	Wood waste
Ungheni	1	500, 300kg/h	-	straw
Bender	1	750-800 kg/h	1000 kg/h	Wood waste



South

Leova	2	500 kg/h	n/a	straw, agro-waste
Stefan Voda	2	4500 (x2)	n/a	straw
Cahul	4	1000 (x2) - 5000 – 6400 (18t/day)	1000	straw, vine and wood waste
Cimislia	2	1000 (x2)	1000	Field(wild) crops, wood,
Comrat	3	160 -300 (x2) kg/h	n/a	Shell of sunflower, wood waste
Taraclia	1	300	-	straw
Ceadar	1		2000	Shell of

Lunga	sunflower

The table shows that:

- *in the South Region* of the country only 2 producers of pellets of small capacities operate, 1000 t/year, they are located in Cahul and Cimislia districts. 12 producers make briquettes with annual capacity of 28 000 t/year.
- *in the Center Region* 16 producers of pellets out of 37 producers produce 15 000 t/year of pellets, and 22 economic entities produce circa 25 000 t/year of briquettes.
- *in the North region* of the country 22 producers of biofuel produce circa 32 000 t of briquettes and 17 000 t of pellets annually.

Therefore, the conclusions based on the table 2.1 show that the South Region of the Republic of Moldova is the most vulnerable in terms of biomass-based fuel production capacity and it requires more attention than other regions.

Running the profitable business in biofuel production field is possible (based on the local producers experience) when a company owns raw material and the investments in the technological equipment are minimal. Concurrently, it is impossible to hold the technological process of the pellets in strict correspondence with the rules of the environment protection and the final product quality requirements. Thus, the investments grow by circa 50% (as compared with the minimum investments the recovery of which require higher production volumes) for state-of-the-art technologies and modern equipment at both production stage and preparation of biomass-based raw material. For this reason, the development of the profitable business based on the procurement of raw material and in compliance with the final product quality requirements is only possible at an average investment /production capacities.

For this reason, at the market of the pellets of the Republic of Moldova which is at the initial stage, mostly agricultural producers with own bimomass activate, but not based on their purchase. Their involvement in the development of appropriate field will lead to secure access to quality biomass-based fuel (briquettes, pellets, packs).

Regional level

The situation of the production of the pellets/briquettes –based fuel in the South Region of the Republic of Moldova according to the information provided above is the most unfavourable compared to other regions of the country.Thus, out of all producers of briquettes and pellets from the Republic of Moldova, only 17% activate in the South. The list of producers for the region is given in the table 2.2. and it was the basis of the information submitted by Moldova Energy and Biomass Project.

Therefore, the investments in the production of biofuel will contribute to secure of fuel supply depending on demand and to the improvement in pellets/briquettes quality production by creating the market competitiveness.

Table 2.2. List of producers of briquettes and pellets in the South Region of the Republic of Moldova [1]

Nr.	Name of a company	Locality	Type of fuel produced		Raw material used	Country of origin of equipment	Average prices of fuel, MDL/ton
			Briquettes, t/year	Pellets, t/year			
1.	"AgroBioBrichet" LLC	Festelita, Stefan Voda	4500	n/a	straw	CIS	1200
2.	„Fratii Chirica" LLC	Leova	500 kg/h	n/a	straw, agri-waste	-	-
3.	„Promo Concept" LLC	Antonesti, Stefan Voda	4500	n/a	Field (wild) cultures	CIS	1200
4.	Agrosud-service LLC	v. Bucuria, Cahul	5000	n/a	straw	Czech Republic	TBD
5.	AgroAndor LLC	Cimislia	1000	1000	Straw cultures	Poland	1200/1500
6.	TransOil Refinery	Ceadîr Lunga	-	2000	Shell of sunflower	TBD	TBD
7.	Grupo Boieru	Burlaceni, Cahul	1000	1000	Straw, wood	TBD	TBD
8.	Egrejius	Leova	TBD	TBD	Straw, agri-waste	Ukraine	1800
9.	Individual*	Comrat	160 kg/h	n/a	Shell of sunflower, wood-waste	Moldova (Balti)	1600
10.	„Master Elit"	Cucoara, Cahul	1000	n/a	straw	Ukraine	TBD
11.	"Azur-Com" LLC	Taraclia	300	-	Straw	Germany	1500
12.	"ROLVIO-GRUP"	V.Cazangicul de Sus, district Comrat, UTAG	300kg/h	-	straw	Ukraine	2100-2200
13.	"Olmar Cost Company" LLC (Moldo-Italian)	v. Ctslita-Prut, distr. Cahul, extravilan (production factory)	6400, 18t/day	-	Straw, vine and wood waste	Italy	*

14.	”Tehnomontaj ” LLC	v. Gradiste, distr. Cimislia	1000	-	different	Ukraine	*
	Total fuel, t/year		**28290**	**4000**			

This table presents totally circa 28 000 t/year of briquettes produced by 13 producers, about 3000 t/year of the pellet production by 2 economic entities operational in the districts of Cimislia and Cahul.

The quantity of the fuel obtained by the economic entities of the region is able to cover the required fuel for current Boiler plants (TS) from the South Region. Meanwhile, increasing the number of Boiler plants will give the opportunity to heat the apartment buildings which are not connected to the local heat supply network

Based on statistics data provided by the Leova District Council, currently a large number of households, schools, public institutions, kindergartens, etc. are not connected to the district heating system and needs to be heated from the autonomous thermal energy sources during cold period of the year. Thus, there is need for the given investment project implementation at the premise of regional **sustainable development.**

Total number of households registered by 2004 census was about 17 543. Over 70% of these are located in the rural area that would form an estimated 12 932 of rural households. Calculations show that potential users of biomass-based fuel in the form of briquettes and pellets would be the same 17543 households who obtain the thermal agent from own sources due to lack of central heating system in Leova district.

According to statistics in winter on average one household for heating uses the fuel approximately equivalent to 1.5 tons of coal. If we consider that there are 17 543 households in Leova district, then the average volume of the coal used is approximately 26.3 thousand tons. The ratio of heating capacity of the pellets as compared to the coal is about 0.9. The replacement of coal for the briquettes and pellets gives 29 thousand tons of briquettes and pellets. Given amount of biofuel can not be provided by the regional producers. Hence, there is an apparent need to diversify the local biomass-based fuel market.

Biomass-based Boiler plants (TS) installed in the localities of Leova District are 5 in number for 3 village municipalities: Tomaiul Nou, Cazangic and Sarata Noua (see table 2.3). That makes circa 11% of the total number of the Boiler plants (TS) installed in the South Region- 19 briquettes-based Boiler plants, 8 pellets-based Boiler plants, 18 straw-based Boiler plants, (see table 2.4). Based on this information the calculations given in the afore tables show the fuel demand for existing Boiler plants to be provided by local producers of biomass-based fuel. However, the information provided

by Leova Council and representatives of beneficiary municipalities shows that they still face difficulties in providing fuel, as well as quality fuel. Hence the need for the investment in the field through the diversification of biomass-based local fuel market.

Table 2.3. Boiler plants in Leova District

Village municipality	Capacity Boiler plant kW	Demand for fuel, t/year	Type of fuel
v. Tomaiul Nou	81,0	65,51	briquettes
v. Seliste	25,0	19,52	pellets
v. Cazangic	190,0	153,67	Packs of straw
v. Sarata Noua	(school) 340,0 (kindergarten) 150,0	275,00 121,32	Packs of straw

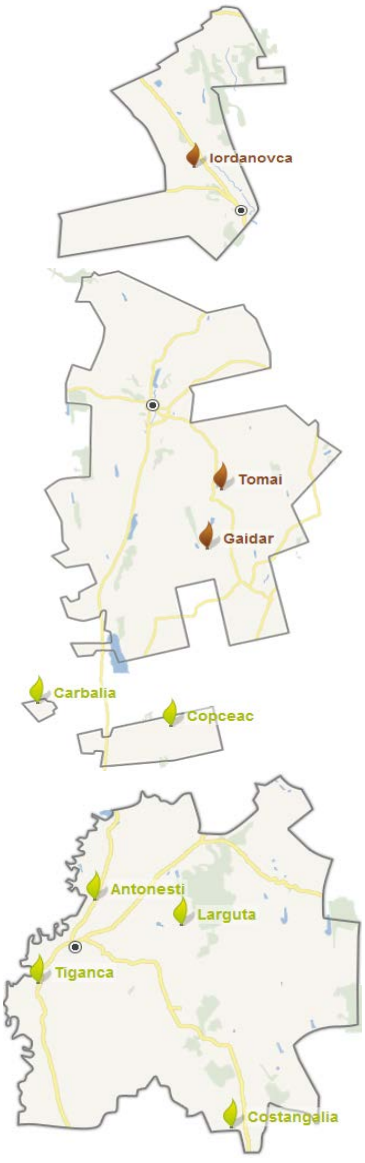
[5]

The above table shows that that the Boiler plants (TS) installed in Leova district need an annual amount of approximately 20 tons of pellets, about 65 tons of briquettes, and packs of straw 550 tons per year. According to the information provided by Leova District Council representatives, the Boiler plants on straw packs have a very low yield (lower heat of combustion of fuel). In the near future they will be replaced by pellet-based fuel.

Table 2.4. Boiler plants (TS) installed in the South Region of RM

Locality	Capacity Boiler plant kW	Required fuel, t/year	Type of fuel	The map of Boiler plants installed in the district [5]
			District Cimislia	
Mihailovca	465,00	376,10	briquettes	
Porumbrei	208,00	168,23	briquettes	
Costangalia	174,00	140,73	briquettes	
Javgur	349,00	282,28	briquettes	
			District Causeni	
Tataranii Noi (contracting)	240,00	194,11	briquettes/pellets	
Cirnatenii Noi (contracting)	120,00	97,06	briquettes/pellets	
Ciuflesti (contracting)	180,00	145,59	briquettes/pellets	

		District Stefan Voda	
Copceac	340,00	275,00	Packs of straw
Ermoclia	150,00	121,32	Packs of straw
Popeasca	300,00	242,64	Packs of straw
	150,00	121,32	Packs of straw
Talmaza	300,00	242,64	Packs of straw
	150,00	121,32	Packs of straw
Rascaieti	140,00	113,23	Packs of straw
Purcari (Viisoara)	250,00	202,20	Packs of straw
Olanesti	400,00	323,52	Packs of straw
Crocmaz	190,00	153,67	Packs of straw
Palanca	300,00	242,64	Packs of straw
		District Basarabeasca	
Iordanovca (contracting)	212,00	171,47	Briquettes
		District Comrat (UTA Gagauzia)	
Tomai (contracting)	94,00	76,03	Briquettes
	349,00	282,28	Briquettes
Gaidar (contracting)	522,00	422,20	Briquettes
Carbalia	80,00	64,70	Briquettes
Copceac	600,00	485,29	Packs of straw
		District Cantemir	
Antonesti	250,00	202,20	Packs of straw
Larguta	150,00	121,32	Packs of straw
Tiganca	340,00	275,00	Packs of straw
Costangalia	290,00	234,56	Briquettes
		District Cahul	
Doina (contracting)	174,00	140,73	Briquettes
Chircani (contracting)	232,00	187,64	Briquettes
Andrusul de Sus (contracting)	174,00	140,73	Briquettes



Andrusul de Jos (contracting)	174,00	140,73	Briquettes
Vadul lui Isac (contracting)	174,00	140,73	Briquettes
Valeni (contracting)	349,00	282,28	Briquettes
Cislita Prut (contracting)	58,00	46,91	Briquettes
Giurgiulesti (contractare)	406,00	328,38	Briquettes
			District Taraclia
Cealîc (contracting)	35,00	28,31	briquettes/pellets
Novoseolovca (contracting)	100,00	80,88	briquettes/pellets
Cairaclia (contracting)	100,00	80,88	briquettes/pellets
Ciumai (contracting)	170,00	137,50	briquettes/pellets

We can see from the table, that in the South Region of the Republic of Moldova approximately 26 % od the Boiler plants ara installed in Stefan Voda district, which represents 11 Boiler plants installed in 9 rural localities. Accordingly, the most precarious situation is in Basarabeasca district, where 1 Boiler plant installation project for Iordanovca locality is at the contracting phase.

The fuel demand for the Thermal Stations installed in the South Region of the Republic of Moldova in conformity with the calculations (the results shown in Annex and tables 2.3 and 2.4) is about 800 t/year of pellets-based fuel, approximately 3600 t/year of briquettes-based fuel, respectively nearly 3 900 t/year of straw packs –based fuel.

Providing the fuel required for Leova district can be performed locally from own forces. Raw material (agro waste) required to produce the fuel is sufficient in the district, according to the analysis performed on the data from different sources.

Thus, approximately 1500 t/year[7] can be obtained-*data categorised in the table 2.5*-raw material from vineyards, orchards, and forest areas from the district.

Table 2.5. Potential for biomass in the South Region [5]

Locality	Type of plantations	Total plantations area, ha		Potential for biomass available , t/ha			
				min		max	
		2009	2010	2009	2010	2009	2010
Leova	vines	959,00	1 138,00	767,20	910,40	1 054,90	1 251,80

[7] sursa: "Estimarea potenţialului energetic al biomasei din culturile agricole pentru brichetare, la nivel de regiuni şi raioane, pentru anii 2009-2010", Chişinău 2012

South Region		16 202,00	15 804,00	12 961,60	12 643,20	17 822,20	17 384,40
Leova	orchards	211,00	181,00	240,54	206,34	300,68	257,93
South Region		5 642,00	4 360,00	6 431,88	4 970,40	8 039,85	6 213,00
Leova	forests	11 539,35	615,98	0,00	0,00	625,55	38,14
South Region		88 948,75	78 041,89	0,00	0,00	4 832,39	4 832,35
Leova	cereals	3 799,00	4 027,00	9 792,00	9 196,00	17 625,00	16 552,00
South Region		70 417,00	66 139,00	134 938,00	142 319,00	242 889,00	256 175,00
Total Leova				**10 799,74**	**10 312,74**	**19 606,13**	**18 099,87**
Total South Region				**154 331,48**	**159 932,60**	**273 583,44**	**284 604,75**

Total of biomass identified and presented in the above table currently is not utilised, leading to the emergence of numeroius heaps of sawdust and other wood waste that pollute soil and water ways. So, this problem fits into the context of need to elaborate and implement such kind of initiated project.

In conclusion:

The need for the investment resulted from:

- **no durability is ensured in the biomass utilisation development;**
- **lack of the economic entities to operate the pellets production;**
- **lack of uniformity of the technologies used by the manufacturers, geographical distribution and biomass used in the production process;**
- **impartial exploited biomass from the South Region of the Republic of Moldova;**
- **lack of clear information on biofuel quality, purchased for the Boiler plants installed both in the district and the Region;**
- *providing potential beneficiaries with 29,0 thousand tons of biofuel;*
- **biofuel sales market is underdeveloped in the region.**

3) Opportunity for Public-Private Partnership Project promotion with technical and economic substantiation that demonstrates the need and opportunity for Public-Private Partnership Project

Assuming that the own renewable energy sources -reduce the dependance over the import,- increase the energetic security of the country, -have lower costs,- permit the development of new businesses and creation of new jobs,- reduce greenhouse gas emissions and environment pollution, the investments in *collection of raw material-production-distribution of final product among*

existing Boiler plants for the production of thermal agent, as well as the operation and maintenance of Boiler plants (TS) will create secure steps to sustainable development.

Moreover, the investments of such kind assume major problems due to the fact that the sector is in the incipient phase of the development.

Thus, the initiation of the project started on the above premise and the landmarks that :

- **Existence in the ditrict** briquette-based Boiler plant (TS)-1 unit, pellet-based Boiler plant (TS) -1 unit and 3 straw packs-based Boiler plants, - the situation is presented in the previous chapter with the need for fuel from : the pellets about 20 t/year, briquettes - 65.51 t/year;
- **lack of control on fuel quality** provided at the existing 5 Boiler plants (TS) causing poor quality of biofuel;
- trouble operation of those 5 Boiler plants (TS) caused by lack of skilled specialists;
- **dependence on fossil fuel** resulting from gas-assisted and and coal-assisted Boiler plants (TS) existing in the district.

  According to Annex 2 „*List of localities and institutions from Leova district proposed for installation of biomass-based Boiler plants (TS)*" , currently there are 5 coal-based Boiler plants (TS) with the operation life up to 2014, 3 coal-based Boiler plants (TS) and 1 natural gas-based Boiler plant (TS) with operation life up to 2015, 3 coal-based Boiler plants (TS) and 2 gas-based Boiler plants (TS) with operation life up to 2016, and 4 gas-based Boiler plants (TS) with operation life up to 2017 respectively.

  Out of all Boiler plants (TS) presented with operation life up to 2017, the following are managed by:

  - **City's education department** -5 coal-based Boiler plants (TS) and 2 gas-based Boiler plants (TS)
  - **Local Public Administration**-4 coal-based Boiler plants (TS).
  - **Leova District Council -2** gas-based Boiler plants (TS)
  - **Education Department Administration**-1 coal-based Boiler plant (TS) and 1 gas-based Boiler plant (TS)

  After expiration of operation life period it will be neccesary to execute current or major repairs. Thus, in order to limit the dependance on fossil fuel and, therefore, to achieve the major objectives of the ***2010-2020 Energy Efficiency National Program***, it is neccesary to take concrete actions, and the replacement of the fossil fuel-based Boiler plants (TS) up to 2017 presented above for biomass-based Boiler plants (TS) will be a step towards the achieving these objectives.

- **Providing required temperature to the public institution** heated by fossil fuel-based Boiler plants (TS) during the cold period of the year is not performed according to the sanitary code. It is caused by outdated Boiler plants which have very low yield compared to the initial one;

Starting the project proposed for the public institution assumes difficulties *due to lack of sufficient experience at the public institutions in the field of collecting of raw material- production-distribution of final product (biofuel) to the Boiler plants* to produce thermal agent, as well as in operation and maintenance of the Boiler plants (TS). Meanwhile, manifestation of interets by a private company neccesitates the support at the District Council level. Thus, in order to achieve the expected outcomes it is necessary to opt for collaboration among the institutions concerned.

As possible forms of involvement that require the cooperation among the interested parties, hereinafter referred to as the public partner presented by Leova District Council, and the private partner to be selected through a competition procedure by Leova District Council-are stipulated by the **Law nr. 179 on Public-Private Partnership dated 10.07.2008** and they include:

- Entrepreneurial contract/services contract;
- Fiduciary management contract;
- Tenancy/lease contract;
- Concession contract;
- Contract of the commercial or civil society.

The application of one of the forms presented will result in Public-Private Partnership establishment for both partners.

So, the newly established Public-Private Partnership based on the benchmarks aims to address the problems identified at both partners involves the activities related to :

- *Construction of the pellet factory to the standards of the private partner* where Leova District Council needs to be involved that has an interest in improving the public services *related to the management of the production of the thermal heat at the existing Boiler plants.* The improvement resulting from the purchase of the required fuel from the private agent will ensure the fuel quality. Moreover, in order to keep an eye on the entire process and to prevent any deviations leading to safety thermal confort at the institutions connected to the Boiler plants –both stakeholders should be involved –the fuel producer and the fuel supplier, as well as the fuel purchaser and the fuel consumer.
- *Installation of new biomass-based Boiler plants (pellet-based)* that will lead to the market development in the field,

Therefore, the following benefits will be obtained via implementing the pellet factory project:

The public partner:

- reduction of the burden of the public institution in the management/technical maintenance of the Boiler plants (TS) (problems related to large storage capacities, repair, inspections, testing)
- possibility to control the entire process of production of the thermal agent;

The private partner:

- possibility to control the fuel production process and the thermal agent, therefore having greater positive impact to adjust the fuel quality to the technical requirements of the Boiler plants (TS);
- possibility to create new Boiler plants (TS) to deliver the thermal agent to household consumers and other public institutions;
- offering incentives and encouragement of the thermal efficiency of the production process and respectively decreasing the consumption of biofuel.

Public-Private Partnership (PPP) was defined according to the **Law nr.179 on Public –Private Partnership of 10.07.2008** as *„ a long-term contract between a public partner and a private partner to carry out activities of public interest, based on the capabilities of each partner to accordingly share the resources, the risks and the benefits ”*.Nowadays it is a key tool in achieveing public policies for the Republic of Moldova. Thus, the development and use of a Public-Private Partnership tool is one of the objectives of the **Program of the Government of the Republic of Moldova: European integration, Freedom, Democracy, Wellfare**. Therefore, the implementing of the proposed project will be an important step in achieving the objective. Once implemented the project will present the pilot model for other projects in the field.

4) Framing the objective in the medium- and short-term general, sectoral or regional policies.

To improve safety in supplying the required fuel for energy production and concurrently to meet the environment requirements (in particular, climate changes and global warming), in the envestment policies at the overall, sectoral and regional level for both short- and long-term duration, the objectives were drawn to highlight the need for the renewable energy sources to become an increasing important part in the energy production structure.

Extending the energy consumption originating from renewable resources must go hand in hand with greenhouse gas emissions. This being the reason for the Republic of Moldova to apply it in every situation and scenario.

The first step was made in this field: the *Law on Renewable Energy* was adopted which established the state principles and the objectives in the field of utilisation of the renewable energy resources[8].

In this context, the proposed project will contribute to the reliability in renewable energy sources supply. Hence it will reduce the dependance on the fossil fuel, concurrently generating the reduction of emissions of greenhouse gases.

The Project implemented is relevant:

- **For the overall and general objective of the 2010-2010 Energy Efficiency National Program** (draft project) which sets the priority policies and actions to be implemented within 2010-2020 to meet the challenges of energy price growth, dependance on energy resources import and energy sector impact on the climate changes.

