

## **Environmental Report 2022**

Galantaterm, s.r.o. was established in the year 1995. Its main activity is utilization of geothermal water for production of heat and domestic hot water. As a heat producer it uses an environmentally friendly source of energy and provides cheaper heating and domestic hot water to a part of the town Galanta. For this purpose, it utilizes an alternative source of heat - geothermal water- by which it reduces the consumption of fossil fuels and reduces the emission of harmful and polluting substances into the air which would arise from burning gas and other fuels.

Galantaterm was the first company in Slovakia using geothermal energy for central heat supply-district heating. Despite the fact that utilization of this energy type was unconventional in our country, without any earlier experiences, the production of heat and domestic hot water has been running successfully and continuously, during a twenty-six-year-operation there have not been any serious problems of technical character, thus Galantaterm is a reliable partner for the consumers of heat and domestic hot water and provides services in full, according to the effective legal regulations and in compliance with the contracts concluded with the consumers.

The company has been monitoring the impact of its activity on environment very carefully. It includes monitoring of the natural source and monitoring of further manipulation with the used geothermal water. This activity is being performed by special employees of Galantaterm and by accredited laboratories. The collected data are included in the information systems of the company, and they reflect the impact of Galantaterm on environment reliably.

Galantaterm, s.r.o. elaborates an internal environmental report every year. The report is focused on periodic updating of data on those components of environmental protection which are being monitored regularly, which are regarded to be the key components of air pollution and pollution of surface waters, and which have significant influence on the quality of air in our town. The main objective of the report is to present the results achieved by the company in the observed sphere of activity and to provide information to the shareholders, the bodies of the company and the public about impacts of the company's activities on environment. The report is based upon the reports of previous years. It contains some essential data on the company as shareholders' structure, technology of production, inputs into production process, these data did not change in the observed period, the operating schedule and technical operational parameters of equipment also remained constant.

### **Foundation and Shareholders of the Company**

The founders and first shareholders of Galantaterm s.r.o. were the Municipality of Galanta, Slovenský plynárenský priemysel a. s., Bratislava (Slovak Gas Industry), Orkuveita Reykjavíkur, Iceland, Slovgeoterm, a.s. Bratislava and Nordic Environment Financial Corporation (NEFCO) Helsinki.

From the foundation of the company, we have registered two changes in the owners' structure. In 2007 NEFCO sold its shares to the Municipality of Galanta.

In 2014, the initial shareholder Slovenský plynárenský priemysel a.s. (SPP, a.s.) transferred its shares to its 100% daughter company SPP Infrastructure a.s.

This change did not have any influence on the portion of ownership.

At present, Municipality of Galanta is the majority shareholder with 77.50% of shares, the other shareholders are: SPP Infrastructure a.s. Bratislava with 17.50% of shares, Orkuveita Reykjavíkur, Reykjavík, Iceland with 4.50% of shares and Slovgeoterm, a.s. Bratislava with 0.50% of shares.

## **Short Description of the Company's Activity**

For production of heat and domestic hot water Galantaterm s.r.o. utilizes a local, low-emission source: geothermal water. The company uses combined method of heat production. The main source of heat is geothermal water and a less volume of natural gas is used for additional heating if required.

The company has been operating two geothermal wells (FGG- 2 and FGG-3) of the depth 2 101 and 2 102 m which serve as primary sources of energy. Their heat potential covers the heat demand until  $-2^{\circ}\text{C}$  of outside temperature. In case of lower temperatures, the needed energy is supplied by the reserve/auxiliary source of heat – a peak-load gas boiler plant. It consists of four hot water boilers fuelled by natural gas. The gas boilers also serve as a 100% reserve in cases when the production from geothermal wells is stopped for some reason.

The extraction of geothermal water from the wells is controlled by a computer according to the actual need of heat. The geothermal water is exploited by pumps and is conducted from the wells into a separation station where it is degassed. After that it is conducted to the heat exchanger station of the Energycentre by a pre-insulated pipeline. The geothermal heat exchanger station is the basic station for transferring the heat energy of geothermal water into the distribution system of secondary circuit. The geothermal water is conducted into a collector and goes through a system of counter-current plate heat exchangers and gradually transfers heat energy into the individual heating systems of the housing estate Sever and Hospital of St. Lucas Galanta.

The thermally used geothermal is discharged into the reservoir of Hydroelectric Power Plant Kráľová through a pumping station at Kaskady.

## **Heat Production in the Year 2022**

In 2022, there were not any changes in the production process. As in previous years the main inputs into the process of heat production and preparation of domestic hot water were geothermal water from the wells FGG-2, FGG-3, drinking water supplied by the company Západoslovenská vodárenská spoločnosť and natural gas supplied by SPP a.s.

The drinking water is used both as heat-transfer fluid (after chemical treatment, as system water) circulating in the heating system and also for production of domestic hot water for the consumers. This water is heated up by the natural source of heat (geothermal water) by heat exchangers.

