ENABLE DHC

Factsheet T.2.2

In depth analysis of the case study in the city of Riga (JSC “RĪGAS SILTUMS”)

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1. INTRODUCTION

The district heating (DH) system in Riga is historically well-developed. The river Daugava divides the city into 2 parts. 6 independent producers supply heat on the right bank of the river Daugava. On the right bank of the river – JSC "RĪGAS SILTUMS" performs only the function of an operator - distribution and sales, while production is partly free market-based. However, on the left bank of the river and in smaller systems, heat is fully produced and supplied by JSC "RĪGAS SILTUMS", which is Riga municipal agency "Riga Energy Agency" partner at the ENABLE DHC project. In 2023, about 1,000 GWh per year of heat (approximately 30% of the total produced heat in Riga) was produced by JSC "RĪGAS SILTUMS" and distributed to the networks.

In 2023, about 3,170 GWh per year of heat was distributed to the networks, and about 2,700 GWh per year was consumed.

The company employs around 690 people.

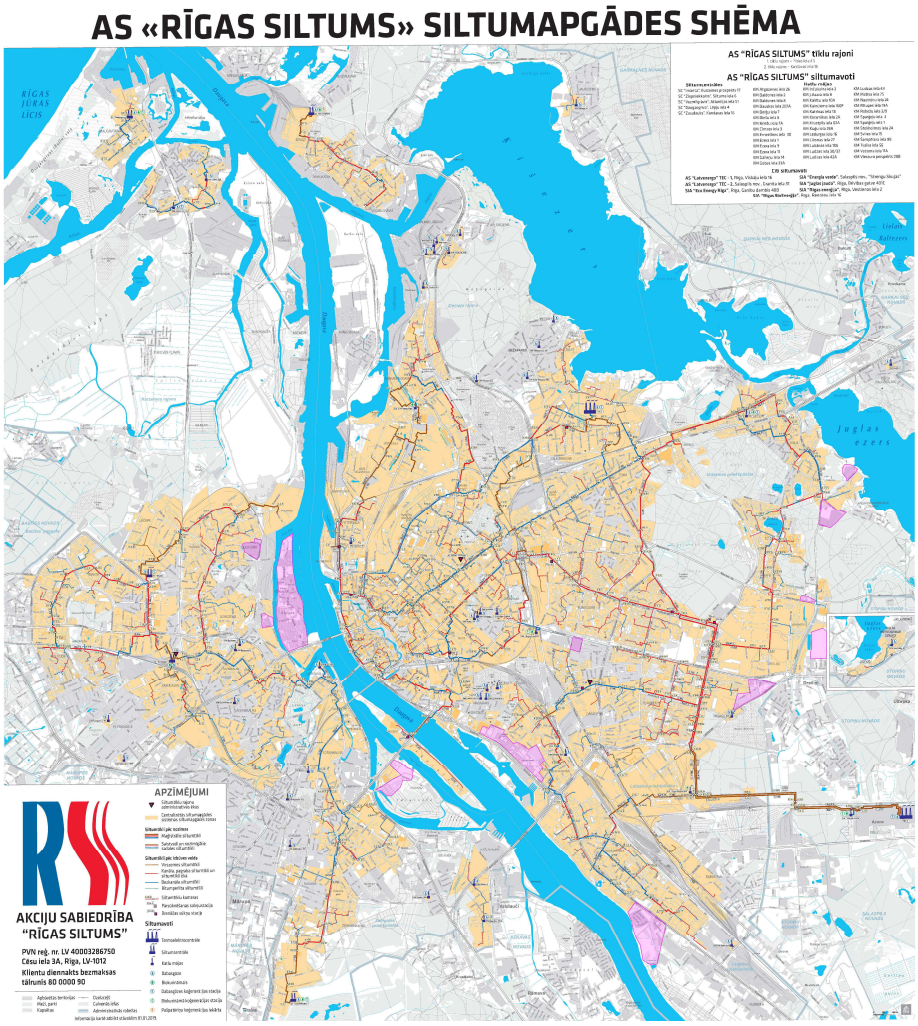

Figure 1 – Map of the city of Riga's district heating system

2. THE DISTRICT HEATING SYSTEM (AS IS)

2.1 Energy generation

Historically, heat production was based on natural gas; however, during the past years, biomass share has increased. Moreover, biomass is considered a local, cheap, and sustainable resource in Latvia. In 2023, JSC "RĪGAS SILTUMS" produced approx. 1000 GWh of heat, 57% was produced by using RES or biomass chips: 46% in heat-only boilers (HOB) technology, and 11% by using CHP technology. The remaining heat was produced using HOB technology with natural gas combustion. A very small part of the heat was produced using a natural gas engine (CHP).