  To overcome the aforestated challenges, the Program foresees the following major objectives for the Republic of Moldova:

  a. Reduction of primary energy global consumption by 20% by 2020;
  b. Reduction of greenhouse gases emissions by 20% by 2020;
  c. Increase of proportion of renewable energy in total energy mix from 6% in 2010 to 20% in 2020;
  d. Increase of the share of biofuel to at least 10% out of all fuel used by 2020.

- **2011-2014 Government Acivity Program of the Republic of Moldova „European integrity: Freedom, Democracy, Welfare" approved by the Parliament of the Republic of Moldova" nr.** 6-XIX of 14.01.2011 in the chapter „Economic and financial policies", section „Competitiveness policies and small and medium enterprises (SME) development "stipulated the government grants for the research and innovations via practical application to increase the efficiency in energy and natural resources utilisation. In the paragraph „Infrastructure and Transport" one of the governing objectives is to ensure the energy security and to promote energy efficiency in all the sectors of the economy.

[8] Sursa: Buletin informativ-ANALITIC "Agenţia pentru Inovare şi Transfer Tehnologic a Academiei de Ştiinţe a Moldovei", MARTIE 2009

Concurrently, the project is relevant to the development policy of the energy sector of the Republic of Moldova meeting the objectives included in the following legislative provisions in force of the Republic of Moldova:

- **2005-2015 National Program „Moldovan Village",**
- **2007-2015 Environment Safety National Program,**
- **Sustainable Development Concept of the localities of the Republic of Moldova,**
- **Energy Strategy of the Republic of Moldova by 2030,**

The Project is framed within the national strategy and policy of security of alternative and renewable fuel supply in the Republic of Moldova which has a huge biomass base and domestic consumers (households, budgetary institutions, etc) based on:

- Increase of competitiveness of energy efficiency;
- Development of producer-consumer direct relations without intermediary;
- Growth of production capacities and permanent stability.

Sectoral and regional investment policies

The proposed investment project in framework within the general objectives of **„2011-2020 Energy Efficiency District Program" approved by the Decision of Leova District Council nr.9.2 of 09.12.2011, Chapter IV paragraph (c) which states „increase of bioduel share to at least 10% out of total fuel used in 2020 "**

5) Public-Private Partnership (PPP) Project beneficiaries

Through the implementation of the given project and Public-Private Partneship (PPP) model application the beneficiaries are:

- **Leova District Council**;
- **3 village municipalities:** Tomaiul Nou, Cazangric and Sarata Noua **which possess 5 biofuel-based Boiler plants (TS)**;
- **16 educational institutions** identified with fossil fuel–based Boiler plants with operation life up to 2017.
- **17 543 households**.

6) The normative framework which regulates the field

The compliance with relevant legislation is tracked through the Public-Private Partnership Project implementation in terms of provision of thermal agent and biomass processing, and namely:

Normative framework which regulate the Energy Efficiency Sector.
LAW Nr. 142 of 02.07.2010 on Energy E\fficiency
LAW Nr. 160 of 12.07.2007 on Renewable Energy
GOVERNMENT ORDINANCE Nr. 833 OF 10.11.2011 on Energy Efficiency National Program for 2011-2020
Normative Frames which regulates the Public-Private Partnership (PPP)
Law nr. 179-XVI of 10.07.2008 on Public-Private Partnership
Government Ordinance nr. 476 of 04.07.2012 on approval the Regulations regarding standard procedures and general conditions for selection of a private partner
Others
LAW Nr. 436 of 28.12.2006 **on Local Public Administration**
LAW Nr. 91 of 05.04.2007 **on Public Property Land and its delimitation**
Law of RM nr.721-XIII „On quality in construction”
Engineering research for construction (Rules and Sanitary code1.02.07-87)
NCM F. 03.02-2005 Standards in construction.”Designing of buildings with masonry walls”.
Standards and rules in construction Nr. 3.02.01.83 „Guidelines on the production and reception of the basis and foundation”
SNiP2.01.07-85 „Assignments and actions”
Law on Environment Protection nr.1515-XII of 16.06.93
Standards on the impact over atmosphere air in accordance with the requirements STAS 2.04.05-91, BCH «Enterprises».

III The main features of the Public-Private Partnership (PPP) Project:

1) Public-Private Partnership (PPP) objectives

Overall Goal of the Project :

Providing efficient and quality thermal agent with optimal costs for the state budget of the public institution from Leova district, including other district from the South Region that have biomass-based Boiler plants.

Specific Project Objectives:

- Enhancement of public service of local and regional interest via creation of Public-Private Partnership
- Utilisation of the potential of renewable sources which will contribute to the growth of security and energy supply;
- Technical barriers elimination at the autonomous Boiler plants (TS) through transmission of the management right and maintenance of biomass-based Boiler plants (TS).

2) Outcomes achieved through Public-Private Partnership (PPP) Project implementation.

By applying the functional model-*the pilot model*-of processing the agricultural and forest solid biomass for obtaining the pellets-the utilisation of biomass potentail can be launched to a larger scale.

Concrete outcomes refer to the following pilot units or systems:

1. initiating the implemenattion activities and the biomass-based pellets and briquettes production originated from agrarian sector;
2. obtaining management and maintetance services of 5 existing biomass-based Boiler plants (TS) aimed to provide thermal agent for public institutions via autonomous biomass-based Boiler plants (TS).
3. providing of required fuel-approximately 20t/year of pellets, about 65t/year of briquettes (as per Annex 1)- for existing Boiler plants (TS) (5 Boiler plants) in the district.
4. possibility of extension of the network in providing the thermal agent for 16 public institutions.
5. substitution of fossil fuel from 16 Boiler plants (TS) with the operation life up to 2017 for agro-biomass-based fuel.

6. creation of quality check, maintenance and repair system of 5 Boiler plants (TS).
7. taking over the management of 21 Boiler plants (TS) for providing pellet-based thermal agent;
8. annual production of approximately 2000 t of pellet-based biofuel .

The achieved outcomes within the project implementation will be widely disseminated in scientific communications, national and international publications, through national seminars. It will raise the awareness of the local Public Administrations and economic entities for the involvement of the Public-Private Partnership for the construction of the pellets factories including the transmission of management right for the biomass-based Boiler plants (TS).

Agricultural solid biomass resources and energy crops can contribute to satisfying the current need for the thermal energy in rural areas, bringing minimum impact on the environment.

3) Technical and economic scenarios for achieving Public-Private Partnership (PPP) Project objectives (variants)

3.1. Formulation and description of 3 scenarios of the investment implementation

In order to achieve the comprehensive analysis it is necessaty to review as many possible options as possible for the implementation of Public-Private Partnership that will result in achieveing the most viable/reliable investments. Further, three possible variants of Public-Private Partnership application will be analysed for the selection of the most viable option of the investment implementation proposed. It will result in the most reliable scenario from both economic, social and environment point of view.

Further analysed variants involve *minimum investments, medium invetments, maximum investments*-providing public services in biomass-based thermal agent for public institutions via providing biofuel for the public institutions involved.

Table 3.1. The analysis of solutions of investment implementation **(formation of Public-Private Partnership (PPP) to produce the pellets) – partnership aspect**

Nr. scenario	*Scenario*	*Description*	*Subject PPP*	*Specific objectives*	*Activities*	*Forms of would be contracts*	*Advantages*	*Disadvantages*
I	with minimum investments	Centralised Public Acquisitions (at a district level) of the pellets/briquettes with further distribution to the beneficiary institutions	**Procurement services of biomass-based fuel:** the private partner delivers pellets/briquettes to the public partner according to fixed schedule and set quality conditions	**Provision of pellets/briquettes for 4 Boiler plants from Leova District**	1. centralised organisation of annual auctions.	**Annual procurement contracts according to the Law of the Republic of Moldova on Public Acquisions.**	**No need for investments**	**Do not provide durability in the development of biomass utilisation system, do not ensure of control over the pellets quality, trouble operation of the Boiler plants (TS), dependance on pellets underdeveloped market from Moldova**
II	With medium investments	Creation of the biomass-based pellets/briquettes provision system of the Boiler plants (TS) from Leova District in partnership with an economic entity (EE) who will manage the pellets production and delivery process, acquisition and delivery of briquettes, distribution to the consumers from the district (on the basis of Public-Private Partnership (PPP contract) with fixing the annual prices via	**Delivery services of biomass-based fuel:** the private partner delivers the pellets/briquettes to the public partner with the prices approved by the District Council (DC) on the annual basis, public partner has the right to monitor the pellets production process	1. centralised provision with biomass-based pellets/briquettes of the Boiler plants from Leova District 2. monitoring of biomass-based pellets quality produced in Leova district at the production process level.	1. construction /creation of biomass-based pellet factory 2. creation of biomass collection and briquettes acquisition system. 3. creation of pellets/briquettes distribution system to the Boiler plants (TS)..	1. the Contract of commercial society 2. entrepreneurial contract/services contract	1. medium investments 2. possibility to control the pellets production process with further adjustment to the technical parameters requirements of the Boiler plants (TS) installed in the public institutions.	1. problems on the delimitation of the property interest rights :the District Council (DC) provides neither a plot of land nor a construction Property contribution can be only in the form of equipment which has operation life 15-20 years maximum and then the contract looses its legal validity in 20 years 2. The subject of the partnership is not clear-neither public service nor public property is transmitted

		the District Council decision) and on the basis of economic entity (EE) contracts with neighboring districts with the attraction of private investments and co-financing by the District Councils (DC).						to the private partner, or any exclusive right due to which the public partner could obtain the public benefit or the private partner could obtain profit; 3. this partnership can be established based on the creation of a joint commectial enterprises (joint-stock company or company with limited liabilities) via co-financing of both partners to obtain the profit. The profit obtained by the District Council afterwards could be reinvested in the promotion of biomass utilisation by the household users and reductions in the prices for the delivery to the own Boiler plants..
III	With maximum investments	Transmission of the right of management and maintenance of the Boiler plants from Leova District in order to provide with the thermal agent, including to produce the biomass-based fuel. *The essence of the*	Management of the public property, supply services of biomass-based thermal agent for public institutions.	1. provision of the thermal agent for the public institution from Leova District, equipped with biomass-based Boiler	1. construction/creation biomass-based pellet factory 2. creation of biomass collection system and briquette	1. contract of fiduciary administration 2. entrepreneurial contract/ services contract	1. permits clear definition of the beneficiaries of both partners; 2. Possibility to control both the fuel production process and the thermal agent, thereby having	1. the investments are comparatively high than other solutions; 2. it might be a single legal person to have expertise in all required fields or it would be necessary the create an association of economic entities in

	partnership consists in the following: a public partner transmits the right of the management of the Boiler plant, of which the owner it is, to deliver the thermal agent and to make payments based on the base of meter registration by jointly established tariffs, approved By the District Council on the annual base. The private partner makes investments in the pellets production infrastructure, acquisitions/supply of briquattes, collection of raw material, distribution, installation of the meters on the existing Boiler plants, extension of biomass-based Boiler plant (TS) in the district through the new pellets-based Boiler plants construction and management to supply pellets-based thermal agent (TA), creation quality check, maintenance and repair system for the Boiler plants (TS), with	plants (TS). 2. creation of centralised system of biomass-based fuel ditribution in the South Region for all categories of the consumers.. 3. check of biomass-based pellets quality produced in Leova district at the production process level.	acquisition. 3. creation of pellets and briquettes distribution system to the Boiler plant (TS). 4. creation of operation and maintenance system of the Boiler plants (TS). . 5. creation of quality monitoring system	higher positive impact over the occasion of adjustment the fuel quality to the technical requirements of the Boiler plants (TS); 3. facilitating the burden of the Public Institutions (PI) in the management/technical maintenance of the Boiler plants (TS) (problems connected with large storage capacities, repair, checks, testings).. 4. possibility to create new Boiler plants (TS) to provide the thermal agent to the household consumer and othe rPublic Institutions (PI). 5. stimulation and encouragement the efficiency of the production process of the thermal agent and accordingly the reduction of biofuel consumption.	the agricultural production and technical maintenance of the Boiler plant

	further (in 20 years) transmission of the Boiler plants in the operational state to the public partner. Many economic entities (EE) can participate in the auction, associating and creating a new legal person and signing the Public-Private Partnership contract.	

3.2. Description and argunentation through multi-criteria analysis of the selected technical solution.

The aforesaid investment implementation variants will be analysed basing on the established criteria.

a) Establishing the criteriia

Economic parameters:

C1: *Econimic parameter 1:* investment required costs

C2: *Econimic parameter 2:* management /technical maintenance of Boiler plant (TS)

C3: *Econimic parameter 3:* upgrowth of sustainability and encouragement of economy rise in the region creşterea sustenabilităţii şi stimularea creşterii economice a regiunii

Social parameters:

C4: *Social parameter 1:* enhancement of public services quality

C5: *Social parameter 2:* creation of new jobs

C6: *Social parameter 3:* increase of comfort grade in rural area via satrisfaction for fuel demand

C7: *Social parameter 4:* decrease of biofuel consumption

Risk parameters:

C8: *Risk parameters 1:* durability of the model applied/loss of economic interest by private partner

C9: *Risk parameters 2:* formal involvement of the partners

Environment parameters:

C10: *Ecologic parameter 1:* pellets quality to reduce concentrations of noxious substances in chimney smoke calitatea peleţilor ce va duce la micşorarea concentranţiei substanţelor nocive în fum

C11: *Ecologic parameter 2:* enhancement of the Boiler plant (TS) operation system to reduce the pelets/biofuel consumption and its impact .

Technical parameters:

C12: *Technical parameter 1:* durability in development biomass utilisation system

C13: *Technical parameter 2:* possibility to control pellet production process aaaand adjustment to the requirements of the technical parameters of the Boiler plants installed in the public institutions.

C14: *Technical parameter 3:* elimination of technical obstacles via operation work and services provided by skilled specialists.rin.

C15: *Technical parameter 4:* higher efficiency of the operation of the Boiler plants to optimize the consumption.

Legal parameters:

C16: *Legal parameters*: compliance with the legislation in force in terms of energy sector and application of Public-Private Partnership (PPP)

b) Establish share of of each criterion relative to other criteria

Table 3.2. Ponderability of the criteria considered for the analysis of optimum alternatives.Ponderea criteriilor luate în considerare pentru analiza alternativei optime

Criterion	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	Score	Level	Ponderability Y
C1	1	2	2	1	1	0	1	1	1	2	1	2	2	2	1	1	21	3	2,89
C2	0	1	0	0	0	1	1	0	1	1	0	1	1	1	1	0	9	16	0,50
C3	0	1	1	1	1	1	2	1	1	2	1	2	2	1	1	0	18	5	2,10
C4	0	2	1	1	1	1	2	2	1	2	1	2	1	1	1	0	19	4	2,35
C5	1	2	1	1	1	2	1	2	2	2	2	2	1	2	1	1	24	2	3,93
C6	0	2	1	1	1	1	1	0	0	1	2	2	1	2	2	1	18	5	2,10
C7	0	1	0	0	0	0	1	2	1	1	1	1	1	2	2	0	13	12	1,04
C8	1	2	1	0	0	2	0	1	1	1	1	1	1	1	1	0	14	9	1,28
C9	1	1	1	1	0	2	0	1	1	1	1	1	1	1	1	0	14	9	1,28
C10	0	1	0	0	0	1	1	1	1	1	2	1	1	1	0	0	11	13	0,79
C11	1	2	1	1	1	0	1	1	1	0	1	2	1	1	0	0	14	9	1,28
C12	0	1	0	0	0	0	1	1	1	1	0	1	1	1	2	0	10	15	0,62
C13	0	1	2	1	1	1	1	1	1	1	1	1	1	1	1	0	15	7	1,50
C14	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0	11	13	0,79
C15	1	1	1	1	1	0	0	1	1	2	2	0	1	1	1	1	15	7	1,50
C16	1	2	2	2	1	1	2	2	2	2	2	2	2	2	1	1	27	1	5,50

c) Evaluation of alternatives (notation) based on criteria

Variant/ Criterion	V1	V2	V3
1: Required investment cost	0	1	2
2: Management/technical maintenance of Boiler plant (TS)	0	0	5
3: Upgrowth of sustainability and encouragement of economic growth in the region	0	2	2
4: Enhancement of public services quality	0	0	2
5: Creation of new jobs	0	2	2

6: Increase of comfort grade in rural areas via satisfaction of fuel demand	0	1	1
7: Decrease of biofuel consumption	0	1	1
8: Durability of the model applied	0	1	1
9: Non-involvement or formal involvement of the partners	0	1	1
10: Pellets quality to reduce the concentration of noxious substances in the chimney smoke	0	1	2
11: Improvement of Boiler plant operation system in order to reduce quantity and impact of biofuel	0	0	2
12: Durability in the development of biomass utilisation system	0	2	2
13: Possibility to control pellets production process and adjustment to the technical parameters requirements of the Boiler plant (TS) installed in the public institutions	0	1	2
14: Elimination of technical obstacles via operation and service work performed by skilled specialists.	0	0	1
15: Higher efficiency of the Boiler plant operation to optimize the consumption	0	1	2
16: Compliance with the legislation in force in energy sector and application of Public-Private Partnership (PPP).	1	2	2

- The investment cost is equal in the V2 and V3, but the number of the outcomes achievedin the V3 predominates over V2.
- good management and maintenance of biomass-based Boiler plant (TS) from Leova district through creation of the operation and maintenance system of the Boiler plants (TS) will be implemented only after the application of Variant 3;
- Application of both V2 and V3 will bring economic benefits for the economic growth in the region;
- biomass-based pellets quality check will be obtained via the application of maximun variant;
- higher positive impact over the possibility to adjust the fuel quality to the technical requirements will be accentuated through the application of Variant 3;
- application of Variant 3 will offer incentives and encourage the efficasy of the production process of the thermal agent;
- decrease of biofuel consumption could be implemented through the application of both medium and maximum variants;
- the number of operational staff predominates in V3;
- numărul de angajaţi în operare prevalează la V3.
- Improvement of quality life will be similar in the last 2 variants;
- application of Variants 2 and 3 will equally increase the confort grade in the rural area via satisfaction of the fuel demand;

- application of Variant 3 as the investment implementation solution will contribute to the sales market development through the extention of biomass-based Boiler plants network in Leova district;

d) Matrix of outcomes

Table 3.2. Matrix of outcomes

Variant	***V1***			***V2***			***V3***		
Criterion	***N1***	***y***	***N1 * γ***	***N2***	***y***	***N2 * γ***	***N2***	***y***	***N2 * γ***
C1	0	2,89	0,00	1	2,89	2,89	2	2,89	5,78
C2	0	0,50	0,00	0	0,50	0,00	5	0,50	2,50
C3	0	2,10	0,00	2	2,10	4,19	2	2,10	4,19
C4	0	2,35	0,00	0	2,35	0,00	2	2,35	4,70
C5	0	3,93	0,00	2	3,93	7,87	2	3,93	7,87
C6	0	2,10	0,00	1	2,10	2,10	1	2,10	2,10
C7	0	1,04	0,00	1	1,04	1,04	1	1,04	1,04
C8	0	1,28	0,00	1	1,28	1,28	1	1,28	1,28
C9	0	1,28	0,00	1	1,28	1,28	1	1,28	1,28
C10	0	0,79	0,00	1	0,79	0,79	2	0,79	1,57
C11	0	1,28	0,00	0	1,28	0,00	2	1,28	2,56
C12	0	0,62	0,00	2	0,62	1,24	2	0,62	1,24
C13	0	1,50	0,00	1	1,50	1,50	2	1,50	3,00
C14	0	0,79	0,00	0	0,79	0,00	1	0,79	0,79
C15	0	1,50	0,00	1	1,50	1,50	2	1,50	3,00
C16	1	5,50	5,50	2	5,50	11,00	2	5,50	11,00
TOTAL			**5,5**			**36,67**			**53,8871**

Multicriterial analysis recommends the optimum implementation solution to be **Variant V3.** It indicates of

Main advantages to use the proposed scenario are :

- Possibility to select three application solutions of the given variant:
- increase of fossil fuel import via substitution or alternative
- possibility to supervise the pellets production process and adjustment to the requirements of the technical parameters of the Boiler plants (TS) installed in the public institutions (PI)
- improvement of the public services in terms of Boiler plants management and maintenance.
- the possibility to extend the biomass-based Boiler plants network through the construction of new pellets-based Boiler plants) TS.

- facilitating of the burden of the public isntitutions in management/technical maintenance of the Boiler plants (TS).
- possibilities of the extension of the provision of the thermal agent for other districts from the South of Moldova, as well as other household consumers from Leova district.
- in addition, 8 new jobs will be created;
- offering an incentive to develop the partnership between Local Public Administration and local entrepreneurs.
- permits the enhancement and the encouragement of the efficacy of the thermal agent production processand accordingly decreasing biofuel consumption;
- Reduction of greenhouse gas emissions from higher efficiency of biomass-based Boiler plant (TS) operation.

4. Data on land on wich will be placed the object, the legal status of the land, modalitz / contract form to be submitted private partner estimated area of land

Installation of 16 biomass-based Boiler plants (TS) will be installed in the existing buildings where currently the fossil fuel-based Boiler plant (TS) operates with the operation life up to 2017. The buildings are situated on the area within maximum 24 m^2 and minimum 12 m^2 and needs current or major repair.

Pellet factory is to be situated on the site with the area of de **2140 m^2**. Total area of the site has resulted from the factory dimensions what consists in :

- **390 m^2** -required for the pellet factory;
- **1500 m^2** –required for the construction of the raw material storage facilities (straw and wood waste);
- necesar pentru construcţia depozitului de materie primă (paie şi deşeuri lemnoase);
- **250 m^2** –required for the construction of the final product warehouse- pellets
- preconizate pentru construcţia depozitului de materie finită – peleţi;

The required invetsment site will be situated according to the standards in force at a distance of minimum 300 m from the neighboring constructions.

