HUSZPO HRVATSKA UDRUGA STRUČNJAKA ZAŠTITE PRIRODE I OKOLIŠA

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OPERATION EXPERIENCE AND OUTLOOK OF WASTE – TO – ENERGY PLANT TOPLARNA CELJE

ISKUSTVA RADA I BODUČNOST UREDŽAJA ZA TERMIČKU PRERADU OTPADA TOPLANA CELJE

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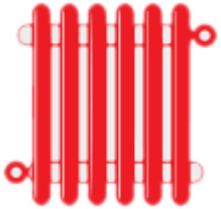
Main activities of Energetika Celje

Osnovne djelatnosti Energetike Celje



1. DISTRICT HEATING

2. DISTRIBUTION OF NATURAL GAS

3. WASTE THERMAL TREATMENT

Waste – to – Energy Celje heating plant

Toplana Celje

- Heat generated during thermal treatment **of pretreated energy rich municipal solid waste fraction and sludge from the wastewater treatment plant** is utilized for the **production of thermal and electrical energy**.
- Is **the first** such plant in Slovenia (also ex-YU).
- Built according to strict EU standards and 70% co-financed by EU funds.
- Operation provided 24 hours/day, up to 8000 hours/ year

The main reasons for the construction of Celje heating plant

Razlozi za izgradnju Toplane Celje

1. **Reducing the volume and mass of waste going to landfill**
2. **Meeting** the EU requirements concerning the **content of biodegradable carbon** in the waste landfilled
3. **Disposal of sewage sludge** from central wastewater treatment plant
4. **Thermal processing** of waste with an energy recovery to cover part of the **energy needs** in Celje

Celje heating plant project time table

Kronološki prikaz projekta Toplane Celje

YEAR	Activity
2003.	Conceptual design and development of a regional strategy
2004.	Conceptual design and investment program
2005.	Environmental impact assessment (EIA) and modification of spatial plans
2006.	Environmental permit, tender, sign a contract
2007.	Obtain a building permit and start of construction (18 months in total – civil construction and technology)
2008.	Completion of construction and trial operation
2009.	Trial operation with thermal treatment of waste
2010.	Operating permit, regular operation from Sept. 2010

Waste thermal treatment process

Proces termičke prerade otpada

In technological process of thermal treatment of waste entering:

- Up to 24,900 t / year of pretreated municipal waste in the form of a light fraction (LF) from the MBT process with a calorific value from 18 to 24 MJ/kg

- Up to 5,100 t / year of sludge sludge from wastewater treatment plants (SS) with a maximum of 25% of the dry matter, and the calorific value around 1 MJ/kg.

The total calorific value of the mixture has an average value of about 16 MJ/kg.