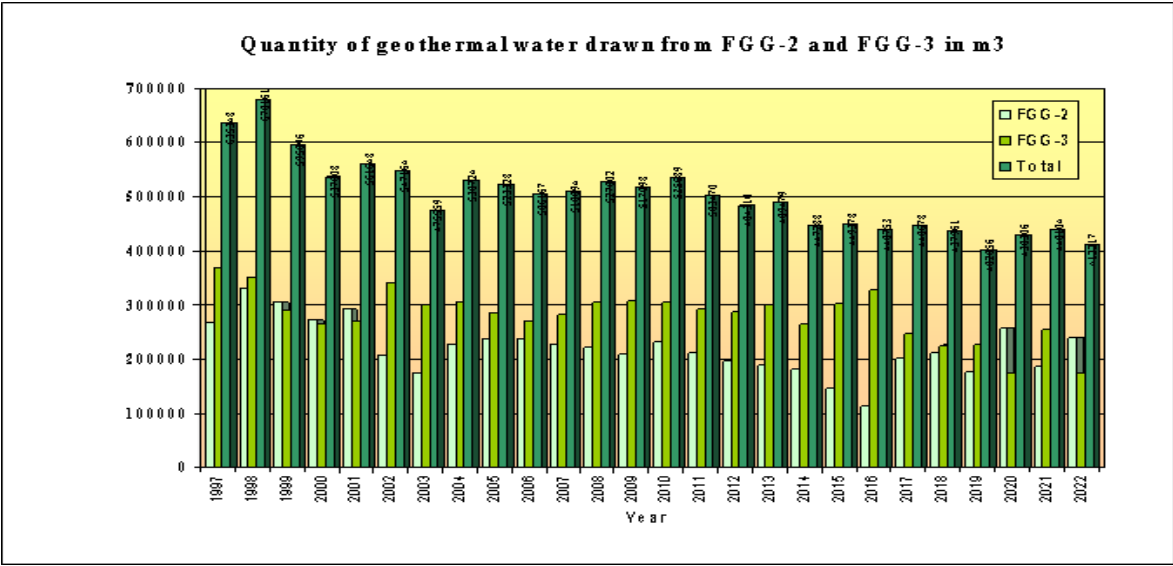
The production of heat and hot water is controlled by the control system consisting of autonomous regulators which drive the technological equipment of heat exchanger station and the wells and ensure the optimal heating according to equithermic curves.

## **Consumption of Geothermal Water**

In 2022, the total volume of extracted **geothermal water** from the two wells was **412 217 m<sup>3</sup>**. This volume is less (by 27 887 m<sup>3</sup>) than the volume exploited in the year 2021 (440 104 m<sup>3</sup>).

Graph 1 shows exploitation of geothermal water from the wells FGG-2, FGG-3 in the period from 1997 to 2022.