- **Provision of utilities**

Public utilities in the region are provided by several suppliers operating at local and national level.
Utilităţile publice în regiune sunt asigurate de câţiva furnizori ce operează la nivel local şi naţional.

- **Access roads**

Creation of the access – at least gravelling –towards the specified site foreseen for the construction of the pellet factory **is the responsibility of the private partner**.

- **Water supply system and sewerage. Sistemul de alimentare cu apă şi canalizare**

The factory of biomass pelleting must be provided with water. (a well or a centralised system) for the needs of the staff.

- **Electrical system.**

The site must ve connected to the electrical network (380 V, 220 V)

The nominal power required for the production line will constitute totally 196.27 kW out of which:

- 190,17 kW for the pellet production line;
- 5,00 kW for the packaging ssystem;
- 1,1 kW – the transport for the drier.transportul pentru uscător.

Preparation for the electricity connecting

5. Dimensioning of the required infrastructure to be constructed via the Project area infrastructurii necesare a fi construite prin proiect

The most appropriate form of the Public-Private Partnership (PPP) resulting from the multicriterial analysis from Chapter 3 can be established via 3 would investment solutions which are based on **the potential financing forms**, **forms of associations, organisational and legal forms:**

1. ***Rendering of public services of the biomass-based thermal agent provision for the public institutions via:***

   - taking the economic management of 5 biomass-based Boiler plants (TS) from 3 municipalities from Leova district to provide biomass-based thermal agent;
   - extension of biomass-based Boiler plants network from the district via the construction of 16 new pellet-based Boiler plants with further management to deliver pellet-based Boiler plants.
   - organisation of pellet production to provide the fuel for the Boiler plants through the analysis of two solutions: *solution A* –construction of the factory for the production of 2 types of pellets (straw and sawdustz); *solution B*-construction of the factory for the production of 1 type of pellet (straw).

2. ***Rendering of public services of the biomass-based thermal agent provision for the public institutions via:***

   - Taking the economic management of 5 Boiler plants from 3 municipalities from Leova district to provide biomass –based thermal agent;

3. ***Rendering of public services of the biomass-based thermal agent provision for the public institutions via:***

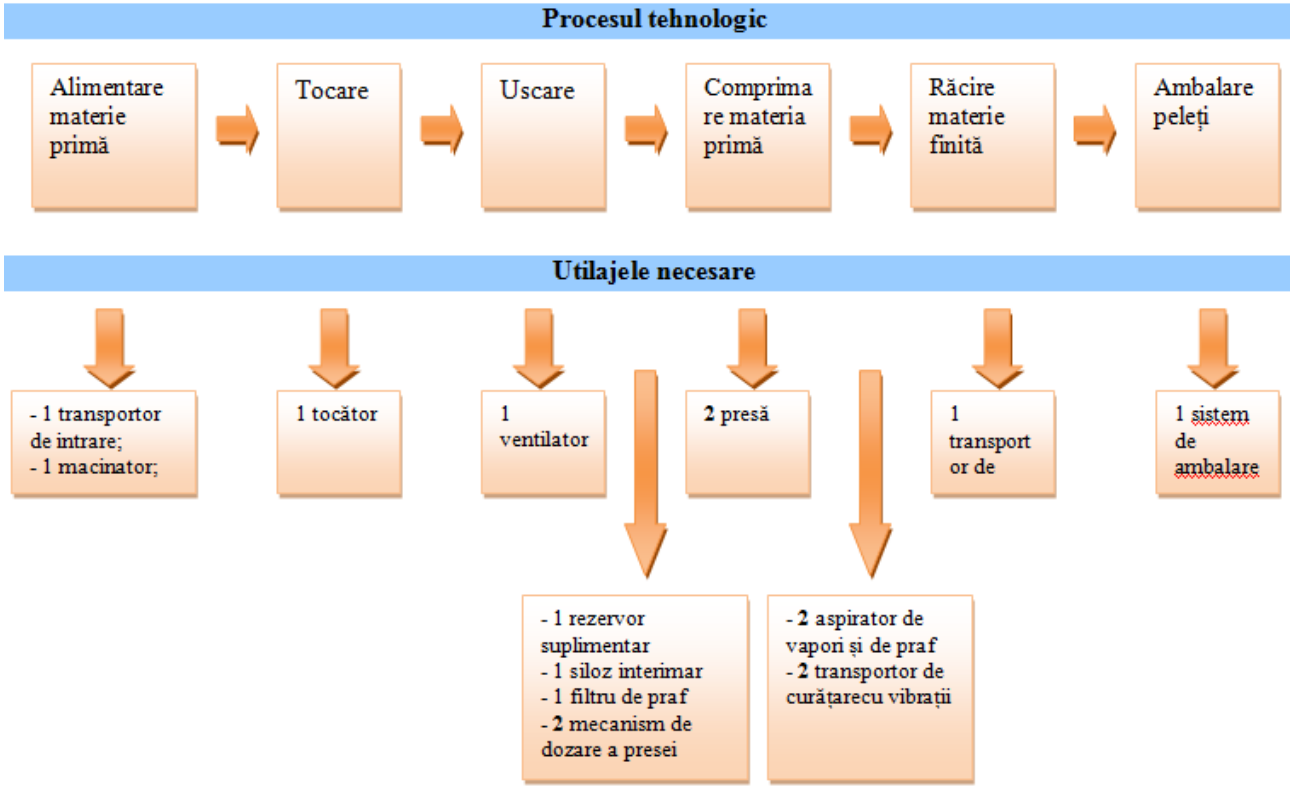
   - Taking of economic management of 5 biomass –based Boiler plants from 3 municipalities from Leova district to provide biomass-based thermal agent;

6.1. Proposed technological flow

Comparative analysis of the proposed variants:

Variant I		Variant II	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
- less cost of investment (descifrare cost prezentat în Devizul general Anexa 4 – Solution I, Variant B)	-the tempo of work of the country depends on the operating regime of the press.	-provides nonstop operation of the factory - the tempo of the factory operation does not depend on the operating of the equipment. Thus, breakdown of one press wil be replaced by the other press. - production of pellets from different types of biomass provides obtaining the profit from the commercialisation for the customers with different demands.	

- **Description of the work flow for the proposed variant**



- **Preparation of material**
- **Separation and chopping**
- **Addition of supplemental material**
- **Transportation of material to the silo:**
- **Granulation /pelleting**
- **Transport of pellets to packaging and packing pellets**

Table 6.1. Nominal power of the machinery of the line

Equipment	**Nominal power, Kw**
Feeding conveyor and separator	44,5
Chopper	55,0
Ventilator transport pneumatic	7,5
Filtration	0,75
Intermediary silo Siloz intermediar	1,1

Dosing conveyor on the press Conveior de dozare în presă	2x 2,2
Press	2x 37,0
Aspirator of the steam and the dust	2x 0,37
Conveyor ior de curăţare cu vibraţii	2x 0,18
Cooling conveyor	2 x 0,36
TOTAL	**189,07**

Maintenance requirements

6.2. Development of technical specifications of the equipment and machinery to be procured

- **Equipment of the pellets production line**

- **Lifting and handling equipment**

6.3. Elaboration of the organigram and project operation plan

Table 6.2. Staff demand for the operation

Staff demand	Manning level	Description
Director	1	- Management, monitoring the operation of the factory- transportation of raw material, production of the final product, delivery of the fuel required to the Boiler plants (TS), delivery to the interested consumers
An accountant	1	-
Operational personnel	6	- Manipulates the whole line (qualification-operator) with the following operations: • feeding the packs of straw; • removal of protection shipping materials from the straw packs; • supervision of preparation of line;

		• supervision of the production part and packaging operations; • packaging of the pellets; • supervision of the burning process at the Boiler plants (TS)
A watchman	1	

6. Technical description of the selected solution

7. Cost estimate of each item and component from Public-Private Partnership Project frame Estimarea de costuri pentru fiecare element şi componentă din cadrul proiectului de PPP

Three invetsment implementation solutions had been identified in the Public–Private Partnership (PPP) Project frame ;

- **Variant A –** installation of 2 presses in the pellets production line for production of pellets from straw and sawdust

Table 8.1. The investment value for the proposed solution.

Nr. Crt.	An item of cost Articolul de cost	Investment value, MDL for solution I		Invetsment value MDL for solution II
		Variant A	Variant B	
1	Purchase of land	36 000,00	36 000,00	0,00
3	Connection to the requied infrastructure	20 000,00	20 000,00	0,00
5	Designing the buildings	75 000,00	75 000,00	0,00
8	Constructions	9 561 603,00	9 415 671,00	7 946 000,00
9	Independent equipment included in the final works	7 036 397,00	4 271 397,00	0,00
10	Independent equipment and transport means	1 281 000,00	291 000,00	0,00
11	Other costs	10 000,00	10 000,00	0,00
TOTAL INVESTMENT		**18 020 000,00**	**14 119 068,00**	**7 946 000,00**

8. Public-Private Partnership (PPP) Project implementation plan (Activities to be implemented with time frame)

9. The schedule of investment corroboration in time

10. Form and manner of the Public-Private Partnership implementation

10.1. Description of the contract performance form, including justification of the Public-Private Partnership term and the conditions of the conclusion of the contract.

Three alternatives (as possible from economic and technical point of view) of the Public-Private Partnership implementation have been analysed. Each form will be analysed in terms of :

1. The manner of the contract performance;
2. The manner of the involvement of the partners, benefits and risk sharing ;
3. Possible organisational and legal form and steps to be taken;
4. Possible forms of funding and Public-Private Partnership contract duration.

The forms of Public-private Partnership implementation in terms of providing public services in biomass-based thermal agent supply for the public institution in the municipalities participating in Public-Private Partnership.

In all the alternatives presented, the Public Partner is Leova District Council acting as the representative of the municipalities participating in the Public-private Partnership

Alternative I

Alternative I involves providing public services in biomass-based thermal agent supply for the municipalities participating in the Public-private Partnership with the following basic characteristics : 5 Boiler plants on different types of biomass-based fuel, construction of 16 new pellet-based Boiler plants and the construction of biomass-based pellet factory.

For this alternative the contribution of the Public Partner will consist of:

- Transmission to the private partner the economic management title for 5 biomass-based Boiler plants located and owned by 3 municipalities of Leova district.
- Transmission to the private partner management the utilisation of the public service consisting in supply the tbiomass hermal agent to the public institutions of the municipalities participating in the Public-Private Partnership.
- Financial contribution in the amount of 100 000 Euro (one hundred thousand Euro) for the construction of the pellet factory.

On the other hand, the Private partner will provide:

- Delivery the thermal agent to the public institutions of the municipalities participating in the Public-Private Partnership.

- Maintenance and operation of 5 biomass-based Boiler plants under economic management;

- Extension of the network of biomass-based Boiler plants in the district via construction of 16 new pellet-based Boiler plants and taking the management for providing the thermal agent from pellets.

- Production of the pellets to provide the fuel for the Boiler plants.

Alternative II

- **Alternative II** includes providing public services in terms of biomass-based thermal agent for the public institutions only for the municipalities participating in the Public-Private Partnership through the extension of the number of biomass-based Boiler plants from the district by 16 pellet-based Boiler plants.

So, the contribution of the Public Partner will consists of:

- transmission of 5 biomass-based Boiler plants to the private partner's management within the Public-Private Partnership duration. The Boiler plants are located on the area and are owned by the 3 municipalities of Leova district.

- transmission to the private partner' s economic management the public service consisting in biomass-based thermal agent for the public institutions from only the municipalities participating in the Public-Private Partnership (3 municipalities including the municipalities for 16 Boiler plants to be constructed).

On the other hand, the private partner will provide:

- supply of the thermal agent for the public institutions from the municipalities participating in the Public-Private Partnership (4 municipalities, with further potential extension);

- maintenance and operation of 5 biomass-based Boiler plants received under economic management;

- extension of the Boiler plants network from the district through the construction of 16 new pellet-based Boiler plants taking them under management for producing pellet-based thermal agent;

This alternative involves the condition for the private partner to arrange and construct concurrently with the project a biomass-based pellet factory to provide the required amount of pellets for the Boiler plants to be constructed within the first 4 years of the project.

Alternative III

Alternative III includes providing public services in thermal agent production for the public institutions only from 3 the municipalities participating in the Public-Private Partnership owning

5 Boiler plants; .

The alternative foresees no extension. Such Public partner's contribution will consists of:

- transmission to the private management 5 biomass-based Boiler plants within the Public-Private partnership duration;
- transmission under private partner' management the public service involving the biomass-based thermal agent for the public instituions only from the municipalities participating in the Public-Private Partnership

On the other hand, the private partner will provide;

- supply of the thermal agent for the public institutions from the municipalities participating in the Public-Private Partnership (3 municipalities);
- maintenance and operation of 5 biomass-based Boiler plants received under economic management.

1. Contractual forms of the Public-Private Partnership implementation

The legislation of the Republic of Moldova provides the contractual forms of the Public-Private Partnership implementation, where:

The service contract aims at the provision of the public services by the private partner, execution of major repair works against payment, maintenance of both the infrastructure components and other property as an object of Public-Private partnership, keeping records of resources consumption, issuing the bills for the consumers.

The Contract of fiduciary management aims at ensuring the proper management of the public property based on performance criteria stipulated in the contract. In this case, the public partner transmits the private partner the management risk control and the risks control related to the Public-Private Partnerhsip object operation, unless the contract stipulates otherwise.

The contract of a concession is the contract whereby the state or the administrative-territorial unit transmits to an investor (a natural or a legal person, including foreign citizens) in exchange for a fee, the right*[...]* to provide public services in exploiting the movable and immovable public property *[...]*of the administrative-territorial units which under the law in force are fully or partially removed from the civil circulation, as well as the right to carry out the certain types of activities, including those the state has the monopoly of , taking the management of the concession object, presumptive risks and financial liability.

In the analysed case, the concession object can be movable and immovable property of public nature or private nature of the administrative-territorial units, including local public works and services.

The contract of the commercial society involves the association of a public and a private partners either under the contract of the commecial society, without creating any legal person, or through the establishing the commercial society (a limited liability company or a joint-stock company) based on the mixed capital (public-private).

Alternative I

Considering the objective of the Public-Private Partnership partners extension and contribution, we recommend 2 alternatives: (i) concession contract, or (ii) creation of a commecial society with the public-private capital.

The object of the concession in this case will be the public services (supply of the thermal agent from biomass) for the public institutions from the municipality involved. The aboe option also involves the concession of the existing Boiler plants after the Public –Private Partnership launching. The public services concession does not exclude the further extension of biomass-based Boiler plants.

The object of the creating of the public-private capital means that the new society will have the private partner shareholders and each of the municipalities participating in the Public-Private Partnership where the social part/number of shares will be proportional to the contribution in the social capital of the entity. The above alternative allows the further entry of other municipalities in the structure of associations/shareholders of new societies.

In this case, it means that the public partner will contribute to the social capital with the right to use property, the right to provide the public services and financial resources, while the private aprtner – with finance, other investment investment liabilities.

Creating the new society will assume administration costs, personnel and operational costs. Also, it will benecessary to establish the exact scope goal and obligations of the society, including obligations of the partners involved.

Alternative II

Structuring the alternative II, including the intention to expand, foresees the joining to the Public-Private Partnerhip of the municipalities that have Boiler plants and for which 16 pellet-based Boiler plants will be built within the project implementation. Considering this, it would be feasible to implement the Public-Private Partnership via concession, or through creating a commercial society with public-private capital similar to alternative 1.

Alternative III

Alternative III involves a combination of the services provided and fiduciary management so that the private partner will receive the Boiler plants management and will delivery the services in providing the biomass-based thermal energy.

Considering that the law stipulates that the Public-Private Partneship can be implemented through the contractual forms not prohibited by law, the Public-Private Partneship contract will be untitled including the elements of both the service contract and the contract of fiduciary management.

2. The implementation manner of the Public-Private Partnership contract.

The current legislation of the Republic of Moldova defines the implementation manner of the the Public-Private Partneship contracts depending on the level of involvement of the private partner. Among these, the most relevant in our case:

Construction-operation-transfer, when the private partner undertakes the construction, financing, operation and maintenance of the public property. The investor has the right to charge the fees for tariffs to return on the investmen and maintenance costs, as well as to obtain the reasonable profit. Upon the completion of the contract, the public property is transmitted to the public authorities on a free basis in a good state and free of any charges and obligations.

The construction–operation-transfer method applies to all three alternatives related to the administration of 5 Boiler plants transferred to the fiduciary management and providing the services of the biomass-based thermal agent supply.

Design-construction-operation through the construction and operation of the public-private partnership object and transfer to the private partner for up to 50 years. The public-private partnership project can be financed entirely by the private partner. Upon the expiry of the public

partner contract, the public-private partnership object is freely transferred to the public partner in a good stat, operational and free of any charges and obligations.

This method is applicable for the alternatives involving the design and construction of the pellet factory.

Construction-transfer-operation when the private partner assumes the construction of a property with further transmission to the public partner ownership immediately after the completion of the construction, and the public partner in turn passes to the private partner utilisation.

The construction-transfer-operation method is perfectly applicable for the expansion of the network of biomass-based Boiler plants when it is planned for the private partner to construct 16 new pellet-based Boiler plants (Alternative I and Alternative II).

Concurrently, it should be noted, that the law stipulates that Public-private partnership can be created via other methods not prohibited by the law.

Considering the above, the methods proposed are presented for each alternative.

Alternative I

Design-construction-transfer-operation-transfer

The private partner manages 5 existing Boiler plants and in parallel designs and constructs biomass-based pellet factory and 16 Boiler plants with further transmision in public partner ownership. Then he receives them under economic management. And upon the completion of the contract it returns them to the owners.

Alternative II

Design→construction→transfer →–operation→transfer.

The private partner manages 5 existing Boiler plants and designs and constructs 16 Boiler plants with further transmision in public partner ownership, then receives under economic management. And upon the completion of the contract it returns them to the owners.

Alternative III

transfer→operation→ transfer

The private partner receives the management of 5 existing Boiler plants, provides the thermal agent and upon the expiry of the contract returns back.

3. Partners involvement manner, benefits and risks sharing

	Alternative I	**Alternative** II	**Alternative** III
Involvement of public partners	1. Transmission in fiduciary management: 5 existing Boiler plant, 16 new Boiler plants; 2. Transmission of the right to provide the public service of biomass-based thermal agent supply. 3. Provision of co-financing in the form of a grant for the pellet factory 4. Allocation of land (including premise) for the construction of the factory	1. Transmission in fiducary management: 5 existing Boiler plants), 16 new Boiler plants , 2. Transmission of the right to provide the public service of biomass-based thermal agent supply. 3. Provision of co-financing in the form of a grant for the private partner for the construction and installation of pellet-based Boiler plant	1. Transmission in fiduciary management : 5 existing Boiler plants), 16 new Boiler plants , 2. Transmission of the right to provide the public service of biomass-based thermal agent supply 3. Provision of co-financing in the form of a grant for the private partner to bring down prices for the supply of the thermal agent;
Involvement of the private partner	Financing the construction of the factory, construction of 16 new Boiler plants, technical maintenance, supply of thermal agent, pellets distribution.	Financing of the construction of 16 new Boiler plants, technical maintenance, supply of the thermal agent. ,	Technical maintenance of 5 existing Boiler plants and supply of the thermal agent;
Benefits of public partners	• Performing the tasks in providing the thermal agent for 21 public institutions from the district, • Providing the sustainable and efficient operationof the biomass-based Boiler plants, • Reduction of the dependance on the fossil energy resources, • Creation the opportunity for the development of biomass	• Performing the tasks in providing the thermal agent for 21 public institutions from the district , • Reduction the dependence on the fossil energy resources, • Reduction of the need to extend the natural gas pipeline in the district villages.	• Performing the tasks in providing the thermal agent for 5 public institutions from the district • Providing the sustainability and efficiency of biomass-based Boiler plants,

	utilisationin thermal energy field, and providing the quality biofuel in the residential sector. • Reduction of the need to expand the natural gas pipeline in the district villages		
Benefits of the private partner	experience in biofuel production, obtaining the profit from providing the thermal agent within 20 years period	obtaining the profit from providing the thermal agent within 11 years period	obtaining the profit from providing the thermal agent within 10 years period
Major risks, bottleneck issues rhat may arise within the implementation period	**Political:** change in local Councils and local policies can lead to the termination of the Public-private Partnership contract or withdrawal from the Association of certain Local Public Associations **Economic:** 1. Dependence on the tariff calculation methodology of the thermal agent –can considerably increase the costs of public institutions heating, covered by the state budget. 2. Dependence on the raw material costs in the fuel production-can increase the thermal agent prime-cost. **Environment:** the occurence of natural calamities can reduce the biomass qiantity for the fuel production.	**Political:** the change in local Councils and local policies can lead to the termination of the Public-private Partnership contract or withdrawal from the Association of certain Local Public Associations **Economic:** 1.dependence on the tariff calculation methodology of the thermal agent-can considerably increase the costs of the public institutiosn heating, covered by the state budget.	**Political:** change in local Councils and local policies can lead to the termination of the Public-private Partnership contract or withdrawal from the Association of certain Local Public Associations **Economic:** 1. Dependence on the tariff calculation methodology of the thermal agent –can considerably increase the costs of public institutions heating, covered by the state budget.

