





## **Evaluation of district heating alternatives in Beverina region**

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### Scope of the study

- 1. The problems of district heating in Beverina region are multi-layered
- 2. It is due to the fact that there are parishes with totally centralised district heating system, partly decentralised and totally decentralised heating systems
- 3. The vision of the region 3Ss:
  - 1. Self-contained
  - 2. Self-served
  - 3. Self-managed
- 4. With the examples of the case study to start to solve the problems in the region



### **Existing situation**

- 3546 inhabitants (2011.gadā)
- 3 parishes (Brenguļu, Trikātas un Kauguru) with 5 largest living areas – Brenguļi, Cempi, Trikāta, Mūrmuiža un Kauguri
- There are different problems in each parish





Individual heating - electricity and firewood

#### New buildings with heat pumps

#### Non-insulated public buildings



Shared ownership; 290 kWh/m<sup>2</sup> year



Large bills, few heat



Lack of energy management



Wood chip boiler house; efficiency 60%



Centralised DH; 70 kWh/m<sup>2</sup> year



Insulated, but not monitored



### Activities to be implemented in the whole region





- 1. Boiler house of Mūrmuiža
- 2. Multi-family building "Lazdas" in Cempi parishe, where electricity is used for heating
- 3. Secondary school and sports hall of Trikāta

### Existing situation in Mūrmuiža





Parameters	2010	2011
Capacity, MW	1	1
Consumption of wood chips, ber m <sup>3</sup>		3000
Consumption of saw dust, ber m <sup>3</sup>	3793	200
Heat energy (fuel), MWh	2503,4	2112
Produced heat energy, MWh	1508,79	1297,36
Calculated efficiency, %	60,2	61,4
Heat tariff, Ls/MWh (without VAT)	31,00	39,99









### Energy consumers in Mūrmuiža





### Alternatives

- Alternative A. Energy management program in the boiler house of Mūrmuiža.
- Alternative B. Replacement of boilers with more efficient boilers with deep flue gas cooling.
- Alternative C. Decentralization of the district heating system by installing wood pellet boiler next to each apartment building.



# Approximate costs and savings of alternative A

Priority	Service	Costs, LVL	Potential economy, LVL/year	Implemen- tation
1	Consultations of specialists and salary for energy manager	2000 - 4000	2000 - 4000	09/2012
2	Purchase of measurement equipment and engineering service	5000 - 7000	2000 - 3000	10/2012
3	Installation of equipment	10000 – 15000	4000 - 5000	10/2013 un 10/2014



### **Solutions for alternative B**

### Solution 1 – installation of pellet boiler

Installation of totally automatised energy efficient (efficiency not lower than 88%) pellet boiler with installed capacity of 0.4 MW.

# Solution 2 – installation of wood chip boiler with deep flue gas condensing

Installation of totally automatised energy efficient (efficiency not lower than 95%) wood chip boiler and deep flue gas condensing with installed capacity of 0.4 MW.

## Solution 3 – installation of pellet and wood chip boiler with deep flue gas condensing

Installed capacity of the pellet boiler could be 200 kW and the same size wood chip boiler – 200kW. Installation of totally automatised energy efficient (efficiency not lower than 90%) pellet and wood chip boilers with installed capacity of 0.4 MW.

## Solution 4 – implementation of innovative solutions at energy source, e.g. cogeneration

Cogeneration equipment with wood chip gasification generator and internal engine with total installed capacity of 0.3 MWe and 0.4 MWth



# Approximate costs and payback time of alternative B

Solution	Equipment at energy source	Costs, LVL*	Payback time, years	Implementa- tion
1	Pellet boiler	40 000	10	09/2017
2	Wood chip boiler with deep flue gas condensing	50 000	7	09/2017
3	Pellet and wood chip boiler with deep flue gas condensing	60 000	10	09/2017
4	Cogeneration equipment	100 000	10	09/2019

\* Costs and payback time are more qualitative parameters to present a comparison between different solutions as after 5 years these figures could change



- Conservation of centralised district heating system for multi-family buildings is important parameter to keep the constructions safe and to ensure comfort
- Therefore it is important to have a centralised system in each block house
- In case if after 5 years it is not economically and technically feasible to change the boiler house and refurbish DH network, it is necessary to assess alternative solutions



### Multi-family building in "Lazdas" in Cempi parish

- Specific heat energy consumption 175 kWh/m<sup>2</sup> year
- Heating area 1089 m<sup>2</sup>
- Annual heat energy consumption 190.6 year
- Annual costs for heat energy 20470 Ls/year
- Specific heat energy costs 18.8 Ls/m<sup>2</sup> year







# Savings and payback time for implementation of measures

Sa	vings component	Unit	Before		After	
Appush	oat oporav					
No	Measure			E)	(penses, l	.S
Centralisé	d heating system	Ls/MWh	107,4		35	
Anhual c	destallation of new centr	alisedheat	ing system		385000	
Sa¥ings	Installation of hot water	systayear	1	6620	12000	
3	Installation of district he	ating subst	ation		5000	
Total			34000			
Thermal insulation						
4. Thermal insulation of the building			120 000			
Energy source						
5.	Fully automated pellet	boiler wit	h capacity		2	0000
	70-100 kW (GRANDEG)*					
Total					17	4000

\* In the case if it is not possible to install boiler in basement of the building, then additional investment (6000 Ls) to install container will be necessary.

### **Payback time is 10.5 years**



### Secondary school and sports hall of Trikāta

- School was built in 1938 and total heated area is 2318 m<sup>2</sup>
- Sport hall was built in 2005; heated area is 1075 m<sup>2</sup>
- Total electricity consumption in 2011 for heat pumps was 143.7 MWh/year;
- Total consumption of diesel oil in sports hall in 2011 was 6.5 t/year
- Total annual costs are 19600 Ls/year (prices of 2012)





### Costs and payback time of alternatives

Alterna tive	Measure	Expenses, Ls	Payback time, years	Possible date of implementation
1	Implementation of energy management program	6000	2.0	09/2012
2	Implementation of energy management program and installation of pellet boiler in sports hall	23000	4.2	09/2013
3	Implementation of energy management program and installation of pellet boiler for base load	27000	3.9	09/2013

### Thank you for attention!



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