General information of Celje heating plant

Opšte informacije o Toplani Celje

- **STEAM BOILER SYSTEM – Thermal treatment of waste**

Capacity of the system: (LF + SS): 30,000 t / year

Steam parameters: 20 t / h, 350 °C and 28 bars

Thermal power of the steam boiler: 15 MW

Electrical power of the steam turbine 2 MWe

- **Two natural gas fired hot water boilers**

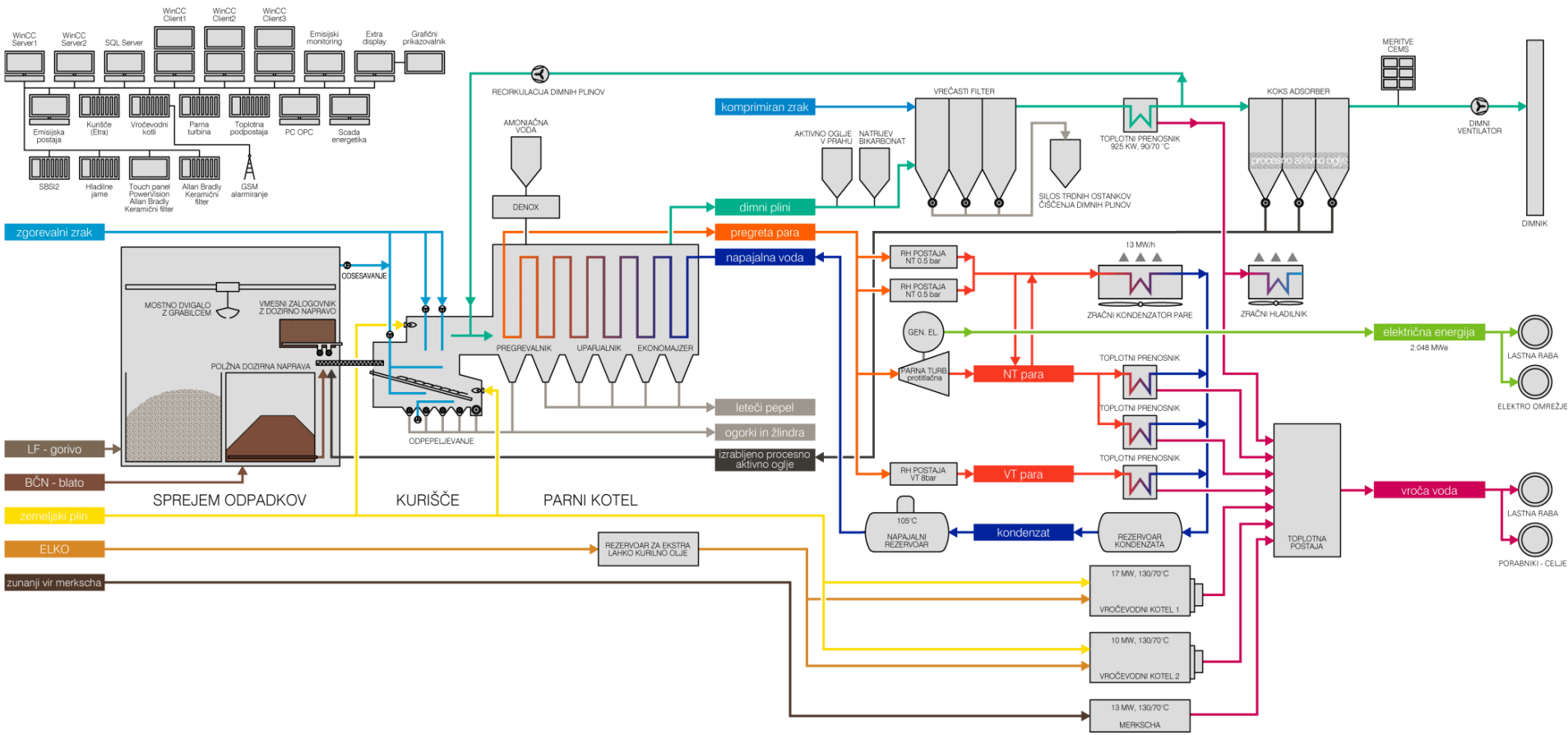
The thermal power of hot water gas boilers:

HWB 1: 10 MW

HWB 2: 16,5 MW

Technology layout

Shema tehnologije



Combustion process

Proces sagorijevanja

The primary chamber:

Combustion on multi-zone static and hydraulically movable grate;

- Pyrolytic-gasification process takes place on the grate at a temperature between 650 °C and 850 °C;
- The proportion of primary air is about 70% of the stoichiometric needed amount of air.

The secondary chamber:

- Temperature up to 1200 °C,
- The residence time after tertiary air inlets over 2 seconds,
- A minimum oxygen content of 6 vol.%.