4. Possible organisational and legal forms and steps to be taken

	Alternative I	**Alternative II**	**Alternative III**
Form of registration	▪ **Public partner:** the Association Agreement between the Public-Partner Partnership and the District Council, that would include the empowerment of the District Council to represent all the municipalities participating in the Ptblic-private Partnership and sign the Public-Orivate Partnership contract ▪ the Public-Private Partnership contract (concession or creation of public-private capital-based entity) ▪ When public-private capital society is created Ijoint-stock company/limited liabilities company), the association agreement and approval of the statute of a new society. Then the registration of new legal person will be necessary. *For more details see paragraph 1 : Contractual forms of Public-Private Partnership*	▪ **Public partner:** the Association Agreement between the Public-Partner Partnership and the District Council, that would include the empowerment of the District Council to represent all the municipalities participating in the Ptblic-private Partnership and sign the Public-private Partnership contract ▪ the Public-private Partnership contract (concession or creation of public-private capital-based entity) ▪ When public-private capital –based society is created (joint-stock company/limited liabilities company), the association agreement and approval of the statute of a new society. Then the registration of new legal person will be necessary. ▪ *For more details see paragraph 1 : Contractual forms of Public-Private Partnership implementation*	▪ **Public partner:** the Association Agreement among 3 municipalities participating in the Public-private Partnership and the District Council that would include the empowerment of District Council to represent the the municipalities participating in the Ptblic-private Partnership and sign the Public-private Partnership contract ▪ The Public-Private Partnership contract (the untitled contract including the service contract and fiduciary management contract) ▪ *For more details see paragraph 1 : Contractual forms of Public-Private Partnership implementation*

	implementation		
Drafting documents	- Decision of the District Council on Public-Private Partnership (PPP) (including approval the list of property and services of public interest for Public-Private Partnership) - Decisions of local Councils of the municipalities-Public-Private Partnership Participants - Association Agreement between the Public-Private Partneship municipalities and the District Council - The Contract of Public-Private Partnership - Acceptance statement of property transmitted to the private partner within the Public-Private Partneship - Draft standard services contract to be used for the supply of the thermal agent to the public institutions against payment.	- Decision of the District Council on Public-Private Partnership (PPP) (including approval the list of property and services of public interest for Public-Private Partnership) - Decisions of local Councils of the municipalities-Public-Private Partnership Participants - Association Agreement between the Public-Private Partneship municipalities and the District Council - The Contract of Public-Private Partnership - Acceptance statement of property transmitted to the private partner within the Public-Private Partneship - Draft standard services contract to be used for the supply of the thermal agent to the public institutions against payment.	- Decision of the District Council on Public-Private Partnership (PPP) (including approval the list of property and services of public interest for Public-Private Partnership) - Decisions of local Councils of the municipalities-Public-Private Partnership Participants - Association Agreement between the Public-Private Partneship municipalities and the District Council - The Contract of Public-Private Partnership - Acceptance statement of property transmitted to the private partner within the Public-Private Partneship - Draft standard services contract to be used for the supply of the thermal agent to the public institutions against payment.

5. Possible financing forms and Public-Private Partnership (PPP) contract duration

	PPP implementation form **1.**	PPP implementation form **2.**	PPP implementation form
Duration of PPP contract	20 years	11 years	10 years

Alternative 1 a

Planned financial sources	**total financing, lei**
Contribution of the private partner	4 986 000,00
Grant	1 700 000,00
Financing of the public partners from the state budget	554 000,00
Investment credit	10 780 000,00
Profit invested	400 000,00
Total	**18 420 000,00**

Alternative 1 b

Planned financial sources	**total financing, lei**
Contribution of the private partner	4 986 000,00
Grant	1 700 000,00
Financing of the public partners from the state budget	554 000,00
Investment credit	6 879 068,00
Profit invested	400 000,00
Total	**14 519 068,00**

Alternative 2

Planned financial sources	**total financing, lei**
Contribution of the private partner	1 246 000,00
Grant	1 700 000,00
Financing of the public partners from the state budget	554 000,00
Investment credit	4 600 000,00
Profit invested	400 000,00
Total	**8 500 000,00**

10.2. Description of the performance of the contract, including justification of the Public-Private Partnership Project term and conditions of the conclusion of the contract.

The final form of the performance of the contract is proposed to be under the following scheme:

Design → construction→ transfer→operation → transfer

The private partner takes over the management of 5 existing Boiler plants, designs and constructs 16 Boiler plants with further transmission under the public partner ownership. Then, the private partner takes over the economic management of them and upon completion of thecontract returns back to the owners.

In order to sign the Public-private Partnership contract it is necessary for the Leova District Council and all the municipalities –owners of the existing Boiler plants and 16 Boiler plants to be built/modernised in the project to :

- Approve in the local Councils the objective and public services list proposed to be included in the Public-Private Partnership
- Sign an association agreement to delegate the signing the Public-private partnership contract to Leova District Council;
- Accept the ownership of the Boiler plants built within the Energy and Biomass Project and transmit the economic management to the private partner;
- Owners/managers of the public institutions included in the Public-private Partnership will sign the service contract with the private partner in terms of supplying the biomass-based thermal agent
- Own the new pellet-based Boiler plants built by the private partner and transmit them in the economic management;

The Contract will be signed for a period of 11 years as the depriciation term of the solid fuel is of 10 tears, the Boiler plants construction is planned within the first 4 years of the project. According to the economic indicators calculations (finacial IRR) the most optimal IRR rate, 8.3%, is obtained after 11 years of operation. Longer period needs additional investments for updating the equipment and the Boiler plants. Taking into account the underdeveloped market of biomass thermal agent production in Moldova, it is risky to plan the activites for longer period of the investment exploitation.

The conclusion of the contract requires the following major conditions:

For the public partner –owning the property of the Public-Private Partnership-related Boiler plants, to assume the Boiler plants repair costs (in the amount of 545 000 lei), to provide cofinancing in the form of the grant of 1 700 000 lei for the construction of new Boiler plants.

For the private partner- to build /to upgrade 16 pellet-based Boiler plants, to provide own cofinancing in the amount of at least 1 246 000 lei, to own or to build, outside the Public-private partnership contract, the pellet factory for the production of the pellets from the straw or sawdust with the capacity of 1500-1600 tons per year , to provide the qualified staff certified in the field of the Boiler plants maintenance.

11. Description of the services/products provided under partnership framework (quantification, pricing)

The following types of services will result from the Public-private partnership applied:

- **Providing the thermal agent from straw, pellets and briquettes for 21 Boiler plants;**
- **Production and trading the pellets**

Within the Public-Private Partnership framework it is planned to produce and provide of maximum 8245 Gcal per year for the public institutions included in the Public-Private Partnership contract.

Prividing the thermal agent, in Gcal, (total amount of Gcal required for the institutions concerned from Leova district is given in *the table 12.1*- the data selected from *Annex 1)* from biomass will be provided for the public institutions: Tomaiul Nou, Cazangic (Seliste) and Sarata Noua- Leova district that currently have Boiler plants.

Table 12.1. Determination of the thermal energy demand for the analysed public institutions

Locality	Capacity of Boiler plant, kW	Type of fuel	Annual consumption of thermal agent at Boiler plant, kWh/year	Demand for thermal agent, Gcal/year	Demand for fuel, kg/h
Tomaiul Nou	81,00	briquettes	183 805,20	158,04	24,50
Seliste	25,00	briquettes	56 730,00	48,78	6,47
Cazangic	190,00	Packs of straw	431 148,00	370,72	56,16
Sarata Noua - (school)	340,00	Packs of straw	771 528,00	663,39	104,08
(kindergarten)	150,00	Packs of straw	340 380,00	292,67	45,92
Total			**1 783 591,20**	**1533,6**	

IV. Identifying and analyzing risk-sharing options for their management capacity (matrix)

	extremely small	small	medium	large	extremely large
Very small	1-4	3-8	5-12	7-16	9-20
small	3-8	9-16	15-24	21-32	27-40
medium	5-12	15-24	25-36	35-48	45-60
large	7-16	21-32	35-48	49-64	63-80
Very large	9-20	27-40	45-60	63-80	81-100
Category of a risk	**I**	**II**	**III**	**IV**	**V**

a. Political risk

1. Political risk					
Category of risk	**Description**	**outcomes**	**Attenuation**	**Solution I Variant A**	
				Impact	**Probal**
Political risk at the microeconomic level	Risk of financial, strategic or staff loss of the company, caused by the factors not related to the market, but social policies (fiscal, monetary, commecial, industrial, income, labourm development) Riscul unei pierderi financiare, strategice sau de personal a unei companii, cauzate de factori care nu ţin de piaţă, precum politici sociale (fiscale, monetare, comerciale, industriale, de venit, de muncă, de dezvoltare)	Diminuation of the revenues of the company	Assets backing of the company Asigurarea activelor companiei	Medium 15%	Mediu 15%
Political instability	Risk of change of the adminstration in the framework of the public partner, frequent changes of the political regime Riscul schimbării administraţiei în cadrul partenerului public, schimbări frecvente ale regimului politic	Possibility of modification of the management direction of the policy of the public partner, n egatively effecting the partnership relations.	Provision for a clause in the contract regulating the emergence of would be risks.	Large 49%	Large 49%

b. Legislative risk

2. Legislative risk					
Category of a risk	**Description**	**Outcomes**	Atttenuation	**Solution I Variant A**	
				Impact	**Probability**
Risk of legislative changes	Riscului introducerii unor dispoziţii legale care vor împiedica sau vor face neatractivă o afacere sau o tranzacţie, precum şi cu lipsa de certitudine privind prevederile legale în viitorul previzibil, modificare şi completarea	Decrease of revenues and/or increase of costs	Mărimea tarifelor la obiectele construite din resursele APL şi externe la solicitarea APL se vor afla sub controlul APL raionale şi locale. Se va solicita ajustarea tarifului cu argumente (suficient de semnificative) şi cuantificabile.	Medium 15%	Medium 15%

	legislaţiei				
Legal risk	Riscul înregistrării unei pierderi din cauza neaplicării sau aplicării defectuoase a prevederilor legale şi/sau contractuale şi/sau din cauza cadrului contractual necorespunzător sau insuficienta reglementare.	Posibilitatea pierderii unei părţi din profit, deteriorarea relaţiilor dintre parteneri	Stabilirea clară a clauzelor contractuale,	Medium 15%	Medium 15%

c. Financial and economic risk

3. Financial and economic risk					
Category of a risk	**Description**	**Outcomes**	**Attenuation**	**Solution Variant A**	
				Impact	**Proba**
Commercial risk	Insufiecienţa pieţei de desfacere, iar aceasta va duce la stoparea comercializării produsului finit - pelete prin supradimensioarea fabricii de peltizare	Diminuarea veniturilor, creşterea stocurilor de produse finite, sistarea procesului de lucru la fabrică	Partenerul privat cu experienţă selectat prin concurs, care aplică: publicitatea, metode de atragere a clienţilor şi de micşorare a costurilor, planificarea şi controlul.	Large 64%	Large 49%
Risk of price control	Expunerea la pierderi a întreprinderii al cărei preţ la produsele realizate şi serviciile prestate este reglementat total sau parţial de către autorităţile publice	Crearea incertitudinii privind cash-flow-urile viitoare	Stabilirea clauzei contractuale prin care tariful delivrare a agentului termic se va aproba anual	Large 69%	Large 69%
Investment risk	Asumarea unor riscuri în speranţa obţinerii unui cîştig viitor suficient pentru a	Pierderea sumei de bani investite	Respectarea metodologiei de calcul a tarifului o data la 5 ani, in care se include costul investiţiei	Small 30%	Large 30%

	compensa riscurile anticipate.				
Riscul of insolvency	Riscul că, întreprinderea administratoare devine insolvabila sau mai târziu se dovedeşte a fi nepotrivită pentru administrarea investiţiei.	Falimenarea companiei.	Partenerul privat va furniza garanţie bancară de bună execuţie, care se transferă automat APL şi pierde sumele deja investite, în caz de neterminare. APL va lansa o nouă procedură de selectare a PP.	Large 30%	Very 30%
Risk of obtaining the credit	Riscul că finanţarea externă va întârzia.	Nerespectarea termenelor de punere în funcţiune a utilităţilor, creşterea mărimii capitalului de lucru.	Ajustarea planului de acţiuni.	Small 15%	Very 15%

d. Risk of execution Riscul de executare

4. Risk of execution cul de executare					
Category of risk	**Description**	**Outcomes**	Attenuation	**Solution Variant**	
				Impact	**Prob**
Risk of placement	Riscul unor condiţii neprevăzute de amplasare a fabricii. Amplasarea fabricii în vecinătatea imediată a localităţii.	Costuri suplimentare de autorizare sau întârzierea parţială a unor activităţi, care conduc la diminuarea parţială a veniturilor.	Instituţiile APL şi raionale verifică corespunderea amplasării fabricii cu normele în vigoare.	Small 30%	Medi 30%
Risk of design	Riscul de proiectare constă în nerespectarea unor norme tehnice, întârzierea proiectării	Creşterea costurilor şi întârzierea proiectării şi/sau creşterea suplimentară a costurilor capitale	Calitatea proiectării poate fi asigurată prin experienţa unei instituţii de proiectări. Dacă proiectul respectă TOR, aceste consecinţe sunt minore.	Small 9%	Smal 9%
Risk of growth of investment costs	Riscul de evenimente care au loc pe durata construcţiei, conduc la imposibilitatea respectării graficului de dare în exploatare a obiectelor şi sau la mărirea costurilor	Creşterea costurilor investiţionale, diminuarea veniturilor	Acest risc poate fi evitat printr-o planificare coerentă a resurselor pentru executarea lucrărilor, prin implementarea unui sistem de prognoză şi verificare a costurilor efectuate şi necesare de realizat în perioada următoare. Responsabil este Întreprinderea administratoare a lucrărilor de construcţie	Small 9%	Smal 9%
Risk of operation costs	Riscul ca intrările necesare costă mai mult decât se anticipase	Creşterea costului de administrare	Partenerul privat poate aplica în relaţiile sale contractuale cu furnizorii angajamente pe termen lung.	Mediu m 25%	Medi 25%

Maintenance risk	Maintenance costs will increase in relation of anticipated costs Riscul ca costurile de întreţinere se vor majora în raport cu ce se anticipase	Growth of maintenance costs Creşterea costului de întreţinere	Partenerul privat va aplica contracte pe termen lung cu furnizorii de materiale şi servicii.	Mediu m 25%	Med 25%

e. Environment risk etc.

5. Environment risk								
Category of a risk	**Description**	**Outcomes**	Attenuation	**Solution I Variant A**		**Solution I Variant B**		**Allocation of a risk**
				Impact	**Probability**	**Impact**	**Probability**	
Environment risk	Probabilitatea producerii unor situaţii excepţionale (incendiu, inundaţii, secetă)	Insuficienţa sau lipsa materiei prime, deteriorarea creşterea costurilor la aceasta	Ajustarea planului de acţiune, prelungirea perioadei de punere în aplicare a contractului prin act adiţional, fără a schimba obiectivele, bugetul, activităţi şi rezultate.	Large 35%	Medium 35%	Large 35%	Medium 35%	Public and private partner
Risk of excessive pollution	Probabilitatea apariţiei unor cantităţi mari de praf în procesul de producere	Poluarea excesivă a mediului ambiant, îmbolnăvirea populaţiei	Determinarea tipului de activităţi si organizarea ciclului tehnologic astfel ca să nu fie poluat mediul şi	Large 21%	Small 21%	Large 21%	Small 21%	Private partner

			să nu se producă zgomot					

Allocation of risks

Table 4.1. Risks transferred, retained

Risk	**Solution I - Variant A**		**Solution I - Variant B**	
	Retained	**Transferred**	**Retained**	**Transferred**
Commercial risk	50	50	0	0
Price control risk	0	0	50	50
Insolvency risk	7	7	40	40
Placement risk	20	20	20	20

Risks values

V. Factors that ensures sustainability of PPP project:

1. The main technical and economic indicators of investment (total investment value, investment scheduling, and investment identification and objectives definition, including specification of the reference period);

General working hypothesis

The essence of financial analysis is to determine if or how much a project is valuable from a financial perspective, public or social. This can be expressed in several ways; the most meaningful and exactly way being use of investment projects performance indicators, namely:

- Internal rate of return **(IRR);**
- Net present value of the project **(NPV);**
- Benefits / Costs rate ($\mathbf{R_{B/C}}$**).**

IRR is defined as the interest rate that leads to zero the net present value of the investment.
VAN calculates the net present value of investment or of the capital by using a present rate (discount rate) and a series of payments (positive values) and income (negative values).
Benefits / costs report is the ratio of the discounted flow of benefits and costs discounted flow.

The results of the financial analysis are interpreted with the following reference values:
IRR > r (5%)
NPV> 0
Coefficient B /C >1

Determining project costs were made based on the following assumptions:

1. Inflation rates for future periods can be estimated based on developments of the previous periods or can be used from official sources of the forecast. Below can be used two approaches for inflation. The first is the separate application of inflation rate for all items of costs and revenues. A second approach consists in projecting costs and revenues in constant prices. The assumption is that indifferent the future rate of inflation, the influence will be proportional on both the costs and the revenues. In constructing models we apply the first variant of prices and tariffs determination.

2. Discount rate. The standard discount rate considered in the financial analysis is r = 5% (according to the European Commission recommendations), when calculating the discount rate (based on the inflation rate of 3,5% (according to the National Bank of Moldova[9]), Interest rate = 3,5% (according to the National Bank of Moldova [10]) and of the capital risk rate for 2013, according to Damodaran A. is 5.62% [11]), it will be equal to 12.62%. Using calculated rate will help to increase the NPV, but will not significantly influence the IRR.

3. Project currency. All project forecasts are calculated in MDL.

[9] http://www.bnm.md/md/current_inflation?redirect=1
[10] http://www.bnm.org/
[11] http://pages.stern.nyu.edu/~adamodar/

Hypothesis in economic and financial analysis (project scenario)

OPTION 1

4. Provision of public services of insurance with thermal agent from biomass of public institutions throw:

- Taking in economic management of 5 biomass boiler stations for provision of thermal agent from biomass, construction of 16 new boiler stations on pellets and taking them into management for provision of thermal agent from pellets, organization of pellet production to ensure with fuel the boiler stations .

- This solution was analyzed by 2 possible options for realization applied to pellet production plant construction:

- Option A- installation of 2 presses in the pellet production line for producing pellets from straw and sawdust pellets;
- Option B install 1 press of straw pellet production line.

OPTION 2

5. Provision of public services of insurance with thermal agent from biomass of public institutions throw:

- Taking in economic management of 5 biomass boiler stations for provision of thermal agent from biomass, construction of 16 new boiler stations on pellets and taking them into management for provision of thermal agent from pellets

OPTION 3

6. Provision of public services of insurance with thermal agent from biomass of public institutions throw:

- Taking in economic management of 5 biomass boiler stations from 4 town halls from Leova district for provision of thermal agent from biomass

Respective option does not require investment and has not been analyzed.

Presumed income evolution

OPTION 1

Analysis Option 1 permits identification of the following categories of income from:

- providing thermal agent to 5 boiler stations from 3 Leova town halls;
- selling pellets for ensuring boiler stations with fuel;
- extension of boiler stations network in the district by building 16 new boiler stations and taking them into management for provision of thermal agent from pellets**.**

In order to achieve projected revenues were taken as reference the following:

- market trading price of agricultural biomass pellet-1800 MDL / t;
- market trading price of woody biomass pellets-2000 MDL / t;
- Tariff for 1 Gcal-881, 77 MDL for existing and planned boiler station on different types of fuel will be recalculated and approved annually.
- Cost of a ton of agricultural biomass straw-500 MDL
- Cost of tons of woody biomass branches and sawdust-700 MDL
- The factory pellet production capacity –
  - 2500 tons / year of which 1500 tons of straw and 1000 of sawdust, the option with oversized factory
  - 1600 tons / year of straw, the option of sizing factory for necessary fuel calculated on the capacity of boiler stations included in the project

Estimated income for the first solution consists of:

• Revenue from selling pellets made at own factory for their own boiler stations and on market of excess

• Revenues from provision of thermal agent to existing boiler stations

• Revenues from provision of thermal agent to new boiler stations (in Table 5. 8.)