Graph 1

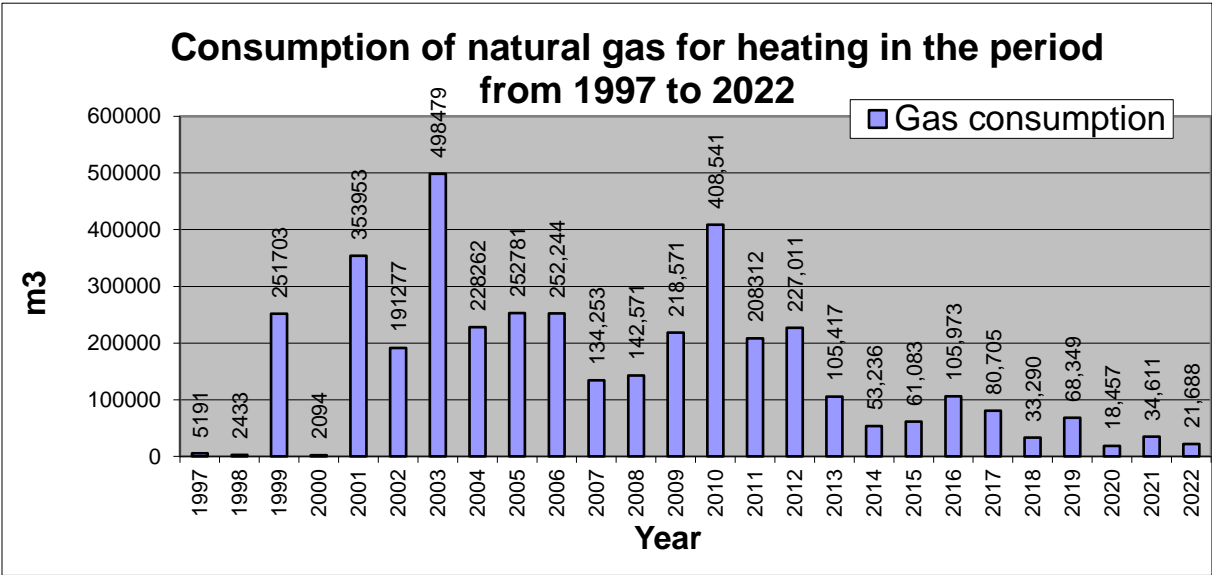


**Consumption of Natural Gas**

In 2022, the company used **21 688 m<sup>3</sup>** of **natural gas** for additional heating. This quantity shows a **decrease by 12 923 m<sup>3</sup>** in comparison to the consumption of the year 2021 when **34 611 m<sup>3</sup>** of natural gas was consumed. The lower gas consumption was caused by different weather conditions of compared years, in the observed heating period the outside temperatures were higher therefore less additional heating (by gas) was needed (that is necessary when the outside temperature of the air is under -2° C)

Graph 2 shows consumption of natural gas for additional heating in the period from 1997 to 2022

Graph 2



From the above quantities of geothermal water and natural gas **56 995 GJ** (15 831.94 MWh) of **energy** was produced. From that **56 425 GJ** (15 673.61 MWh) was gained **from geothermal water** and **570 GJ** (158.33 MWh) was generated **from natural gas**.

Expressed in percentages: the **99.00 %** of energy was produced from geothermal water and **1.00 %** from natural gas.

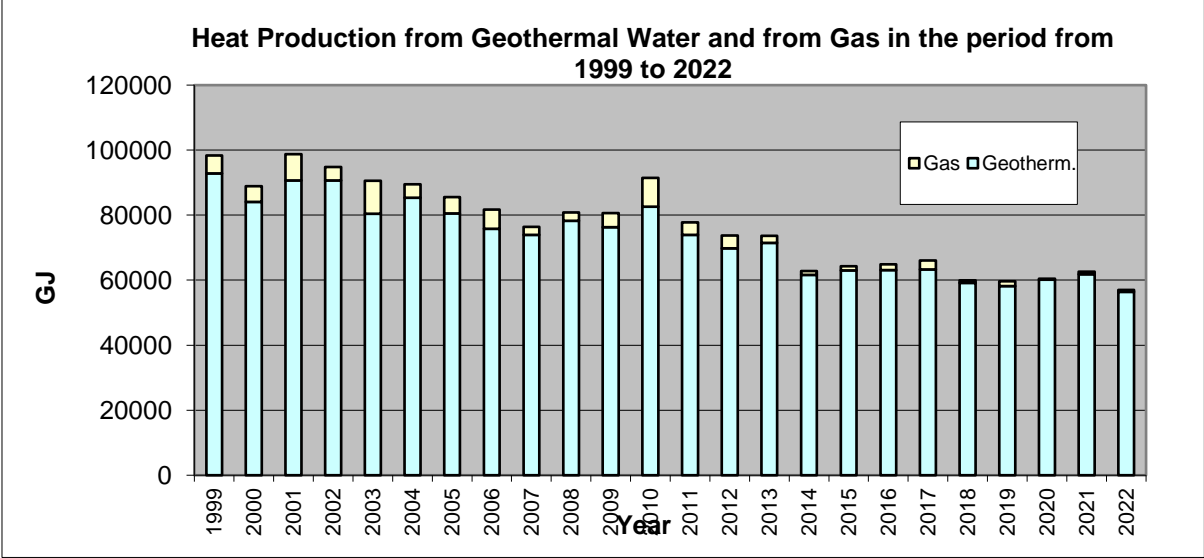
In 2021 the total of produced energy amounted to **62 647 GJ** (17 401.94 MWh), from that **61 774 GJ** (17 159.44 MWh) was produced from geothermal water and **873 GJ** (242.50 MWh) from natural gas. Expressed in percentages: the **98.61 %** of energy was produced from geothermal water and **1.39 %** from natural gas.

If we compare production data of the years 2021 and 2022, we can state that heat production in 2022 decreased by 5 652 GJ (1 570 MWh). 5 349 GJ (1 485,83 MWh) less heat was produced from geothermal water and 303 GJ (84.167MWh) less from natural gas. The reason for this decrease was the above- mentioned warmer weather during the heating period probably caused by climatic changes that manifest themselves in increase of average temperature of the air.

In 2022 the heating season 2021/2022 ended on 2 May 2022 and a new heating season started on 19 September 2022.

Graph 3 shows the development of heat production from geothermal water and from natural gas in the period from 1999 to 2022:

Graph 3



**Consumption of Drinking Water**

In the year 2022, the company consumed **58 290.00 m<sup>3</sup> of drinking water**. From that **72.00 m<sup>3</sup>** was chemically treated and used as system water circulating in the heating system and **58 218.00 m<sup>3</sup>** was used for production of domestic hot water supplied to the consumers. In the year 2022 the company consumed more drinking water (by 140 m<sup>3</sup>) than in the previous year.