"RĪGAS SILTUMS" operates one large CHP plant "Imanta," along with four medium and small CHP facilities and 39 boiler houses. Table 1 summarises all installed capacities in the JSC "RĪGAS SILTUMS"

Table 1 – Description of heating plants owned by JSC "RĪGAS SILTUMS"

Indicator	*Value*
Number of energy sources	*44*
Installed thermal and power capacity (HOB and CHP)	*751 MW_{th} (including 100 $MW_{thwood\ chips}$) 55 MW_{el})*
Used fuel[1]	*67% natural gas, 33% wood chips, 0.025% diesel fuel*

Used acronyms: Station of combined heat and power – CHP, heat only boiler technology – HOB

In 2022, the Riga City Council approved the «Riga City Sustainable Energy and Climate Action Plan 2022-2030» (SECAP)[1], which was developed by the Riga Energy Agency. The SECAP includes 2020 baseline values against which Riga City DH system improvement indicators will be calculated until 2030. (Table 2).

Table 2 – Baseline indicators included in the Riga City SECAP

Part of the DH system	*Indicators*		
	Produced heat, GWh per year	*Produced by RES, GWh per year*	*GHG (CO_2) emissions, ktCO_2 per year*
JSC "RĪGAS SILTUMS"	*1,130*	*256*	*140**
The other part of the DH system of Riga	*2,137*	*682*	*258**

[1] https://rea.riga.lv/wp-content/uploads/2024/12/JAUNS_energoneatkaRIGA_en_gb.pdf

In the entire DH system in Riga	*3,267*	*938*	*398*(524**)*

** The fuel used in CHP to produce thermal energy in SECAP is allocated by applying the Alternative Production Method. ** The fuel used in CHP to produce thermal energy in SECAP is allocated by applying the Energy Method.*

JSC "RĪGAS SILTUMS" aims to enhance its heating supply through electrification by installing electric boilers, heat pumps, and exploring other innovative technological solutions.

The ENABLE DHC project will study the recovery of heat from treated wastewater at the "Wastewater Treatment Plant (WWTP) "Daugavgrīva" with its further use in heat supply - in the combined "Daugavgrīva" and Bolderāja (the boiler house on Gobas Street and the CHP on Keramikas Street) heat supply zone. To increase the efficiency of the "Daugavgrīva" heating plant and reduce the proportion of natural gas consumption in the total fuel balance, 2 biomass (wood chips) water heating boilers with a capacity of 4 MW each and a flue gas condenser were built in 2021. Unlike the Daugavgrīva heating plant, heat sources of the Gobas and Keramikas streets use natural gas. In addition, the Keramikas Street heating plant operates a natural gas engine, which will soon provide a balancing service in the power system.

Table 3 below summarizes the key characteristics of the heat supply zones "Daugavgrīva" and "Bolderāja".

Table 3 – Description of the heating supply zones of "Daugavgrīva" and Bolderāja (boiler house on Gobas Street and CHP on Keramikas Street)

Plant	***Location***	***Installed thermal power, supplied yearly heat***	
		MW	*Approximately MWh_{th}/year*
Plant 1 *Heating plant - "Daugavgrīva",*	*Lēpju street 4*	*NG HOB* *8.5 MW_{th}* *B HOB* *15.5 MW_{th}*	*40,000*
Plant 2 *Boiler house* Gobas 33A	Gobas 33A	*NG HOB* *20.0 MW_{th}*	*20,000*
Plant 3 *Boiler house* Keramikas 2A	Keramikas 2A	*NG HOB* *10.0 MW_{th}* *NG CHP* *2.97 MW_{th}* *2.33 MW_{ee}*	*30,000*

Used acronyms: Station of combined heat and power – CHP, heat only boiler technology – HOB, natural gas – NG, biomass fuel (wood chips) - B

2.2 Energy Distribution Network and Consumers

JSC "RĪGAS SILTUMS" provides transmission and distribution services to the entire city of Riga. The total length of heating networks in Riga is approximately 830 km, with around 700 km owned by JSC "RĪGAS SILTUMS." About 30% of the networks are situated on the left bank of the Daugava River. The heating networks are

undergoing gradual renovation, with roughly 65% already modernised, primarily using pre-insulated pipes. Of the reconstructed pipes, 160 km (35%) are installed above ground, in channels, or within basements.

The heating networks maintain a temperature regime of 120/70 °C, which determines the supply and return temperatures in the networks at an outdoor temperature of -20.0 °C. The average outdoor temperature during the heating season in Riga is 1.1 °C. Supply temperature in the summer period is 65±3 ^{0}C and the return temperature should be no higher than 45 ^{0}C. In smaller heating areas, the temperature regime may be lower, for instance, 105/65.

Heat losses vary between 11% and 13%, depending on the duration of the heating season. In 2023, heat losses were recorded at 11.5%. 887.8 GWh of heat from heat produced by JSC "RĪGAS SILTUMS" was transferred to consumers in 2023. At the same time, JSC “RĪGAS SILTUMS”, as a distribution operator, has distributed 3,170 GWh in 2023, and consumers have consumed 2,700 GWh per year.