Option 1 a

Table 5.1: Estimated income of pellets production

Categories of revenue	Quantity	Price	Total revenues	Quantity produced monthly (maximum capacity)	Quantity produced monthly (testing)
Income from the sale of agricultural biomass pellets	1500	1700	2 700 000,00	166,67	100
Income from the sale of woody biomass pellets	988,29	2000	1 976 576,00	109,81	80,00

Table 5.2: Estimated income from provision of thermal agent of existing boiler station

Income from ensuring of thermal agent	Necessary Gcal	Gcal price	Total revenues per season (7 months)	Total monthly revenues
Kindergarten from Cazangic	370,72			
Kindergarten from Seliste	48,78			
Gymnasium from Sarata Noua	663,39			
Kindergarten from Sarata Noua	292,67			
Gymnasium -Kindergarten from Tomaiul-Nou	158,04			
Total	1.533,60	881,77	1 352 286,55	193 183,79

Table 5.3: Projection of revenue for a period of 20 years -option1a

Categories of revenues	1	2	3	4	5	6	7	8	9	10
Revenues from providing thermal agent to existing boiler station[12]	676.143,28	1.352.286,55	1.365.809,42	1.379.467,51	1.393.262,19	1.407.194,81	1.421.266,76	1.435.479,43	1.449.834,22	1.464.332,56
Income from the sale of fuel (agricultural biomass pellets)	2.460.000,00	2.700.000,00	2.727.000,00	5.508.540,00	5.563.625,40	5.619.261,65	5.675.454,27	5.732.208,81	5.789.530,90	5.847.426,21
Income from the sale of fuel (woody biomass pellets)	1.418.097,78	1.976.576,00	1.996.341,76	4.032.610,36	4.072.936,46	4.113.665,82	4.154.802,48	4.196.350,51	4.238.314,01	4.280.697,15
Revenues from new boiler station[13]	455.927,26	1.101.107,36	1.686.070,64	4.000.116,57	5.918.452,04	5.977.636,56	6.037.412,93	6.097.787,06	6.158.764,93	6.220.352,58
Total	676.143,28	1.352.286,55	1.365.809,42	1.379.467,51	1.393.262,19	1.407.194,81	1.421.266,76	1.435.479,43	1.449.834,22	1.464.332,56

Categories of revenues	11	12	13	14	15	16	17	18	19	20
Revenues from providing thermal agent to existing boiler station[14]	1.478.975,89	1.493.765,65	1.508.703,30	1.523.790,34	1.539.028,24	1.554.418,52	1.569.962,71	1.585.662,34	1.601.518,96	1.617.534,15

[12] According table 5.8
[13] According table 5.8
[14] According table 5.8

Income from the sale of fuel (agricultural biomas pellets)	5.905.900,47	5.964.959,48	6.024.609,07	6.084.855,16	6.145.703,71	6.207.160,75	6.269.232,36	6.331.924,68	6.395.243,93	6.459.196,37
Income from the sale of fuel (woody biomass pellets)	4.323.504,12	4.366.739,16	4.410.406,56	4.454.510,62	4.499.055,73	4.544.046,29	4.589.486,75	4.635.381,62	4.681.735,43	4.728.552,79
Revenues from new boiler station[15]	6.282.556,10	6.345.381,66	6.408.835,48	6.472.923,83	6.537.653,07	6.603.029,60	6.669.059,90	6.735.750,50	6.803.108,00	6.871.139,08
Total	**17.990.936,59**	**18.170.845,95**	**18.352.554,41**	**18.536.079,96**	**18.721.440,76**	**18.908.655,16**	**19.097.741,72**	**19.288.719,13**	**19.481.606,32**	**19.676.422,39**

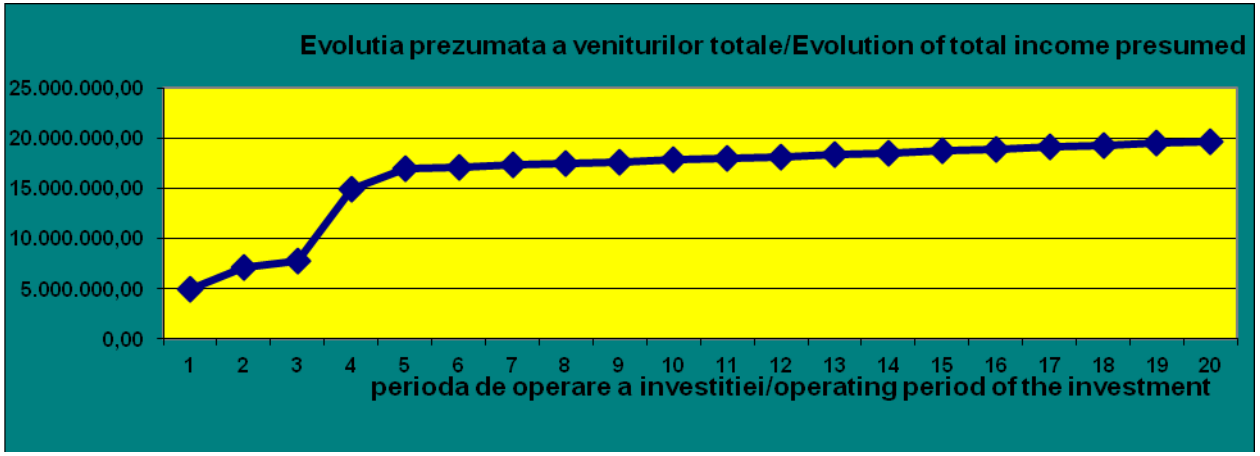


Figure 5.1: Evolution of total income presumed-option 1a

[15] According table 5.8

Option 1 b

Table 5.4: Estimated income of pellets production, option1b

Categories of revenues	Quantity	Price	Total revenues	Quantity produced monthly (maximum capacity)	Quantity produced monthly (testing)
Income from the sale of agricultural biomass pellets	1600	1700	2 720 000,00	177,78	100

Table 5.5 Projection of revenue for a period of 20 years -option1b

Categories of revenue	1	2	3	4	5	6	7	8	9	10
Income from the sale of thermal agent	676.143,28	1.352.286,55	1.365.809,42	1.379.467,51	1.393.262,19	1.407.194,81	1.421.266,76	1.435.479,43	1.449.834,22	1.464.332,56
Income from the sale of fuel (straw pellets)	818.518,52	906.666,67	457.866,67	2.720.000,00	2.747.200,00	2.774.672,00	2.802.418,72	2.830.442,91	2.858.747,34	2.887.334,81
Revenues from new boiler station[16]	455.927,26	1.101.107,36	1.686.070,64	4.000.116,57	5.918.452,04	5.977.636,56	6.037.412,93	6.097.787,06	6.158.764,93	6.220.352,58
Total	**1.950.589,06**	**3.360.060,58**	**3.509.746,73**	**8.099.584,08**	**10.058.914,23**	**10.159.503,37**	**10.261.098,41**	**10.363.709,39**	**10.467.346,48**	**10.572.019,95**

Categories of revenue	11	12	13	14	15	16	17	18	19	20

[16] According table 5.8

Income from the sale of thermal agent	1.478.975,89	1.493.765,65	1.508.703,30	1.523.790,34	1.539.028,24	1.554.418,52	1.569.962,71	1.585.662,34	1.601.518,96	1.617.534,15
Income from the sale of fuel (straw pellets)	2.916.208,16	2.945.370,24	2.974.823,94	3.004.572,18	3.034.617,90	3.064.964,08	3.095.613,72	3.126.569,86	3.157.835,56	3.189.413,91
Revenues from new boiler station[17]	6.282.556,10	6.345.381,66	6.408.835,48	6.472.923,83	6.537.653,07	6.603.029,60	6.669.059,90	6.735.750,50	6.803.108,00	6.871.139,08
Total	**10.677.740,15**	**10.784.517,55**	**10.892.362,73**	**11.001.286,35**	**11.111.299,22**	**11.222.412,21**	**11.334.636,33**	**11.447.982,69**	**11.562.462,52**	**11.678.087,15**

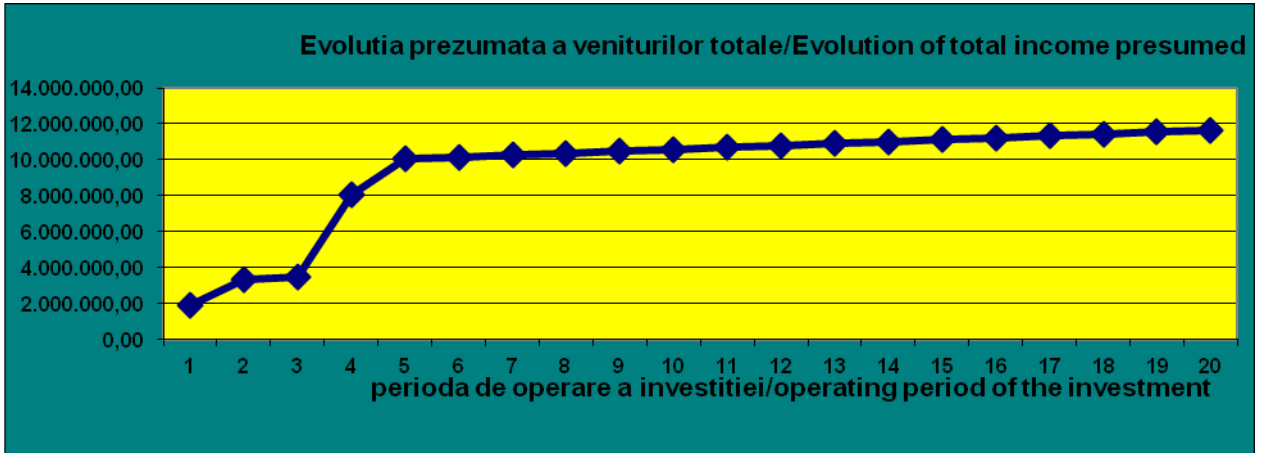


Figure 5.2: Evolution of total income presumed-option 1b

[17] According table 5.8

OPTION 2

In order to achieve option 2 was selected regions in which will be made the economic operator extension, and for the calculations were used estimates of the option 1.

Table 5.6: Estimation of the necessary investment, revenue forecasting for 16 new and 5 existing boiler station

no	location	Boiler station capacity, kW	Repair cost / boiler station room construction, lei /	Total cost per boiler (including installation costs),lei	Total investment, lei	/ Heat demand per season, Gcal	/Expenses for pelets, lei	Total revenues per year, lei
	2014							
1	Orac	100	40000	261000	301000	195,12	80901,7889	172.048,02
2	Colibabovca	60	48000	174000	222000	117,07	48541,07334	103.228,81
3	Vozniseni	120	24000	348000	372000	234,14	97082,14668	206.457,63
4	Ceadir	100	28000	261000	289000	195,12	80901,7889	172.048,02
5	Tochile Raducani	150	64000	464000	528000	292,67	121352,6833	258.072,04
	total per year	530,00	204.000,00	1.508.000,00	1.712.000,00	1.034,12	428.779,48	911.854,53
	2015							
6	Ceadir	100	28000	261000	289000	195,12	80901,7889	172.048,02
7	Sarata Rezesti	60	28000	130500	158500	117,07	48541,07334	103.228,81
8	Covurlui	60	48000	130500	178500	117,07	48541,07334	103.228,81
	total per year	220,00	104.000,00	522.000,00	626.000,00	429,26	177.983,94	378.505,65
	2016							
9	Orac	100	24000	261000	285000	195,12	80901,7889	172.048,02
10	Cneazevca	100	30000	261000	291000	195,12	80901,7889	172.048,02
11	Colibabovca	100	24000	261000	285000	195,12	80901,7889	172.048,02
12	Leova town	160	28000	493000	521000	312,19	129442,8622	275.276,84

	total per year	460,00	106.000,00	1.276.000,00	1.382.000,00	897,53	372.148,23	791.420,91
	2017							
13	Leova town	1500	48000	2610000	2658000	2.926,74	1213526,833	2.580.720,37
14	Leova town	330	28000	986000	1014000	643,88	266975,9034	567.758,48
15	Leova town, Independentiei, 3	200	32000	522000	554000	390,23	161803,5778	344.096,05
16	Leova town, Independentiei, 5	200	32000	522000	554000	390,23	161803,5778	344.096,05
	total per year	2.230,00	140.000,00	4.640.000,00	4.780.000,00	4.351,09	1.804.109,89	3.836.670,95
	total investment	3.440,00	554.000,00	7.946.000,00	8.500.000,00	6.711,99	2.783.021,54	5.918.452,04
	Wear new assets, equipment / boilers				754870,00			
	rooms wear / construction related to investment				55400			
	Kindergarten from Cazangic				14.383.820,00	370,72		326.890,76
	Kindergarten from Seliste					48,78	19910,4	43.012,87
	Gymnasium from Sarata Noua					663,39		584.959,17
	Kindergarten from Sarata Noua					292,67		258.068,40
	Gymnasium - Kindergarten from Tomaiul-Nou					158,04	66820,2	139.355,35
	total existent boiler station, MDL per year					1.533,60	86.730,60	1.352.286,55

Table 5.7: Tariff calculation for 1 Gcal-option 2

	total	New boilers station	Existent boilers stations	% New BS	% Existent BS
Costs	4973018,17	3637175,26	1335842,91		
profit 5%	248650,91	181858,76	66792,15		
Total wear per year	1122112,00	810270,00	311842,00		
The rate of assets profitability 9%	926957,52	715140,00	211817,52		
Total costs	7270738,60	5344444,02	1926294,58		
Total Gcal	8245,59	6711,99	1533,60	81,40	18,60
Price 1 Gcal without VAT	881,77	796,25	1256,06		
Proportional to the Gcal quantity in total amount ,lei		648,16	233,62		
total lei 1 Gcal		881,77			

Table 5.8: Projection of revenue for a period of 20 years –option2

Year	Existent boiler stations	New boiler stations	**Total**
0			
1	676.143	455.927	1.132.070,54
2	1.352.287	1.101.107	2.453.393,91
3	1.365.809	1.686.071	3.051.880,06
4	1.379.468	4.000.117	5.379.584,08
5	1.393.262	5.918.452	7.311.714,23
6	1.407.194,81	5.977.636,56	7.384.831,37
7	1.421.266,76	6.037.412,93	7.458.679,69
8	1.435.479,43	6.097.787,06	7.533.266,48

9	1.449.834,22	6.158.764,93	7.608.599,15
10	1.464.332,56	6.220.352,58	7.684.685,14
11	1.478.975,89	6.282.556,10	7.761.531,99

Presumed evolution of expenses

OPTION 1

Assumptions of cost estimates. In order to achieve cost estimates we assume the following hypotheses on the determination of costs for option 1:

1. Objects constructed or acquired are valued based on the latest cost or based of recent offers from construction companies.
2. Operational costs include costs for producing pellets and thermal agent production expenses for existing and new boiler stations.

Expenses for pellets production

a) Electric energy expenses;
b) Expenses for raw material;
c) Expenses for raw material transport;
d) MK expenses;
e) Consumption expenses;
f) Wear expenses;
g) Current reparations expenses;
h) Staff expenses;
i) Communications expenses;
j) Payment of Interest;

Expenses for thermal agent production

a) Expenses for transportation to boiler
b) Technical maintenance expenses

c) Expenses for briquettes procurement
d) Expenses for straw bales procurement
e) Expenses for pellets procurement

- **Expenses for pellets production**

Table 5.9: Projection of expenses for a period of 20 years –option1a

Categories of expenses	1	2	3	4	5	6	7	8	9	10
Expenses of pellets production from agricultural biomass	1.485.591,67	2.353.186,81	2.364.206,84	4.258.514,33	4.280.087,63	4.301.876,67	4.323.883,59	4.346.110,59	4.368.559,86	4.391.233,61
Expenses of pellets production from woody biomass	1.081.767,50	1.947.474,54	1.955.174,73	3.597.797,29	3.599.372,85	3.614.492,02	3.629.762,38	3.645.185,44	3.660.762,74	3.676.495,80
Expenses of assurance with thermal agent	667.921,46	1.335.842,91	1.335.842,91	1.335.842,91	1.349.201,34	1.362.693,35	1.376.320,29	1.390.083,49	1.403.984,32	1.418.024,17
Expenses from new boiler stations	374.923,67	894.444,16	1.305.327,53	2.604.394,67	3.637.175,26	3.673.547,01	3.710.282,48	3.747.385,30	3.784.859,16	3.822.707,75
Total	3.610.204,29	6.530.948,42	6.960.552,01	11.796.549,19	12.865.837,08	12.952.609,05	13.040.248,74	13.128.764,82	13.218.166,07	13.308.461,33
Categories of expenses	11	12	13	14	15	16	17	18	19	20
Expenses of pellets production from agricultural biomass	4.414.134,11	4.437.263,61	4.460.624,41	4.484.218,81	4.508.049,16	4.532.117,81	4.556.427,15	4.580.979,58	4.605.777,54	4.630.823,47
Expenses of pellets production from woody biomass	3.692.386,20	3.708.435,50	3.724.645,30	3.741.017,19	3.757.552,80	3.774.253,77	3.791.121,75	3.808.158,41	3.825.365,43	3.842.744,52
Expenses of assurance with thermal agent	1.432.204,41	1.446.526,45	1.460.991,72	1.475.601,63	1.490.357,65	1.505.261,23	1.520.313,84	1.535.516,98	1.550.872,15	1.566.380,87
Expenses from new boiler stations	3.860.934,83	3.899.544,18	3.938.539,62	3.977.925,01	4.017.704,26	4.057.881,31	4.098.460,12	4.139.444,72	4.180.839,17	4.222.647,56
Total	13.399.659,55	13.491.769,74	13.584.801,04	13.678.762,65	13.773.663,88	13.869.514,12	13.966.322,86	14.064.099,69	14.162.854,28	14.262.596,43

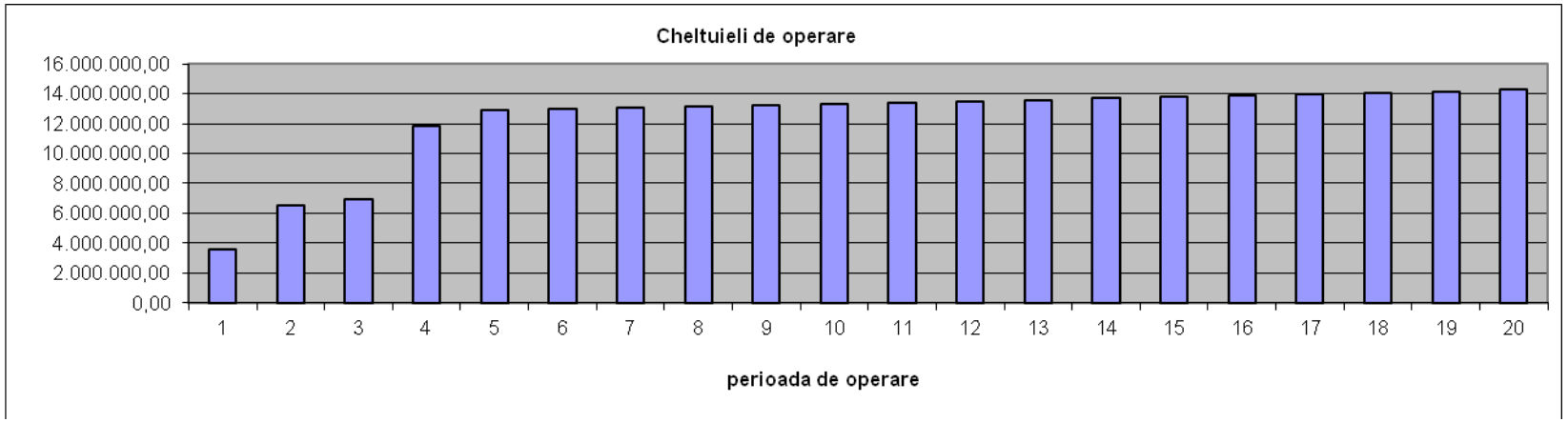


Figure: Presumed evolution of total expenses -option 1a

Table 5.10: Projection of expenses for a period of 20 years –option1b

Categories of expenses	1	2	3	4	5	6	7	8	9	10
Expenses of pellets production from agricultural biomass	1.879.489,44	2.811.031,75	2.823.769,67	2.835.069,06	2.848.047,35	2.861.155,42	2.874.394,58	2.887.766,12	2.901.271,39	2.914.911,70
Expenses of assurance with thermal agent	670.552,15	1.380.098,11	1.393.899,09	1.407.838,08	1.421.916,46	1.436.135,62	1.450.496,98	1.465.001,95	1.479.651,97	1.494.448,49
Expenses from new boiler stations	374.923,67	894.444,16	1.305.327,53	2.604.394,67	3.637.175,26	3.673.547,01	3.710.282,48	3.747.385,30	3.784.859,16	3.822.707,75
Total	2.924.965,26	5.085.574,02	5.522.996,29	6.847.301,80	7.907.139,07	7.970.838,06	8.035.174,04	8.100.153,38	8.165.782,51	8.232.067,94
Categories of expenses	11	12	13	14	15	16	17	18	19	20
Expenses of pellets production from agricultural biomass	2.928.688,42	2.942.602,90	2.956.656,53	2.970.850,69	2.985.186,80	2.999.666,27	3.014.290,53	3.029.061,04	3.043.979,25	3.059.046,64

Expenses of assurance with thermal agent	1.509.392,97	1.524.486,90	1.539.731,77	1.555.129,09	1.570.680,38	1.586.387,18	1.602.251,06	1.618.273,57	1.634.456,30	1.650.800,86
Expenses from new boiler stations	3.860.934,83	3.899.544,18	3.938.539,62	3.977.925,01	4.017.704,26	4.057.881,31	4.098.460,12	4.139.444,72	4.180.839,17	4.222.647,56
Total	8.299.016,22	8.366.633,98	8.434.927,92	8.503.904,80	8.573.571,45	8.643.934,76	8.715.001,71	8.786.779,32	8.859.274,72	8.932.495,06

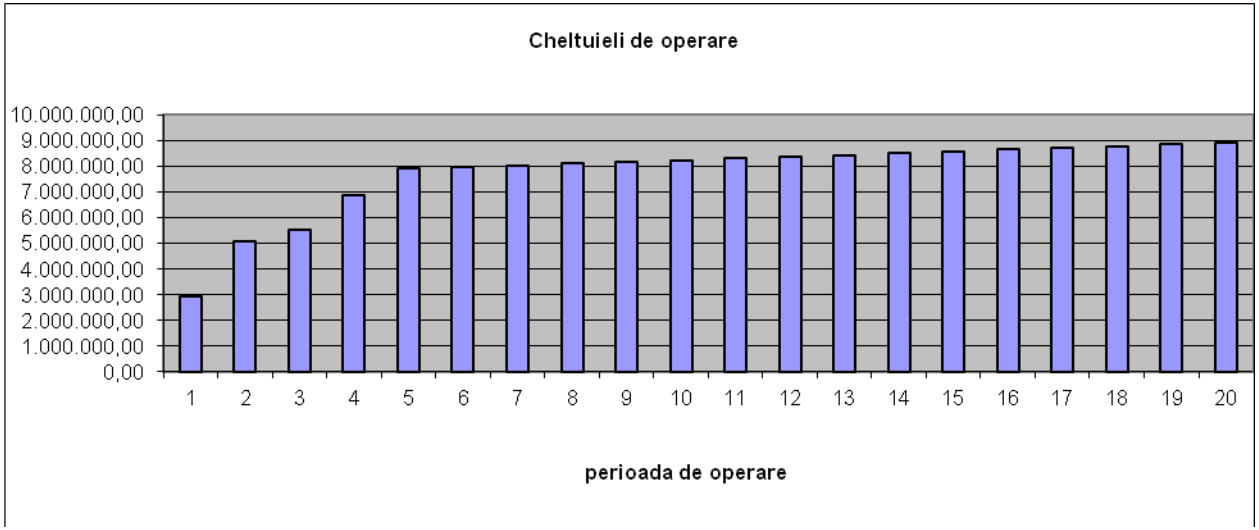


Figure: Presumed evolution of total expenses -option 1b

Table 5.11: Projection of expenses for pellets production from agricultural biomass for a period of 20 years –option1a