**Consumers**

In 2022, company Galantaterm s.r.o. supplied heat and domestic hot water to the following management companies delivering it to consumers included in Table 1:

Table 1

No.	Management company/consumer	Delivery point -street, no.of building	No.	Management company/Consumer	Delivery point-street, no.of building
1.	BYSPRAV s r.o. (a housing company)	Česká 1437 Hodská 1645/71 Mierová 1431 Mierová 1434 Mierová 1436 Vodárenská 1546 Železničiarska 1423 Železničiarska 1441 Železničiarska 1442	10.	GASTROCENTRUM s r.o.	Železničiarska 1556
2.	SBD Sládkovičovo and Galanta (a housing cooperative)	Česká 1428 Česká 1438 Mierová 1432 Mierová 1448 Mierová 1449 Švermova 1443 Železničiarska 1422 Železničiarska 1424 Železničiarska 1425 Železničiarska 1427 Železničiarska 1433 Železničiarska 1439 Železničiarska 1440	11.	Pohoda seniorov s.r.o. (old people's home)	Hodská 360
3.	Anna Hauková	Česká 1429 Švermova 1444 Mierová 1435	12.	Hospital of St.Lucas Galanta, a.s.	Hodská 373/38
4.	TECHNOSPOL Slovakia, s.r.o.	Mierová 1430 Mierová 1447 Švermova 1445 Švermova 1446 Hodská 2441 POHODA, (a residential building)	13.	Regional Office of Public Health	Hodská 2352/62
5.	Contesta s.r.o.	Hodská 89-91	14.	Jozef Bugyi	Hodská 373
6.	FACILITY GROUP s r.o.	Hodská 93-95 Hodská 107-109 Hodská 119-121-123 K. Duchoňa 2429 K. Duchoňa 2439 K. Duchoňa 2438 K. Duchoňa 2437 K. Duchoňa 2436 K. Duchoňa 2435 K. Duchoňa 2434	15.	TRIMONT SLOVAKIA s r.o	Hodská 373
7.	PATRIA - (retired people's home Galanta)	Švermova 1457/16	16.	Skyfit, s r.o.	Fitness Centre: Hodská 373 Company housing: Športová 3049/51
8.	Basic school of Gejza Dusík	Mierová 1454/10	17.	KOI CARP SLOVAKIA s.r.o.	Hodská 68
9.	Kindergarten – Óvoda	Česká 1453	18.	Galandia s.r.o.	Kpt.Nálepku 43/2373

The company renewed supplying used geothermal water (containing the heat remaining after its utilization in Energycentre) to thermal centre Galandia s.r.o. for the period from 29 April 2022 to 5 September 2022.

## **Environmental Impact of Our Activity**

The above-described combined method for production of heat and domestic hot water significantly reduces the environmental burden, but this environmentally friendly generation of heat also produces minimalised but measurable and regularly monitored pollutants in form of emissions which derive from two sources: from geothermal water and from natural gas.

### **Emissions from Geothermal Water**

Gases included in the geothermal water are eliminated in separation tanks. Their analyses are performed twice a year, one analysis is made in summer period, when the production of geothermal water is lower, and one analysis is carried out during the main heating season in winter.

Table 2 shows the results of analyses of gases included in the geothermal water in the year 2022

Table 2

<b>Well</b>	<b>FGG-2</b>		<b>FGG-3</b>	
<b>Date of sampling</b>	<b>30.11.2022</b>		<b>21.7.2022</b>	
<b>Analysis No.</b>	<b>221205/289722</b>		<b>220722/221321</b>	
<b>Composition</b>	<b>% vol.</b>		<b>% vol.</b>	
Methane	27.22	53.01	51.11	
Ethane	0.40	1.72	1.48	
Propane	0.14	0.47	0.48	
i-Butane	0.07	0.11	0.14	
n-Butane	0.02	0.06	0.07	
i-Pentane	0.02	0.02	0.03	
n-Pentane	0.01	0.01	0.01	
Cont.of hydrocarbon > n-Pentane	0.03	0.02	0.02	
Oxygen	0.37	0.18	0.20	
Nitrogen	57.10	19.16	28.00	
CO <sub>2</sub>	14.62	25.24	18.46	
Sulphur		0.7400		

### **CO<sub>2</sub> Emissions from Geothermal Water in 2022**

Emissions of CO<sub>2</sub> from geothermal water are calculated on the basis of water/gas ratio in the geothermal water, percentage of CO<sub>2</sub> in the gas and the quantity of geothermal water produced from the wells. The volume of CO<sub>2</sub> in geothermal water in the year 2022 is shown in Table 3.

Table 3

<b>Well</b>	<b>FGG-2</b>	<b>FGG-3</b>
<b>Quantity of water (m<sup>3</sup>)</b>	238827	173390
<b>CO<sub>2</sub> (vol. %)</b>	14.62	21.85
<b>Water/gas ratio</b>	0.0946674	0.0652648
<b>Average temperature (°C)</b>	77.65	73.88
<b>Quantity of CO<sub>2</sub> (t/year)</b>	5.05	3.82

In the year 2022 the volume of CO<sub>2</sub> emissions from geothermal water was **8.87 t/y**.