Approximately 8200 buildings are connected to the centralised heat supply (Table 4).

Table 4 – Description of consumers

Type of buildings	*Number of buildings*	*Heated area (thousand m^2)*
Residential	*5,800*	*15,800*
Tertiary	*2,400*	*6,700*

The “Daugavgrīva” and “Bolderāja” heat supply zones are dominated by residential buildings. The total heated area of buildings in the “Daugavgrīva” and in the “Bolderāja” is approximately 410,000 m^2.

All consumers are connected to the networks through a substation, which divides the heating network contour from the consumer. A SCADA system is in place, enabling the collection, monitoring, and analysis of real-time data from the network.

JSC “RĪGAS SILTUMS” provides regular maintenance activities (pipe inspection, leakage detection), but a hydraulic test is performed once a year.

The supply of thermal energy is a regulated public service in Latvia. The supply of thermal energy is regulated up to the boundary of ownership with a user. Usually, it is up to the input of a heating main into a building. Production of thermal energy, transmission and distribution of thermal energy, as well as the trade of thermal energy, are regulated in the sector of thermal energy supply. The Public Utilities Commission of Latvia approved the heat tariff that consists of 3 parts: production, distribution, and trade. From October 15, 2024, the heating energy tariff of JSC “RĪGAS SILTUMS” is 74.17 EUR/MWh, excluding VAT.

3. UPGRADING MEASURES

As mentioned above, the ENABLE DHC project will explore heat recovery from treated wastewater at the WWTP “Daugavgrīva” for use in the combined heat supply zone of “Daugavgrīva” and “Bolderāja”, which includes a boiler house on Gobas Street and a cogeneration plant on Keramikas Street. The two heating zones, “Daugavgrīva” and “Bolderāja”, are currently not interconnected (Figure 3). Therefore, the first objective during the ENABLE DHC project would be to explore the feasibility and effectiveness of connecting the two zones. Integrating a storage tank into the system will improve the economic efficiency of heat production.

Therefore, the second objective would be to investigate this and assess what tank volume would be economically justified and determine the performance indicators of its integration.
The third objective is related to the need to maintain the flow temperature during the heating season. In addition, the impact of new heat sources (wastewater heat pumps) on the hydraulic stability of the system should be assessed.
In general, the project aims to replace traditional fuels — natural gas and biomass — with compression heat pump technology. Taking into account that various DH development scenarios (installed heat pump capacities, heat storage volume, etc.) would be possible, all key performance indicators would be calculated for them. This is the fourth objective of the ENABLE DHC project. As a result, an investment plan for a scheme that provides for heat recovery from treated wastewater from the WWTP for use in the “Daugavgrīva” and “Bolderāja” combined heat and power supply zones will be developed.

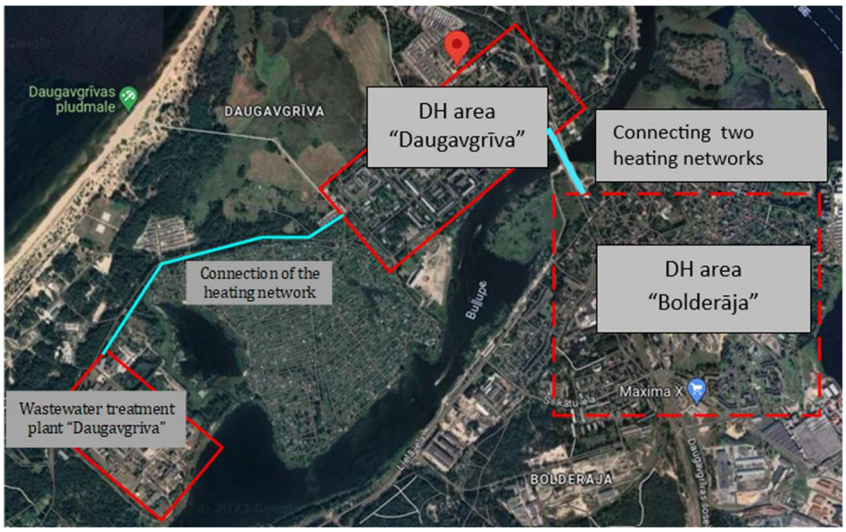

Figure 3. Case study map

At the beginning of the project, a decarbonisation plan for JSC "RĪGAS SILTUMS" was created, which related to all the company's heat generation facilities. During the project, monitoring of existing measures will be carried out, and a roadmap for further decarbonisation will be developed. For instance, JSC “RĪGAS SILTUMS” is advancing its decarbonisation efforts by electrifying the district heating system through the installation of electric boilers, implementing condensing units for biomass boilers, and increasing the share of renewable energy sources and biomass in heat production. The experience of JSC "RĪGAS SILTUMS" will be summarised by calculating key performance indicators at the end of the project, and a roadmap for their development will be developed, introducing zero-emission or low-emission technologies for the next 5 years. This is the fifth objective of the ENABLE DHC project.

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