Categories of expenses	1	2	3	4	5	6	7	8	9	10
Electric energy expenses	382 666,67	424 200,00	428 442,00	865 452,84	874 107,37	882 848,44	891 676,93	900 593,70	909 599,63	918 695,63
Expenses for raw material transport	300 600,00	343 400,00	346 834,00	700 604,68	707 610,73	714 686,83	721 833,70	729 052,04	736 342,56	743 705,99
Expenses for raw material	83 500,00	850 000,00	850 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1700 000,00

MK expenses	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00
Consumption expenses	132 430,00	145 350,00	146 803,50	293 607,00	296 543,07	299 508,50	302 503,59	305 528,62	308 583,91	311 669,75
Wear expenses	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00
Current reparations expenses	15 030,00	17 170,00	17 341,70	35 030,23	35 380,54	35 734,34	36 091,69	36 452,60	36 817,13	37 185,30
Staff expenses	168 021,00	169 701,21	171 398,22	259 668,31	262 264,99	264 887,64	267 536,52	270 211,88	272 914,00	275 643,14
Communications expenses	720,00	727,20	734,47	1 483,63	1 498,47	1 513,45	1 528,59	1 543,87	1 559,31	1 574,91
Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	1 440,00	1 454,40	1 468,94	1 483,63	1 498,47	1 513,45	1 528,59	1 543,87	1 559,31	1 574,91
Total	**1 485 591,67**	**2 353 186,81**	**2 364 206,84**	**4 258 514,33**	**4 280 087,63**	**4 301 876,67**	**4 323 883,59**	**4 346 110,59**	**4 368 559,86**	**4 391 233,61**

Categories of expenses	11	12	13	14	15	16	17	18	19	20
Electric energy expenses	927 882,59	937 161,41	946 533,03	955 998,36	965 558,34	975 213,92	984 966,06	994 815,72	1 004 763,88	1 014 811,52
Expenses for raw material transport	751 143,05	758 654,48	766 241,02	773 903,43	781 642,47	789 458,89	797 353,48	805 327,01	813 380,28	821 514,09
Expenses for raw material	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00	1 700 000,00
MK expenses	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00	18 000,00
Consumption expenses	314 786,44	317 934,31	321 113,65	324 324,79	327 568,04	330 843,72	334 152,15	337 493,68	340 868,61	344 277,30
Wear expenses	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00	383 184,00
Current reparations expenses	37 557,15	37 932,72	38 312,05	38 695,17	39 082,12	39 472,94	39 867,67	40 266,35	40 669,01	41 075,70

Staff expenses	278 399,57	281 183,57	283 995,40	286 835,36	289 703,71	292 600,75	295 526,75	298 482,02	301 466,84	304 481,51
Communications expenses	1 590,66	1 606,56	1 622,63	1 638,85	1 655,24	1 671,80	1 688,51	1 705,40	1 722,45	1 739,68
Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	1 590,66	1 606,56	1 622,63	1 638,85	1 655,24	1 671,80	1 688,51	1 705,40	1 722,45	1 739,68
Total	**4 414 134,11**	**4 437 263,61**	**4 460 624,41**	**4 484 218,81**	**4 508 049,16**	**4 532 117,81**	**4 556 427,15**	**4 580 979,58**	**4 605 777,54**	**4 630 823,47**

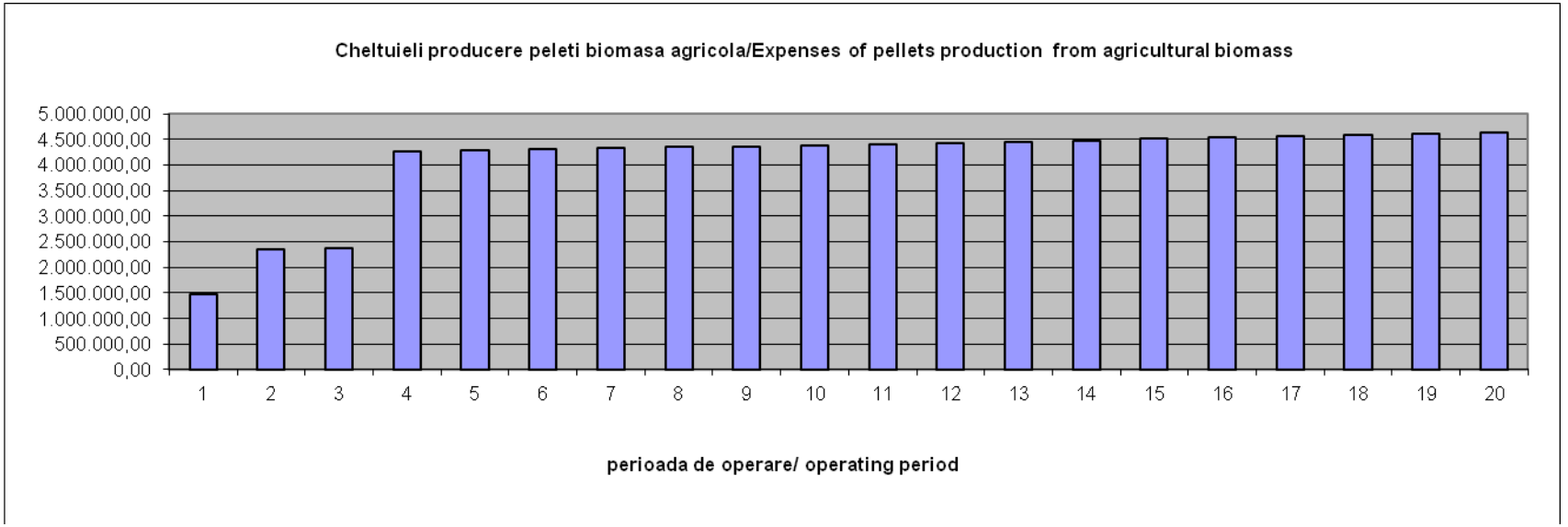


Figure: Presumed evolution of expenses for pellets production from agricultural biomass –option1a

Table 5.12: Projection of expenses for pellets production from woody biomass for a period of 20 years –option1a

Categories of expenses	1	2	3	4	5	6	7	8	9	10
Electric energy expenses	245 000,00	282 800,00	285 628,00	576 968,56	582 738,25	588 565,63	594 451,28	600 395,80	606 399,76	612 463,75
Expenses for raw material transport	239 400,00	262 600,00	265 226,00	535 756,52	541 114,09	546 525,23	551 990,48	557 510,38	563 085,49	568 716,34
Expenses for raw material	119 700,00	910 000,00	910 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00
MK expenses	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00
Consumption expenses	84 787,50	96 900,00	97 869,00	195 738,00	197 695,38	199 672,33	201 669,06	203 685,75	205 722,61	207 779,83
Wear expenses	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00
Current reparations expenses	11 970,00	13 130,00	13 261,30	26 787,83	13 527,85	13 663,13	13 799,76	13 937,76	14 077,14	14 217,91
Staff expenses	112 014,00	113 134,14	114 265,48	173 112,20	174 843,33	176 591,76	178 357,68	180 141,25	181 942,67	183 762,09
Communications expenses	480,00	484,80	489,65	989,09	998,98	1 008,97	1 019,06	1 029,25	1 039,54	1 049,94
Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	960,00	969,60	979,30	989,09	998,98	1 008,97	1 019,06	1 029,25	1 039,54	1 049,94
Total	**1 081 767,50**	**1 947 474,54**	**1 955 174,73**	**3 597 797,29**	**3 599 372,85**	**3 614 492,02**	**3 629 762,38**	**3 645 185,44**	**3 660 762,74**	**3 676 495,80**

Categories of expenses	11	12	13	14	15	16	17	18	19	20
Electric energy expenses	618 588,39	624 774,27	631 022,02	637 332,24	643 705,56	650 142,62	656 644,04	663 210,48	669 842,59	676 541,01

Expenses for raw material transport	574 403,51	580 147,54	585 949,02	591 808,51	597 726,59	603 703,86	609 740,90	615 838,30	621 996,69	628 216,65
Expenses for raw material	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00	1 820 000,00
MK expenses	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00	12 000,00
Consumption expenses	209 857,63	211 956,21	214 075,77	216 216,53	218 378,69	220 562,48	222 768,10	224 995,78	227 245,74	229 518,20
Wear expenses	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00	255 456,00
Current reparations expenses	14 360,09	14 503,69	14 648,73	14 795,21	14 943,16	15 092,60	15 243,52	15 395,96	15 549,92	15 705,42
Staff expenses	185 599,71	187 455,71	189 330,27	191 223,57	193 135,81	195 067,16	197 017,84	198 988,01	200 977,90	202 987,67
Communications expenses	1 060,44	1 071,04	1 081,75	1 092,57	1 103,50	1 114,53	1 125,68	1 136,93	1 148,30	1 159,78
Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	1 060,44	1 071,04	1 081,75	1 092,57	1 103,50	1 114,53	1 125,68	1 136,93	1 148,30	1 159,78
Total	**3 692 386,20**	**3 708 435,50**	**3 724 645,30**	**3 741 017,19**	**3 757 552,80**	**3 774 253,77**	**3 791 121,75**	**3 808 158,41**	**3 825 365,43**	**3 842 744,52**

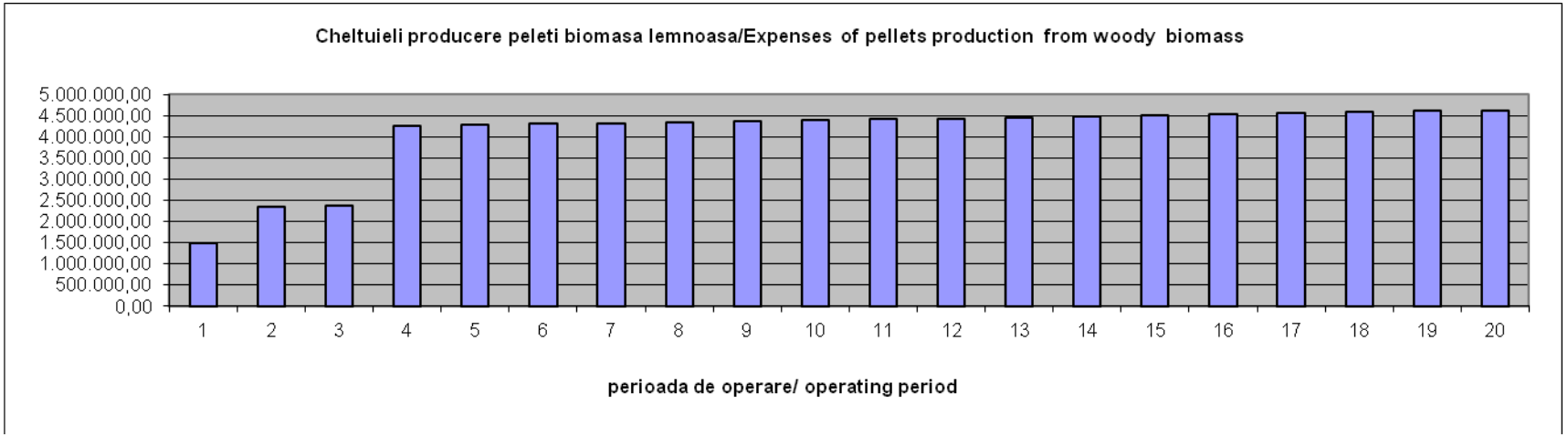


Figure: Presumed evolution of expenses for pellets production from woody biomass –option1a

Table 5.13: Projection of expenses for pellets production from straw for a period of 20 years –option1b

Categories of expenses	1	2	3	4	5	6	7	8	9	10
Electric energy expenses	404.444,44	452.480,00	457.004,80	461.574,85	466.190,60	470.852,50	475.561,03	480.316,64	485.119,80	489.971,00
Expenses for raw material transport	300.600,00	363.600,00	367.236,00	370.908,36	374.617,44	378.363,62	382.147,25	385.968,73	389.828,41	393.726,70
/ Expenses for raw material	83.500,00	900.000,00	900.000,00	900.000,00	900.000,00	900.000,00	900.000,00	900.000,00	900.000,00	900.000,00
MK expenses	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00
Consumption expenses	155.040,00	155.040,00	156.590,40	156.590,40	158.156,30	159.737,87	161.335,25	162.948,60	164.578,08	166.223,86
Wear expenses	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00	607.240,00
Current reparations expenses	15.030,00	17.170,00	17.341,70	17.515,12	17.690,27	17.867,17	18.045,84	18.226,30	18.408,56	18.592,65
Staff expenses	280.035,00	282.835,35	285.663,70	288.520,34	291.405,54	294.319,60	297.262,80	300.235,42	303.237,78	306.270,16
Communications expenses	1.200,00	1.212,00	1.224,12	1.236,36	1.248,72	1.261,21	1.273,82	1.286,56	1.299,43	1.312,42
Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	2.400,00	1.454,40	1.468,94	1.483,63	1.498,47	1.513,45	1.528,59	1.543,87	1.559,31	1.574,91
Total	**1.879.489,44**	**2.811.031,75**	**2.823.769,67**	**2.835.069,06**	**2.848.047,35**	**2.861.155,42**	**2.874.394,58**	**2.887.766,12**	**2.901.271,39**	**2.914.911,70**

Categories of expenses	11	12	13	14	15	16	17	18	19	20
Electric energy expenses	494 870,71	499 819,42	504 817,61	509 865,79	514 964,45	520 114,09	525 315,23	530 568,39	535 874,07	541 232,81
Expenses for raw material transport	397 663,97	401 640,60	405 657,01	409 713,58	413 810,72	417 948,82	422 128,31	426 349,60	430 613,09	434 919,22

/ Expenses for raw material	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00	900 000,00
MK expenses	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00	30 000,00
Consumption expenses	167 886,10	169 564,96	171 260,61	172 973,22	174 702,95	176 449,98	178 214,48	179 996,63	181 796,59	183 614,56
Wear expenses	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00	607 240,00
Current reparations expenses	18 778,58	18 966,36	19 156,03	19 347,59	19 541,06	19 736,47	19 933,84	20 133,18	20 334,51	20 537,85
Staff expenses	309 332,86	312 426,19	315 550,45	318 705,95	321 893,01	325 111,94	328 363,06	331 646,69	334 963,16	338 312,79
Communications expenses	1 325,55	1 338,80	1 352,19	1 365,71	1 379,37	1 393,16	1 407,09	1 421,17	1 435,38	1 449,73
/ Payment of Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Waste disposal expenses	1 590,66	1 606,56	1 622,63	1 638,85	1 655,24	1 671,80	1 688,51	1 705,40	1 722,45	1 739,68
Total	**2 928 688,42**	**2 942 602,90**	**2 956 656,53**	**2 970 850,69**	**2 985 186,80**	**2 999 666,27**	**3 014 290,53**	**3 029 061,04**	**3 043 979,25**	**3 059 046,64**

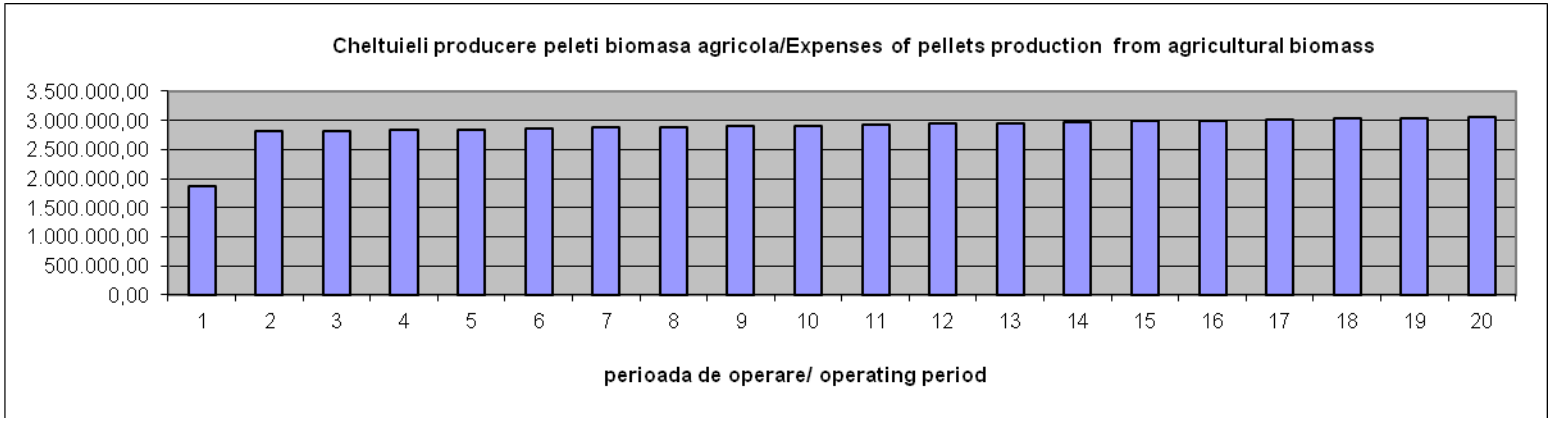


Figure: Presumed evolution of expenses for pellets production from straw –option1b

Deciphering of the pellets producing costs

Detailed calculation of the pellets producing cost is exemplified in the tables of Annexes, and the graphical representation of these is shown in the figures below:

Electrical energy expenses

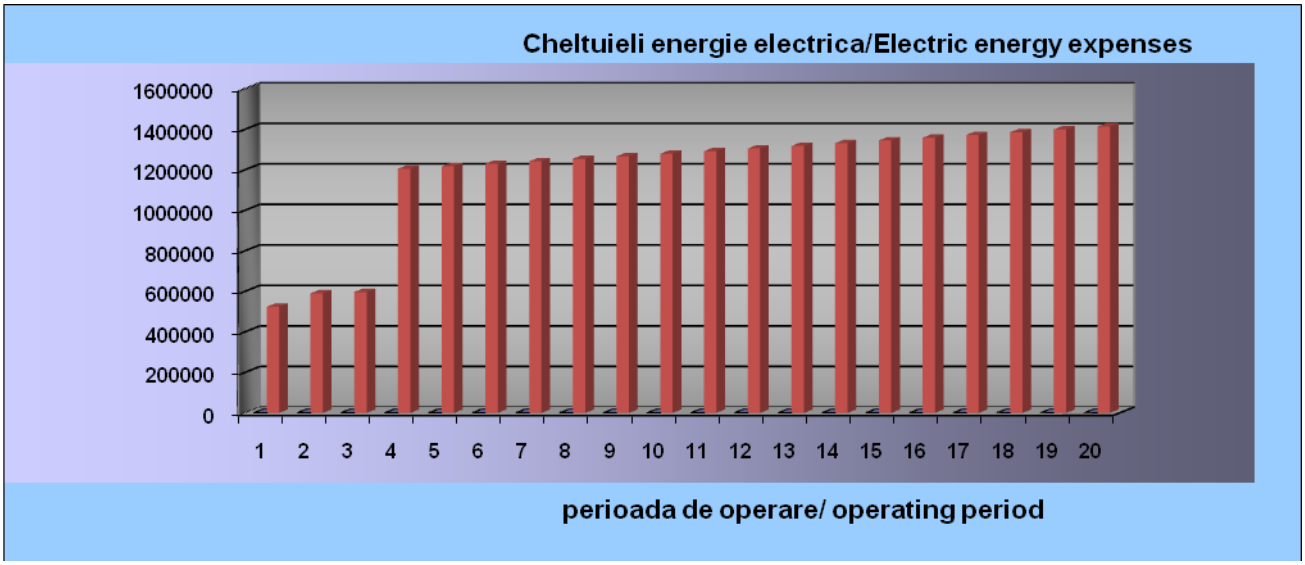


Figure: Presumed evolution of energy costs expenses for pellets production- option 1a

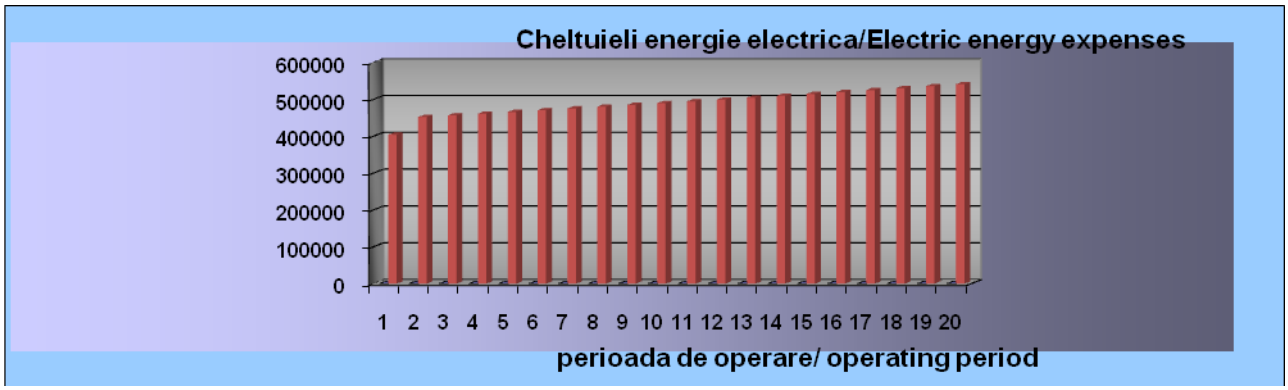


Figure: Presumed evolution of energy costs expenses for pellets production - option 1b