### **CO<sub>2</sub> Emissions from Natural Gas in the Year 2022**

Emissions of CO<sub>2</sub> from natural gas are calculated by the formula:

$$\text{Emission CO}_2 \text{ [t/y]} = \text{consumed gas} \times \text{heat value} \times \text{emission factor} \times \text{oxidation factor}$$

Calculation of CO<sub>2</sub> emissions from natural gas in the period 1997 – 2022 (for Energycentre) is shown in Table 4.

Table 4

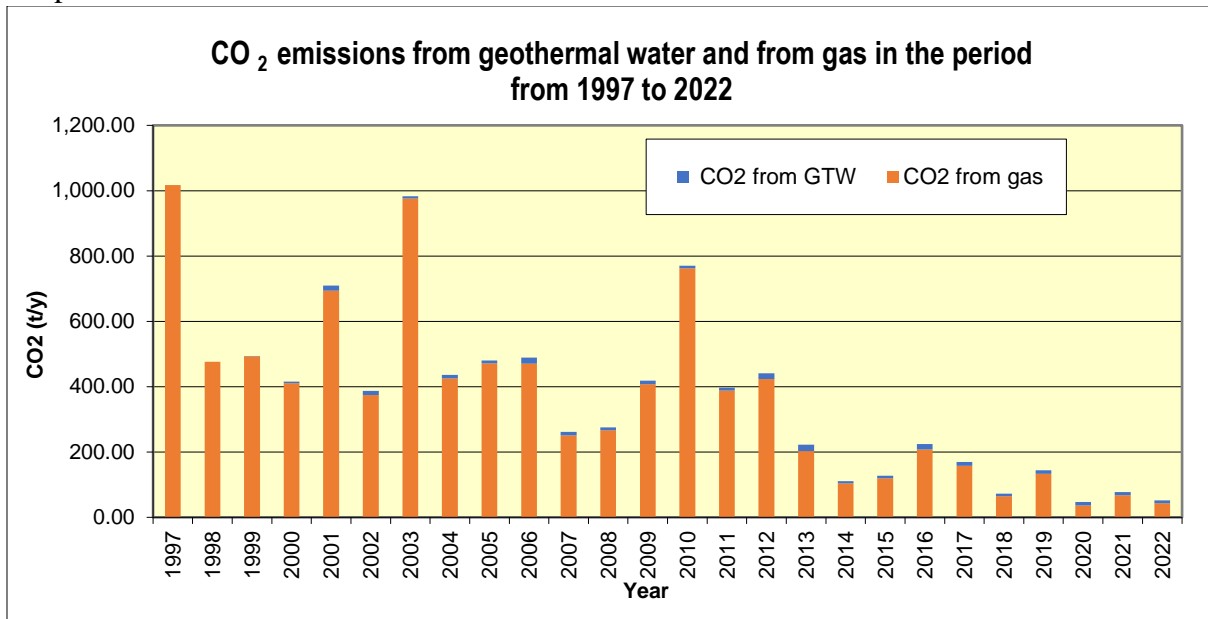
Year	Consumed gas. mill m <sup>3</sup>	Heat value MJ/m <sup>3</sup>	Emission factor tCO <sub>2</sub> /TJ	Oxidation factor	Total CO <sub>2</sub> (t/y) Energycentre
1997	0.5191	33.411	58.92	0.995	1 016.78
1998	0.2433	33.411	58.92	0.995	476.56
1999	0.251703	33.411	58.92	0.995	493.02
2000	0.2094	33.411	58.92	0.995	410.16
2001	0.353953	33.411	58.92	0.995	693.3
2002	0.191277	33.411	58.92	0.995	374.66
2003	0.498479	33.411	58.92	0.995	976.39
2004	0.228262	33.411	56.1	0.995	425.71
2005	0.252781	33.411	56.1	0.995	471.43
2006	0.252 244	33.411	56.1	0.995	470.42
2007	0.134 253	33.441	56.1	0.995	250.37
2008	0.142 571	33.441	56.1	0.995	266.13
2009	0.218 571	33.441	56.1	0.995	407.62
2010	0.408 541	33.441	56.1	0.995	762.61
2011	0.208312	33.441	56.1	0.995	388.48
2012	0.227011	33.441	56.1	0.995	423.45
2013	0.105417	34.686	55.53	1.00	203.05
2014	0.053236	34.85	55.76	1.00	103.45
2015	0.061083	35.0541	55.7483	1.00	119.37
2016	0.089664	35.0778	55.7810	1.00	207.35
2017	0.080705	34.9548	55.7810	1.00	157.3597
2018	0.033290	34.8981	55.6758	1.00	64.6818
2019	0.068349	34.9374	55.6958	1.00	132.9981
2020	0.018457	35.0157	55.7142	1.00	36.0072
2021	0.034611	34.9623	55.9233	1.00	67.6717
<b>2022</b>	<b>0.021688</b>	<b>35.2530</b>	<b>56.1775</b>	<b>1.00</b>	<b>42.9515</b>

The total of CO<sub>2</sub> emissions from gas in the year 2022 was **42.9515 t/y**.