Transport expenses of raw materials

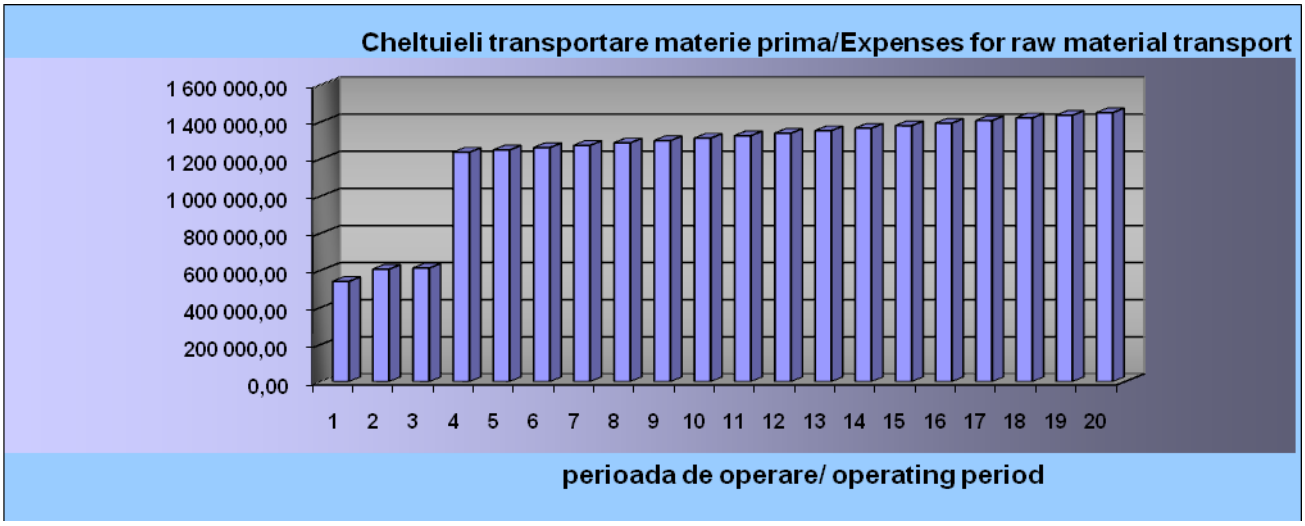


Figure: Presumed evolution of transportation expenses of raw materials for the pellets production - Option 1a

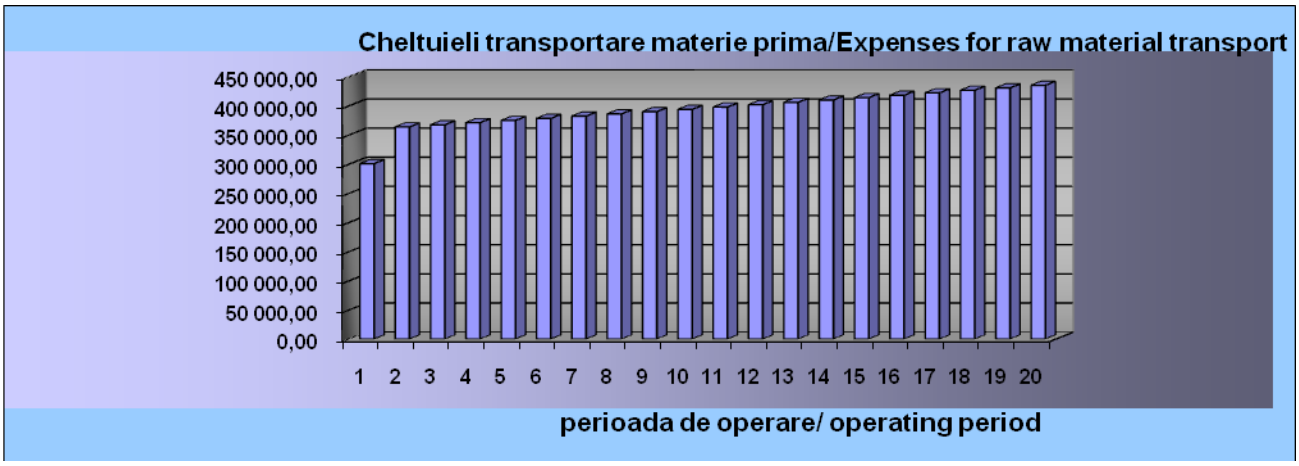


Figure: Presumed evolution of transportation expenses of raw materials for the pellets production - Option 1b

Expenses of raw materials procurement

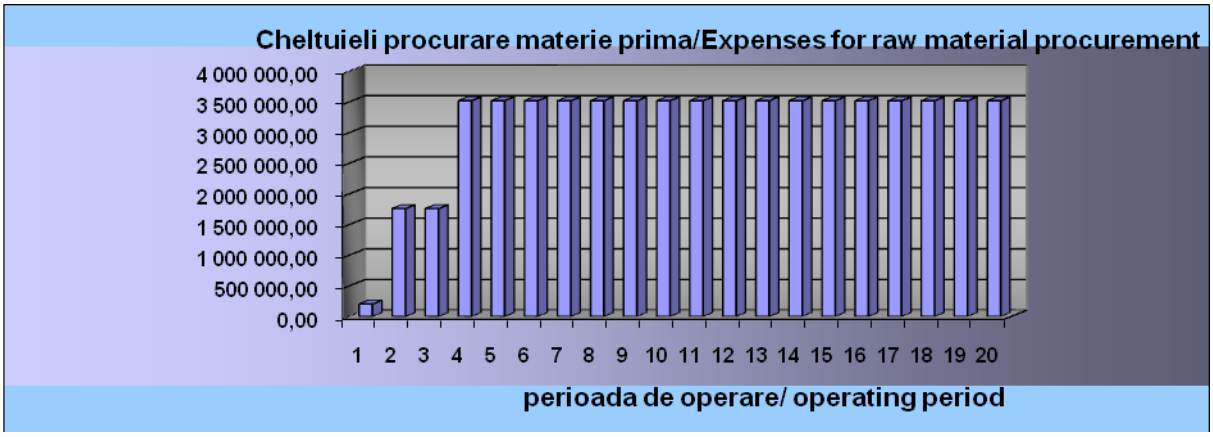


Figure: Presumed evolution of expenses with raw materials procurement for the pellets production, option 1a

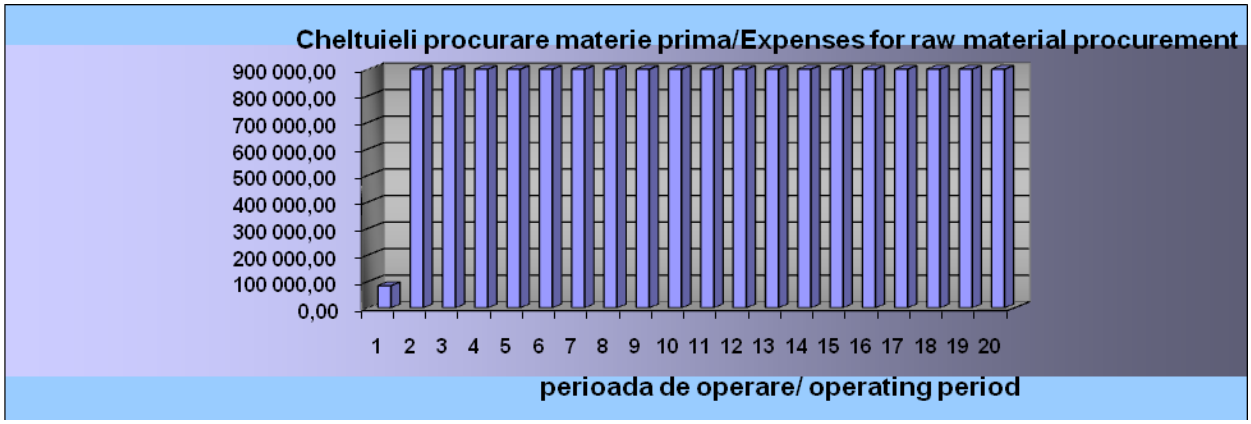


Figure: Presumed evolution of expenses with raw materials procurement for the pellets production, option 1b

Marketing expenses

Table for deciphering of marketing expenses is presented in the annexes, their quantum, does not exceed amount of 30,000 MDL per year.

Consumption expenditure

For producing of 1 tonnes of pellets are used consumables in the amount of MDL 96.9, detailed calculation is presented in Annexes.

Expenses related to wear

In calculating of wear were took into account the estimated useful life of the investment elements that constitutes 50, 15 and 10 years.

Repairs expenses

The basis for equipment reparation costs calculation are the quantity and estimate cost of 10 MDL/tonne of processed raw materials.

Personal expenses

For investment realization will be employed a manager, an accountant, 6 persons in the production department and a guardian, which will work 9 months per year, 6 days per week, personnel from production in two shifts.

As a result of the performed estimates was calculated the prime cost for a tonne of produced pellets from agricultural and woody biomass, in the calculation process was determined that the first year of the factory operation will not produce at full capacity, will have 2 months of testing and for the option 1a from the year 4 produced capacity will be double.

Table 5.14: Projection of the prime cost of pellet for a period of 20 years- option1a

	1	2	3	4	5	6	7	8	9	10
The quantity of straw pellets produced annually	1.367	1500	1500	3000	3000	3000	3000	3000	3000	3000
The quantity of wood pellets produced annually	875	1000	1000	2000	2000	2000	2000	2000	2000	2000
Expenses for the production of straw pellets	1.485.591,67	2.353.186,81	2.364.206,84	4.258.514,33	4.280.087,63	4.301.876,67	4.323.883,59	4.346.110,59	4.368.559,86	4.391.233,61
Expenses for the production of wood pellets	1.081.767,50	1.947.474,54	1.955.174,73	3.597.797,29	3.599.372,85	3.614.492,02	3.629.762,38	3.645.185,44	3.660.762,74	3.676.495,80
Prime cost of a ton of straw pellets	**1.087,02**	**1.568,79**	**1.576,14**	**1.419,50**	**1.426,70**	**1.433,96**	**1.441,29**	**1.448,70**	**1.456,19**	**1.463,74**
Prime cost of a ton of wood pellets	**1.236,31**	**1.947,47**	**1.955,17**	**1.798,90**	**1.799,69**	**1.807,25**	**1.814,88**	**1.822,59**	**1.830,38**	**1.838,25**

	11	12	13	14	15	16	17	18	19	20
The quantity of straw pellets produced annually	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
The quantity of wood pellets produced annually	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Expenses for the production of straw pellets	4.414.134,11	4.437.263,61	4.460.624,41	4.484.218,81	4.508.049,16	4.532.117,81	4.556.427,15	4.580.979,58	4.605.777,54	4.630.823,47

Expenses for the production of wood pellets	3.692.386,20	3.708.435,50	3.724.645,30	3.741.017,19	3.757.552,80	3.774.253,77	3.791.121,75	3.808.158,41	3.825.365,43	3.842.744,52
Prime cost of a ton of straw pellets	**1.471,38**	**1.479,09**	**1.486,87**	**1.494,74**	**1.502,68**	**1.510,71**	**1.518,81**	**1.526,99**	**1.535,26**	**1.543,61**
Prime cost of a ton of wood pellets	**1.846,19**	**1.854,22**	**1.862,32**	**1.870,51**	**1.878,78**	**1.887,13**	**1.895,56**	**1.904,08**	**1.912,68**	**1.921,37**

Table 5.15: Projection of the prime cost of pellet for a period of 20 years-opțiunea1b

	1	2	3	4	5	6	7	8	9	10
The quantity of straw pellets produced annually	1.444	1500	1500	3000	3000	3000	3000	3000	3000	3000
Expenses for the production of straw pellets	1.879.489,44	2.811.031,75	2.823.769,67	2.835.069,06	2.848.047,35	2.861.155,42	2.874.394,58	2.887.766,12	2.901.271,39	2.914.911,70
Prime cost of a ton of straw pellets	**1.301,19**	**1.874,02**	**1.882,51**	**945,02**	**949,35**	**953,72**	**958,13**	**962,59**	**967,09**	**971,64**

	11	12	13	14	15	16	17	18	19	20
The quantity of straw pellets produced annually	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Expenses for the production of straw pellets	2.928.688,42	2.942.602,90	2.956.656,53	2.970.850,69	2.985.186,80	2.999.666,27	3.014.290,53	3.029.061,04	3.043.979,25	3.059.046,64
Prime cost of a ton of straw pellets	**976,23**	**980,87**	**985,55**	**990,28**	**995,06**	**999,89**	**1.004,76**	**1.009,69**	**1.014,66**	**1.019,68**

- **Expenses for assurance with thermal agent from existing central and new boiler station**

Table 5.16: The expenses projection of assurance with thermal agent from existing and new boiler station -option1

N.	Placement locality	Expenses of transport to boiler, MDL	Technical service expenses, MDL	Personal expenses, MDL	Expenses for procurement straw bales, MDL	Expenses for pelets, MDL	AdministratiVe costs, MDL	expenses with electricity energy from boiler station, MDL	Comunication costs, MDL	Total cost, MDL/year
	2014									
1	Orac	3.807,14	2610	30.480,00		80901,7889		2.058,00		
2	Colibabovca	2.284,29	1740	30.480,00		48541,07334		2.058,00		
3	Vozniseni	4.568,57	3480	30.480,00		97082,14668		2.058,00		
4	Ceadir	3.807,14	2610	30.480,00		80901,7889		2.058,00		
5	Tochile Raducani	5.710,71	4640	30.480,00		121352,6833		2.058,00		
	total per year	20.177,86	15.080,00	152.400,00	0,00	428.779,48	121.920,00	10.290,00	1.200,00	749.847,34
	2015									
6	Ceadir	3.807,14	2610	30.480,00		80901,7889		2.058,00		
7	Sarata Rezeati	2.284,29	1305	30.480,00		48541,07334		2.058,00		
8	Covurlui	2.284,29	1305	30.480,00		48541,07334		2.058,00		
	total per year	8.375,71	5.220,00	91.440,00	0,00	177.983,94	0,00	6.174,00		289.193,65
	2016									
9	Orac	3.807,14	2610	30.480,00		80901,7889		2.058,00		
10	Cneazevca	3.807,14	2610	30.480,00		80901,7889		2.058,00		
11	Colibabovca	3.807,14	2610	30.480,00		80901,7889		2.058,00		
12	Leova town	6.091,43	4930	30.480,00		129442,8622		2.058,00		
	total per year	17.512,86	12.760,00	121.920,00	0,00	372.148,23	0,00	8.232,00		532.573,09

	2017									
13	Leova town	57.107,15	26100	30.480,00		1213526,833		2.058,00		
14	Leova town	12.563,57	9860	30.480,00		266975,9034		2.058,00		
15	Leova town, Independentiei, 3	7.614,29	5220	30.480,00		161803,5778		2.058,00		
16	Leova town, Independentiei, 5	7.614,29	5220	30.480,00		161803,5778		2.058,00		
	total per year	84.899,29	46.400,00	121.920,00	0,00	1.804.109,89	0,00	8.232,00		2.065.561,18
	total investment	130.965,72	79.460,00	487.680,00	0,00	2.783.021,54	121.920,00	32.928,00	1.200,00	3.637.175,26
	new assets wear, equipment / boiler									
	room wear / construction related investment									
	Kindergarten from Cazangic	30734	13144,79	243840	69151,5					
	Kindergarten from Selişte	1536,42	3634,11	30480		19910,4		1.719,90		
	Gymnasium from Sarata Noua	55000	17548,4	243840	123750					
	Kindergarten from Sarata Noua	24264	13741,66	243840	54594					
	Gymnasium - Kindergarten Tomaiul-Nou	5156,29	10119,24	60960		66820,2		2.058,00		
	Total existing boiler, MDL year	116.690,71	58.188,20	822.960,00	247.495,50	86.730,60		3.777,90		1.335.842,91

OPTION 2

Structure and value of operating costs for new and existing boiler stations coincides with the expenses for assurance of thermal agent from option 1.

Table 5.17: Expenses projection during a period of 13 years - option 2

Year	Wear	variable costs		Costs of current repairs	Residual value	Total cost for calculation of taxable base	Total cost with tax	Revenue tax, 12%
		Existent	New					
**								
0								
1	510.502	667.921	374.924			1.553.347	1.042.845	0
2	560.092	1.335.843	894.444			2.790.379	2.230.287	0
3	681.407	1.335.843	1.305.328			3.322.577	2.641.170	0
4	1.122.207	1.335.843	2.604.395			5.062.445	3.978.294	38056,74073
5	1.122.207	1.349.201	3.637.175	1.000.000		7.108.584	6.010.752	24375,6761
6	1.122.207	1.362.693	3.673.547			6.158.447	5.183.406	147166,0813
7	1.122.207	1.376.320	3.710.282			6.208.810	5.236.587	149984,3905
8	1.122.207	1.390.083	3.747.385			6.259.676	5.290.300	152830,8828
9	1.122.207	1.403.984	3.784.859			6.311.050	5.344.549	155705,84
10	1.122.207	1.418.024	3.822.708			6.362.939	5.399.341	158609,5468
11	1.122.207	1.432.204	3.860.935		-1.298.765	6.415.346	4.155.917	161542,2907

2. Sources of investment financing (own funds, bank loans, budget funds for state / local budget, foreign loans contracted or guaranteed by the State; nonreimbursable external funds, other legally constituted sources);

For each from these 3 solutions of project realization of PPP was estimated necessary investments volumes depending on the necessary infrastructure for their realization.

For each alternative were analyzed the funding opportunities taking into consideration the projected cash flows for the whole period of validity of the PPP contract.

- **Option 1a service provision of assurance with thermal agent with 21 boiler stations and producing own pellets**

In case of option 1a funding sources of investment a total amount of MDL 18 020 000.00 will constitute:

Table 5.18: Investment rescheduling and funding sources for the option 1a

Option 1

Planned funding sources	project year				Total funding, MDL
	zero year, MDL	first year, MDL	second and third year, MDL	year 11, MDL	
Private partner contribution	3 740 000,00		1 246 000,00		4 986 000,00
Funding of the public partners from grant - nonreimbursable funding from eligible funds	1 700 000,00				1 700 000,00
Financing of the public partners from the state budget	0,00	12 000,00	542 000,00	0,00	554 000,00
Investment credit	0,00	5 780 000,00	5 000 000,00	0,00	10 780 000,00
Reinvested profit	0,00	0,00	400 000,00	0,00	400 000,00
Total	**5 440 000,00**	**5 792 000,00**	**7 188 000,00**	**0,00**	**18 420 000,00**

- **Option 1b service provision of assurance with thermal agent with 21 boiler stations and producing own pellets**

In case of option 1b funding sources of investment in total value of 14 119 068.00 MDL will constitute:

Tabel 5.19: Investment rescheduling and funding sources for the option **1b**

Option 1 b

Planned funding sources	project year				Total funding, MDL
	zero year, MDL	first year, MDL	second and third year, MDL	year 11, MDL	
Private partner contribution	3 740 000,00		1 246 000,00		4 986 000,00
Funding of the public partners from grant - nonreimbursable funding from eligible funds	1 700 000,00				1 700 000,00
Financing of the public partners from the state budget	0,00	12 000,00	542 000,00	0,00	554 000,00
Investment credit	0,00	1 879 068,00	5 000 000,00	0,00	6 879 068,00
Reinvested profit	0,00	0,00	400 000,00	0,00	400 000,00
Total	**5 440 000,00**	**1 891 068,00**	**7 188 000,00**	**0,00**	**14 519 068,00**

Option 2 service provision of assurance with thermal agent with 21 boiler stations and with purchased fuel

For option 2 were analyzed two variants of investment financing: partial (50%)from grant and total from credit or own financing from private partner. Analysis of cumulative cash flow confirmed that this option is not economically and financially viable. It can only be achieved with partial funding from the grant, at least 50%.

Table 5.20: Investment rescheduling and funding sources for option 2

Option 2

Planned funding sources	project year				Total funding, MDL
	zero year, MDL	first year, MDL	second and third year, MDL	year 11, MDL	
Private partner contribution			1 246 000,00		1 246 000,00
Funding of the public partners from grant - nonreimbursable funding from eligible funds	1 700 000,00				1 700 000,00
Financing of the public partners		12 000,00	542 000,00	0,00	554 000,00

from the state budget					
Investment credit	0,00		4 600 000,00	0,00	4 600 000,00
Reinvested profit	0,00	0,00	400 000,00	0,00	400 000,00
Total	**1 700 000,00**	**12 000,00**	**6 788 000,00**	**0,00**	**8 500 000,00**

Opportunities to attract funding from National Funds in the relevant field of the project:

Energy Efficiency Agency offers in leasing and pellet equipment, along with briquetting lines, previously available from credit line of EUR 500 thousand.
A decision to this regard was approved on April 18, by Economics Deputy Minister, Octavian Calmac. List of eligible equipment for funding within this Program has been extended and for primary grinding equipment. *[18]*

Moldova Energy and Biomass Project
In order to promote effective of Republic of Moldova Government efforts to achieve the objectives of Energy Strategy 2030, through the Moldova Energy and Biomass Project, European Union gives financial assistance in order to stimulate the fuel consumption from solid biomass at the household level.
The financial means are provided under the project Document signed between the Ministry of Economy and the United Nations Programme in Moldova on 16 September 2011 and will observe the rules the disbursement of UNDP according to Harmonized Approach regarding cash transfer (HACT). *[19]*

[18] Sursa: *http://aee.md/*
[19] Sursa: *http://biomasa.aee.md*

Financing Line for Energy Efficiency in Moldova (MoSEFF)

In September 2009 was launched Financing Line for Energy Efficiency in Moldova (MoSEFF) in order to support investment in energy efficiency to enterprises in Republic of Moldova.

A credit line of 42 million euros, in conjunction with a grant component of 5-20% was provided for granting loans for companies from Moldova, through the partner banks of the EBRD. MoSEFF, also, provides technical assistance for projects through Fichtner - a German company leaders in the field of engineering and consulting. The MoSEFF loans are provided by partner banks for Moldovan companies which requesting funding.

Size of MoSEFF loan is between 10 thousand to 2 million.

Funding is directed toward promote energy efficiency investments and renewable energy production. A team of technical and financial experts will help candidates to evaluation and optimization projects. Local banks are responsible for assessing and financial analysis and final decision regarding loan payment.

After project implementation independent consultant (Allplan, Austria) will verify energy savings. A grant with a value up to 20% of the loan amount will be paid to the company. *[20]*

[20] Sursa: *http://www.moseff.org/*

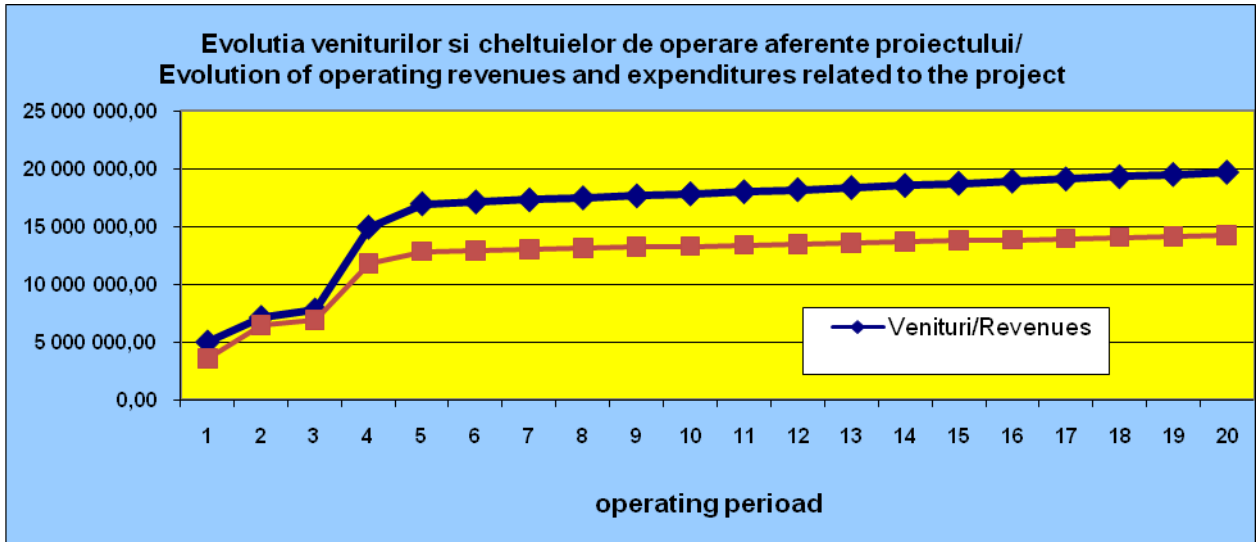
3. Financial analysis, including calculation of financial performance indicators: internal rate of return net discounted value and cost-benefit report.

Financial indicators are calculated based on the total amount of investment without the no-reimbursable co-financing part.

Option 1a

Category	Investment value	1	2	3	4	5	6	7	8	9	10
Revenues	0,00	5.010.168,32	7.129.969,91	7.775.221,82	14.920.734,44	16.948.276,09	17.117.758,85	17.288.936,44	17.461.825,80	17.636.444,06	17.812.808,50
Expenditures	16.320.000,00	3.610.204,29	6.530.948,42	6.960.552,01	11.796.549,19	12.865.837,08	12.952.609,05	13.040.248,74	13.128.764,82	13.218.166,07	13.308.461,33
Total	**16.320.000,00**	**1.399.964,03**	**599.021,49**	**814.669,81**	**3.124.185,25**	**4.082.439,01**	**4.165.149,80**	**4.248.687,70**	**4.333.060,98**	**4.418.277,99**	**4.504.347,17**
Cumulated Cash-flow		14.920.035,97	14.321.014,48	-13.506.344,67	-10.382.159,43	-6.299.720,41	-2.134.570,61	2.114.117,09	6.447.178,07	10.865.456,06	15.369.803,23
Cost-benefit rate		1,39	1,09	1,12	1,26	1,32	1,32	1,33	1,33	1,33	1,34

Category	11	12	13	14	15	16	17	18	19	20
Revenues	17.990.936,59	18.170.845,95	18.352.554,41	18.536.079,96	18.721.440,76	18.908.655,16	19.097.741,72	19.288.719,13	19.481.606,32	19.676.422,39
Expenditures	13.399.659,55	13.491.769,74	13.584.801,04	13.678.762,65	13.773.663,88	13.869.514,12	13.966.322,86	14.064.099,69	14.162.854,28	14.262.596,43
Total	**4.591.277,04**	**4.679.076,21**	**4.767.753,37**	**4.857.317,31**	**4.947.776,88**	**5.039.141,05**	**5.131.418,86**	**5.224.619,45**	**5.318.752,04**	**5.413.825,96**
Cumulated Cash-flow	19.961.080,27	24.640.156,48	29.407.909,85	34.265.227,16	39.213.004,03	44.252.145,08	49.383.563,94	54.608.183,39	59.926.935,43	65.340.761,39
Cost-benefit rate	**1,34**	**1,35**	**1,35**	**1,36**	**1,36**	**1,36**	**1,37**	**1,37**	**1,38**	**1,38**



VAN/NPV	**0,05**	**9.106.640,32**
RIR/IRR		**12,46%**

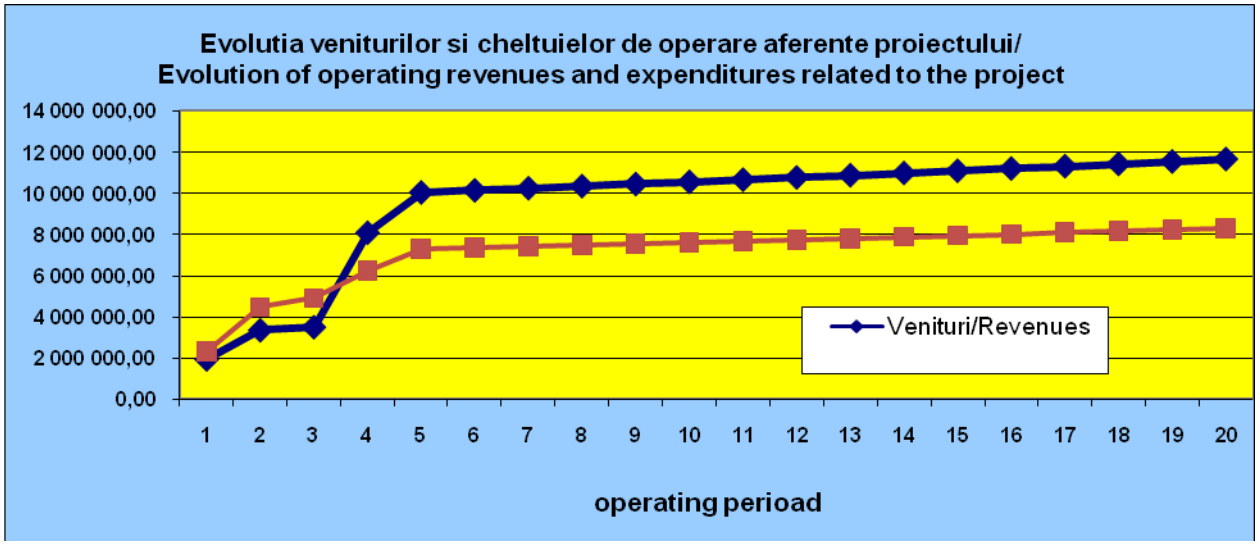
Proiecţii economice estimate pe 20 ani/ Estimated economic projections for 20 years	Values	Updated values
Revenues	327.327.146,62	97.803.231,01
Expenditures	261.986.385,23	91.419.390,68
Residual value	2.722.800,00	
Benefit cost- rate		1,07

Analysis of income and expenditure option 1a shows that the project registers a **NPV (Net Present Value) by the MDL 9,106,640.32, an IRR (Return Internal Rate) by the 12.46%** positive fact and thereof recovery in year 11, and the benefit cost ratio is superior unit value and is equal to 1, 07.

Option 1b

Category	Investment value	1	2	3	4	5	6	7	8	9	10
Revenues	0,00	1.950.589,06	3.360.060,58	3.509.746,73	8.099.584,08	10.058.914,23	10.159.503,37	10.261.098,41	10.363.709,39	10.467.346,48	10.572.019,95
Expenditures	12.419.068,00	2.317.725,26	4.478.334,02	4.915.756,29	6.240.061,80	7.299.899,07	7.363.598,06	7.427.934,04	7.492.913,38	7.558.542,51	7.624.827,94
Total	**-12.419.068,00**	**-367.136,20**	**-1.118.273,44**	**-1.406.009,56**	**1.859.522,28**	**2.759.015,16**	**2.795.905,32**	**2.833.164,37**	**2.870.796,01**	**2.908.803,97**	**2.947.192,01**
Cumulated Cash-flow		-12.786.204,20	-13.904.477,64	-15.310.487,20	-13.450.964,92	-10.691.949,76	-7.896.044,44	-5.062.880,07	-2.192.084,06	716.719,91	3.663.911,92
Cost-benefit rate		0,84	0,75	0,71	1,30	1,38	1,38	1,38	1,38	1,38	1,39

Category	11	12	13	14	15	16	17	18	19	20
Revenues	10.677.740,15	10.784.517,55	10.892.362,73	11.001.286,35	11.111.299,22	11.222.412,21	11.334.636,33	11.447.982,69	11.562.462,52	11.678.087,15
Expenditures	8.299.016,22	8.366.633,98	8.434.927,92	8.503.904,80	8.573.571,45	8.643.934,76	8.715.001,71	8.786.779,32	8.859.274,72	8.932.495,06
Total	**2.378.723,93**	**2.417.883,57**	**2.457.434,81**	**2.497.381,56**	**2.537.727,77**	**2.578.477,45**	**2.619.634,62**	**2.661.203,37**	**2.703.187,80**	**2.745.592,08**
Cash-flow cumulat/ Cumulated Cash-flow	6.649.875,86	9.067.759,43	11.525.194,24	14.022.575,79	16.560.303,56	19.138.781,01	21.758.415,64	24.419.619,01	27.122.806,81	29.868.398,89
Rata cost beneficiu/Cost-benefit rate	1,39	1,39	1,39	1,39	1,39	1,40	1,40	1,40	1,40	1,40



NPV	**0,05**	**1.454.433,62**
IRR		**5,16%**

Estimated economic projections for 20 years	Values	Updated values
Revenues	190.515.359,18	54.864.726,49
Expenditures	155.181.800,29	56.368.292,86
Residual value	2.958.000,00	
benefit cost- rate		0,97

Analysis of income and expenditure option 1b shows that the project registers a **NPV (Net Present Value) by the MDL 1.454.433,62 lei, an IRR (Return Internal Rate) by the 5,16%** positive fact and thereof recovery in year 14, and the benefit cost ratio is superior unit value and is equal to 0, 97.

Option 2

Category	Investment value	1	2	3	4	5	6	7	8	9	10	11
Revenues	0,00	1.132.070,54	2.453.393,91	3.051.880,06	5.379.584,08	7.311.714,23	7.384.831,37	7.458.679,69	7.533.266,48	7.608.599,15	7.684.685,14	7.761.531,99
Expenditures	6.800.000,00	1.042.845,12	2.230.287,07	2.641.170,44	4.530.294,32	6.562.752,27	5.643.406,44	5.696.587,16	5.750.299,68	5.804.549,32	5.859.341,46	4.155.916,53
Total	**-6.800.000,00**	0,00	0,00	0,00	849.289,77	748.961,96	1.741.424,93	1.762.092,53	1.782.966,81	1.804.049,83	1.825.343,68	3.605.615,46
SURSA: CALCULAT PE BAZA METODOLOGIEI DIN "GUIDE TO COST-BENEFIT ANALYSIS OF INVESTMENT PROJECTS, EUROPEAN COMMSSION - DG REGIONAL POLICY , 2000"												
Cumulated Cash-flow		-6.800.000,00	-6.800.000,00	-6.800.000,00	-5.950.710,23	-5.201.748,28	-3.460.323,35	-1.698.230,82	84.735,99	1.888.785,82	3.714.129,49	7.319.744,96
Benefit-cost rate		**1,09**	**1,10**	**1,16**	**1,19**	**1,11**	**1,31**	**1,31**	**1,31**	**1,31**	**1,31**	**1,87**

Estimated economic projections for 20 years	Values	Updated values
Revenues	**64.760.236,65**	**46.165.046,79**
Expenditures	**54.915.449,82**	**39.628.743,06**
benefit cost- rate		**1,16**

NPV	**VAN**	**0,05**	**3.926.700,22**
IRR	**RIR**		**15,68%**

Analysis of income and expenditure option 2 shows that the project registers a **NPV (Net Present Value) by the MDL 3.926.700,22, an IRR (Return Internal Rate) by the 15,68% a** positive fact, and the benefit cost ratio is superior to unit value and is equal with 1,16.

Cash-Flows for selected solution is presented in Annex 6.

4. Risk adjustment of financial performance indicators: internal rate of return and cost-benefit report

Calculations indicators of financial performance not include risks associated with the project.
Thus it is necessary to adjust with risk of financial performance indicators.
Risks associated with the project were determined and evaluated. According to the classification of risks these are divided, by their mode control, in the retained risks and transferable risks. Risk allocation is given to the part which holds the best risk control.
Were included in the adjusted reference model with risks only those risks retained whose impact varies in dependence of option selected. Transferable risks, not included in the reference model adjusted with risk.
Retained risk assessment is presented in Annex 7.
Economic indicators are calculated on the basis of total values of investment.

Indicators	Option 1 a	Option 1b	Option 2
financial NPV	**9.106.640,32 lei**	**1.454.433,62 lei**	**3.926.700,22 lei**
financial IRR	**12,46%**	**5,16%**	**15,68%**
Financial NPV adjusted with risk	**-3.727.353,73 lei**	**-2.595.058,76 lei**	**1.094.472,83 lei**
Economic NPV adjusted with risk	**-5.346.401,35 lei**	**-4.214.106,38 lei**	**-524.574,79 lei**
financial IRR adjusted with risk	**1%**	**2%**	**8,31%**
Economic IRR adjusted with risk	**-1%**	**0%**	**3,64%**
B/C Rate adjusted with risk	**0,88**	**0,90**	**1,09**

Analyzing the indicators in based on the described options we can state that the best version of project realization is for option 2, which consists in realization of investment project in extension of the number of boiler by pellets in Leova district during the first 4 years of the activity in same with service provision of assurance with thermal agent of institutions which have biomass boiler station.
This option has the best financial indicator values before of adjustment with risk and after of adjustment with risk.
Economic IRR adjusted with risk by the 3.64% shows that the project can not be achieved under reimbursable financing (own contribution or loans) and require funding from grants, because the value of IRR is below the 5% discount rate used in the calculations.
In the case of calculation of financial IRR value (without the grant amount invested) we obtain a rate of 8.31%, confirming that if the project will be realized with nonreimbursable funding in the amount of MDL 1.700.000,00 (20% from total investment value) for a period of 11 years, the investment will be profitable.
According to EU recommendations, FRR / K (rate of return financially of its own capital) after subsidies should not exceed a certain limit (EC recommends 8%) for in order to avoid an excessive return for project beneficiary at the expense of Public taxpayer.
In the case of PPP project which consists in providing of insurance services

with thermal agent from biomass, revenues within the activity will originate from public funds (grant), and respectively profits from PPP activity must not be too large in order to avoid excessive return. In the case of option 2, the financial IRR is 8.31%, which also confirms a return not too high for the project.

Rate benefit / cost for PPP project according to option 2 is over-unit and confirms that the project is susteinabil and deserves to be funded.

5. The sensitivity analysis of the project

Sensitivity analysis of the project was carried out for option 2 which as a result of the analysis of financial indicators has been identified the most appropriate version.

Following modifications on income, expenses and capital costs, basic indicators financial NPV (3,926,700.22), IRR (15.68%) and their modification according to the table demonstrates the **viability of the project.**

The investment is viable because it is difficult to influenced by reduce of returns up to 10%.

Following the analysis of the table it may be established that a negative development in the first years of the expenditure not influence an essential the project.

Also, reducing of revenues does not significantly influence the project because the obtained IRR (7.01%) at therevenues reduce with 10%, however, is higher than the minimum required of 5%, and NPV not registered negative values.

Reducing the capital cost estimated by the beneficiary would lead to a good thing as it can analyze from financial indicators that have obtained better values than the calculation base, ranging from 14.34% to 15.92%, and as a result of increasing of the capital costs it can be seen that its not achieve a critical threshold

Table 5.1. Influence of income change, expenses and capital costs of NPV and IRR key variables

Calculated risks	IRR (%)		NPV (€)		Admissibility of Cash-Flow
	Value	Influence on IRR	Value	Influence on NPV	
Estimated values in project	**15,68%**		**3.926.700,22**		**positive**
Reducing incomes by 1 %	13,53%	16,81%	7.970.650,04	9.082.089,22	**positive**
Reducing incomes by 2%	12,87%	16,15%	4.572.982,92	**5.684.422,10**	**positive**
Reducing incomes by 5%	10,79%	14,07%	3.253.981,59	**4.365.420,77**	**positive**
Reducing incomes by 10%	7,01%	10,29%	1.055.646,03	**2.167.085,21**	**positive**
Increased operational costs with 1 %	13,70%	16,98%	5.131.935,11	**6.243.374,29**	**positive**
Increased operational costs with 2%	13,21%	16,49%	4.811.553,08	**5.922.992,26**	**positive**
Increased operational costs with 5%	11,70%	14,98%	3.850.406,97	**4.961.846,15**	**positive**
Increased operational costs with 10%	7,01%	10,29%	2.248.496,79	**1.055.646,03**	**positive**
Reducing the cost of capital with 1%	14,34%	17,62%	5.517.079,05	**6.628.518,23**	**positive**

Reducing the cost of capital with 2%	14,51%	17,79%	5.581.840,96	**6.693.280,14**	**positive**
Reducing the cost of capital with 5%	15,02%	18,30%	5.776.126,67	**6.887.565,85**	**positive**
Reducing the cost of capital with 10%	15,92%	19,20%	6.099.936,20	**7.211.375,38**	**positive**
Increased capital costs with 1%	14,02%	17,30%	5.387.555,24	**6.498.994,42**	**positive**
Increased capital costs with 2%	13,86%	17,14%	5.322.793,34	**6.434.232,52**	**positive**
Increased capital costs with 5%	13,39%	16,67%	5.128.507,63	**6.239.946,81**	**positive**
Increased capital costs with 10%	12,65%	15,93%	4.804.698,10	**5.916.137,28**	**positive**

6. Estimates of the employed force by creating public-private partnership project

7. Environmental impacts and mitigation solutions including its costs.

- **During operation period**
- **During the burning process**

Table 7.1. Pollutant emissions ratio by different types of fuel [21]

Fuel	**Emissions ratio, kg/kWh**			**Ash**	**Powder**
	CO_2	*SO2*	*NOx*		
Natural gas	0,245	0,7			
Coal	0,396	0,58	0,035	0,055	0,0039
Black oil fuel	0,32	0,5	0,02		
Wood pellets	0,021	0,05	0,002	0,007	0,0002
Packs of straw	0	0	0	0,008	0,0001

Table 7.2. Emissions calculations of noxious substances

			min	*medium*	*max*
1	**Fuel consumption at Boiler plants**	**t/year**	**28,06**	**131,29**	**610,52**
2	Quantity of solid particles emissed in the ambient air	t/year	0,10	0,10	0,10

[21] Sursa: http://www.iea.org/

3	*Admissible maximum concentration of sulphur oxide; η,SO2*	*mg/m3*	*0,50*	*0,50*	*0,50*
4	Quantity of sulphur emissed in ambient air	SO2(t/year)	0,02	0,11	0,49
5	*Admissible maximum cincentration of η,CO*	*mg/m3*	*5,00*	*5,00*	*5,00*
6	Quantity of CO emissed in ambient air	CO (t/year)	0,12	0,03	0,01
7	*Admissible maximum cincentration of nitric oxide, η,NO2*	*mg/m3*	*0,085*	*0,085*	*0,085*
8	Quantity of NO_2 emissed in ambient air	NO_2 (t/year)	0,00	0,00	0,02
	Total emissions of gas	**t/year**	**0,24**	**0,23**	**0,61**

AS TO THE PROPOSED CONSTRUCTION

- **Fire safety**
- **Self-protection plan**
- **Hygiene and population health**

Hygiene of air

Water quality protection

Illumination

ASSIGNMENT FOR THE BENEFICIARY

- **Labour protection measures**
- **Basic quality requirements**

A. Resistance and stability

B. Trouble-free operation Reliability in operation

C. Fire safety

F. Noise-protection via Protecţia împotriva zgomotului prin:

Sanitary installations

The beneficiary has the right Beneficiarul are dreptul:

VI General conclusions in terms of Public-Private Partnership implementation alternatives in biomass-based pelleting in Leova district.

II. Technical drawings

VIII. Annexes