**The total of CO<sub>2</sub> emissions from the activity of Galantaterm s.r.o. Galanta was 51.8215 t/y in 2022, from that 8.87 t/y was from geothermal water and 42.9515 t/y from natural gas.**

The development of CO<sub>2</sub> emissions from geothermal water and from gas in the period from 1997 to 2022 is shown in Graph 4.

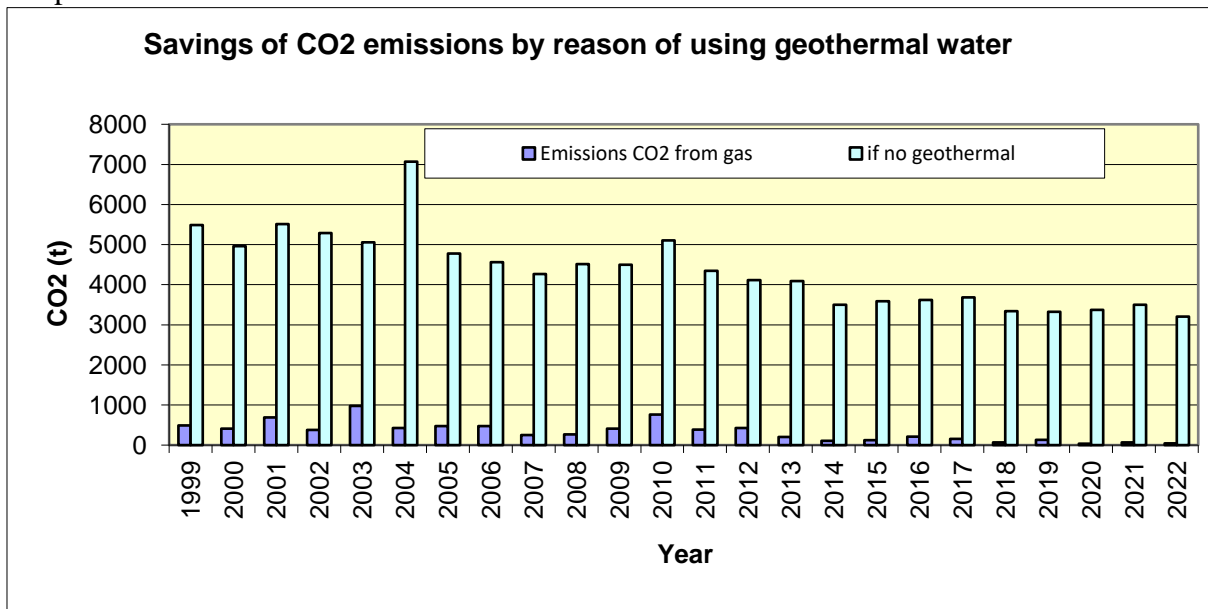
Graph 4



**Savings of CO<sub>2</sub> Emissions by Reason of Using Geothermal Water**

The main source of CO<sub>2</sub> emissions in Galantaterm is natural gas used for additional heating if needed. Graph shows the actual volume of CO<sub>2</sub> emissions from natural gas by the individual years. Emission of CO<sub>2</sub> would be much higher if geothermal water was not used, and all the volume of produced energy would be generated from natural gas as the graph shows. Savings by reason of producing the bulk of energy from geothermal water are on average above 3 000 -5 000 t/y.

Graph No.5





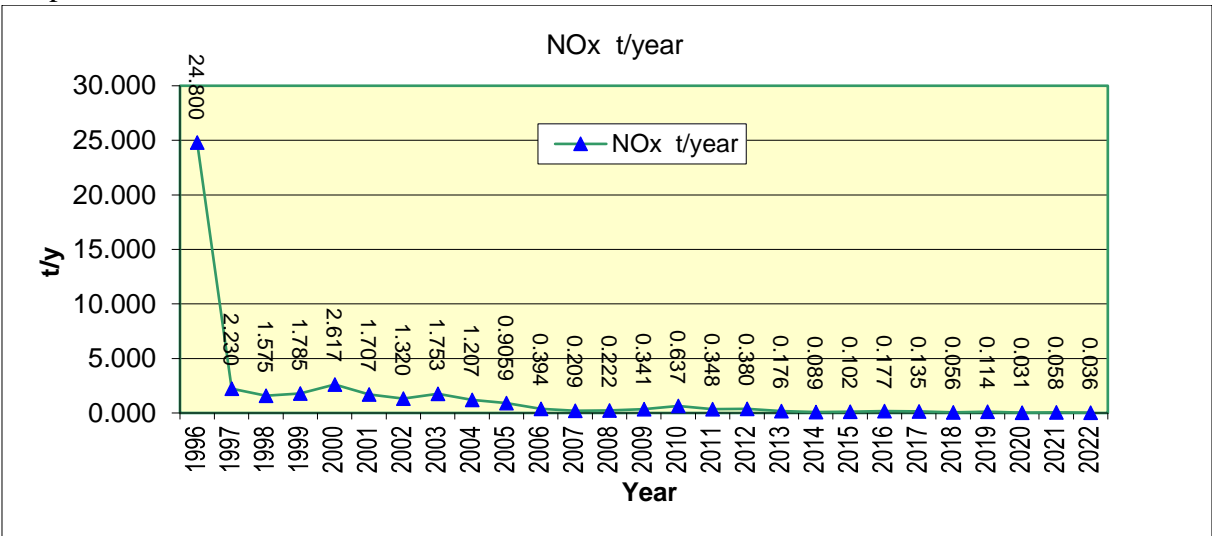
**Other components of air pollution: NO<sub>x</sub>, SO<sub>2</sub> and solid particles/dust (from natural gas):**

Emissions of key pollutants deriving from our activity have been monitored and recorded since 1996/97 when, after commencement of geothermal heating, a significant reduction was achieved in emissions of CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub> and solid particles. From that time on, the emissions have constantly been on low, roughly the same level, but in 2022 a moderate decrease was caused by using less natural gas for additional heating.

**Development of NO<sub>x</sub> Emissions**

In 2022, the quantity of NO<sub>x</sub> emissions was **0.036262 t/y**. Graph 6 shows the development of NO<sub>x</sub> emissions in the period from 1996 to 2022.

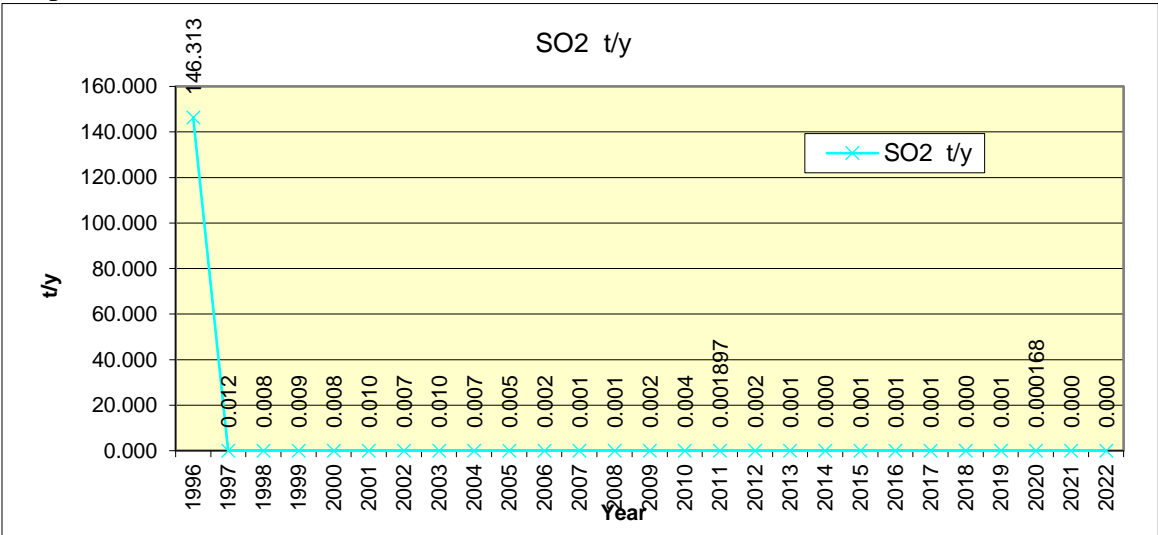
Graph 6



**Development of SO<sub>2</sub> Emissions**

In 2022, the quantity of SO<sub>2</sub> emissions was **0.000198 t/y**. Graph 7 shows the development of SO<sub>2</sub> emissions in the period from 1996 to 2022.

Graph 7

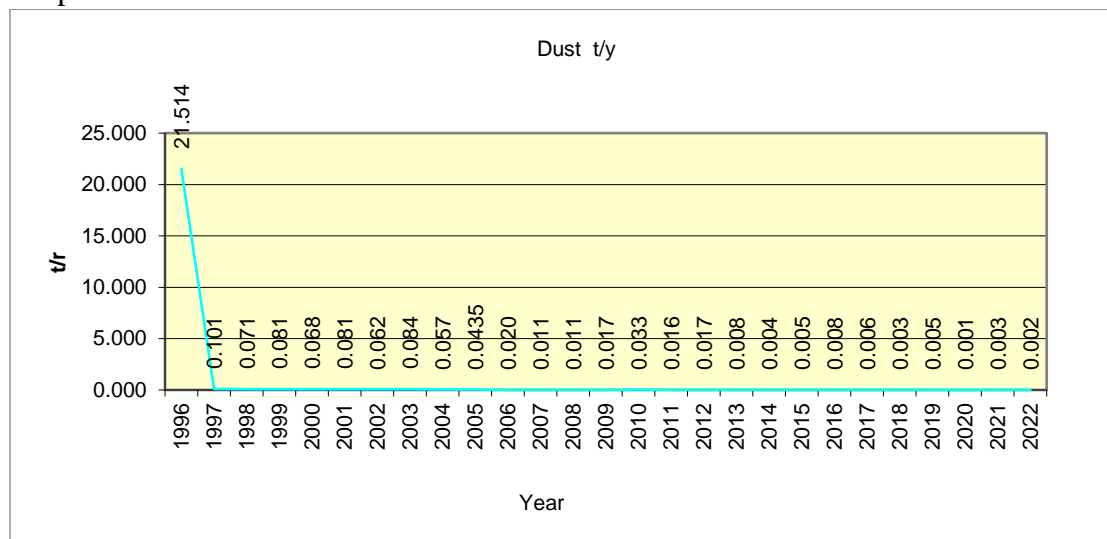


## Solid Particles/Dust

In 2022, the quantity of **solid particles/dust** was **0.001648 t /y**.

Graph 8 shows emissions of solid particles in the period from 1996 to 2022.

Graph 8



## **Treatment of Geothermal and System Water**

### Geothermal Water

Before its utilization for energetic purposes the geothermal water is treated with inhibitor of corrosion and scaling.

In 2022 inhibitor CRW85218 was substituted by another product named CRW85672. The active ingredient of this product is also imidazoline, but the composition of additional substances has been changed. The new corrosion inhibitor CRW 85672 meets the requirements of EU regulations REACH.

Composition and dosage of this inhibitor is included in Table 5.

Table 5

Type	Sort of material	Composition	Dosage
CRW 85218	Corrosion inhibitor	Salts of imidazolines Methanol 2-mercaptoethanol Quaternary ammonium salts	2.0 mg/l
CRW 85672	Corrosion inhibitor	Salts of imidazolines Ethan -1.2 diol 2-mercaptoethanol Quaternary ammonium salts	2.0 mg/l

In 2022 the overall consumption of inhibitor CRW 85218 was 335 kg and the consumption of CRW 85672 was 525 kg.

## **Treatment of System Water**

The system water is softened by sodium chloride (NaCl) and treated by sodium sulphite Na<sub>2</sub>SO<sub>3</sub> and sodium phosphate Na<sub>3</sub>PO<sub>4</sub>. The consumption of chemicals for treatment of system water in the year 2022 is shown in Table 6.

Table 6

<b>Chemicals</b>	<b>Quantity (kg)</b>
Na <sub>3</sub> PO <sub>4</sub>	5
Na <sub>2</sub> SO <sub>3</sub>	10
NaCl	125

## **Thermally Used Geothermal Water**

After its utilization in Energycentre, the thermally used geothermal water containing some residual heat energy is utilized by companies Galandia s.r.o. and Kaskády s.r.o. for energetic purposes. Thereafter the used geothermal water is discharged into the reservoir of Hydroelectric Power station Kráľová.

For this purpose, a pumping station was erected including two pumps for pumping the used geothermal water over the dam.

In the year 2014, an outlet facility was built into the water course Derňa at the intersection of road Galanta – Kolónia on the right side of the flow. This facility serves as an emergency outlet of geothermal water from discharge pipeline (only for provisional, short-time employment in case of failure or shortage of electricity in the pumping station). The above measures secure the reliable, effective, ecological, and environmentally friendly disposal of used geothermal water.

Discharge of used geothermal water was permitted by Environmental Department of the District Office Trnava, in Decision No. OU-TT-OSZP-2015/036146/GI.

According to this permission the following characteristic indicators have to be monitored in the samples taken from behind the heat exchangers in Energycentre:

pH (6.5 - 8.5)

DS<sub>105</sub> (4 600 mg/l)

The measurements are made by accredited laboratories. The periodicity of measurements is 3 times a year, twice in the heating period and once in summer period. The results of these measurements are submitted to the competent body of state water administration once a year.

This regulation is fully respected and observed by the company.

Table 7 shows the values of used geothermal water discharged into the recipient in the year 2022:

Table 7

<b>Measured parameter</b>	<b>Unit/Date of Protocol Issuing</b>	<b>08/03/2022</b>	<b>21/06/2022</b>	<b>25/10/2022</b>	<b>Concentration</b>	<b>Balance value</b>
pH	-	7.18	7.19	7.32	6.50 – 8.50	-
DS at 105 °C	mg/l	4122	3714	4002	4600	3038.2 t/y