Flue gas treatment process

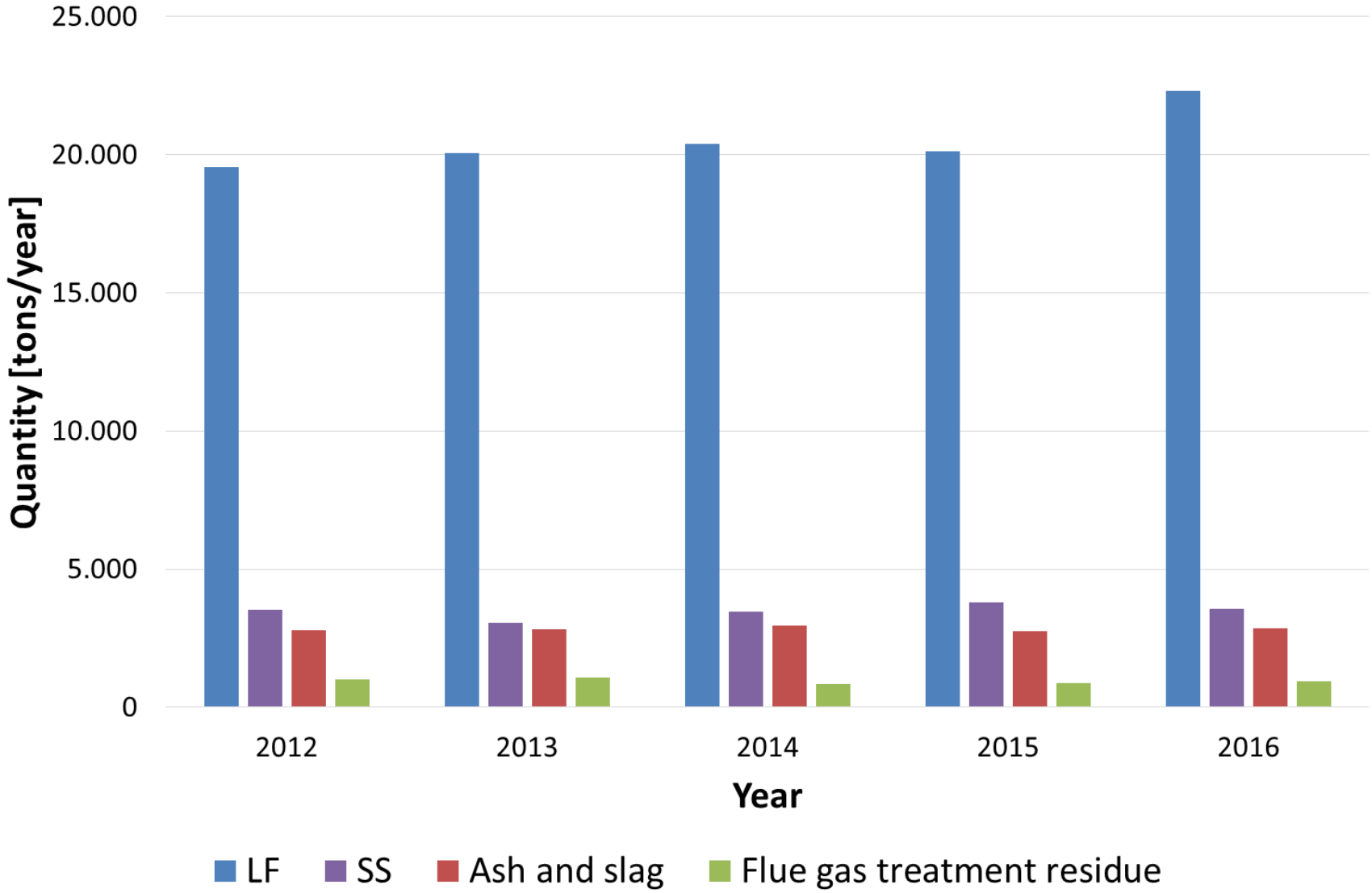
Proces pročišćavanja dimnih plinova

Flue gas treatment process is designed in multiple stages with various technological solutions:

1. Reducing NOx:
   - recirculation of cleaned and cooled flue gases;
   - spraying ammonia solution into the hot flue gases (SNCR process).
2. The elimination of particulate matter, acid gases and organic substances
   - injection of sodium bicarbonate and activated carbon powder for neutralization of acid gases (SO_2, HCl, HF) and adsorbtion of organic compounds and heavy metals;
   - bag filter for the extraction of particulate matters.
3. Final stage of flue gas cleaning - polishing
   - coke adsorber for additional elimination of organic substances (e.g. PCDD / F), acid gases and possibly present heavy metals (e.g. Hg).

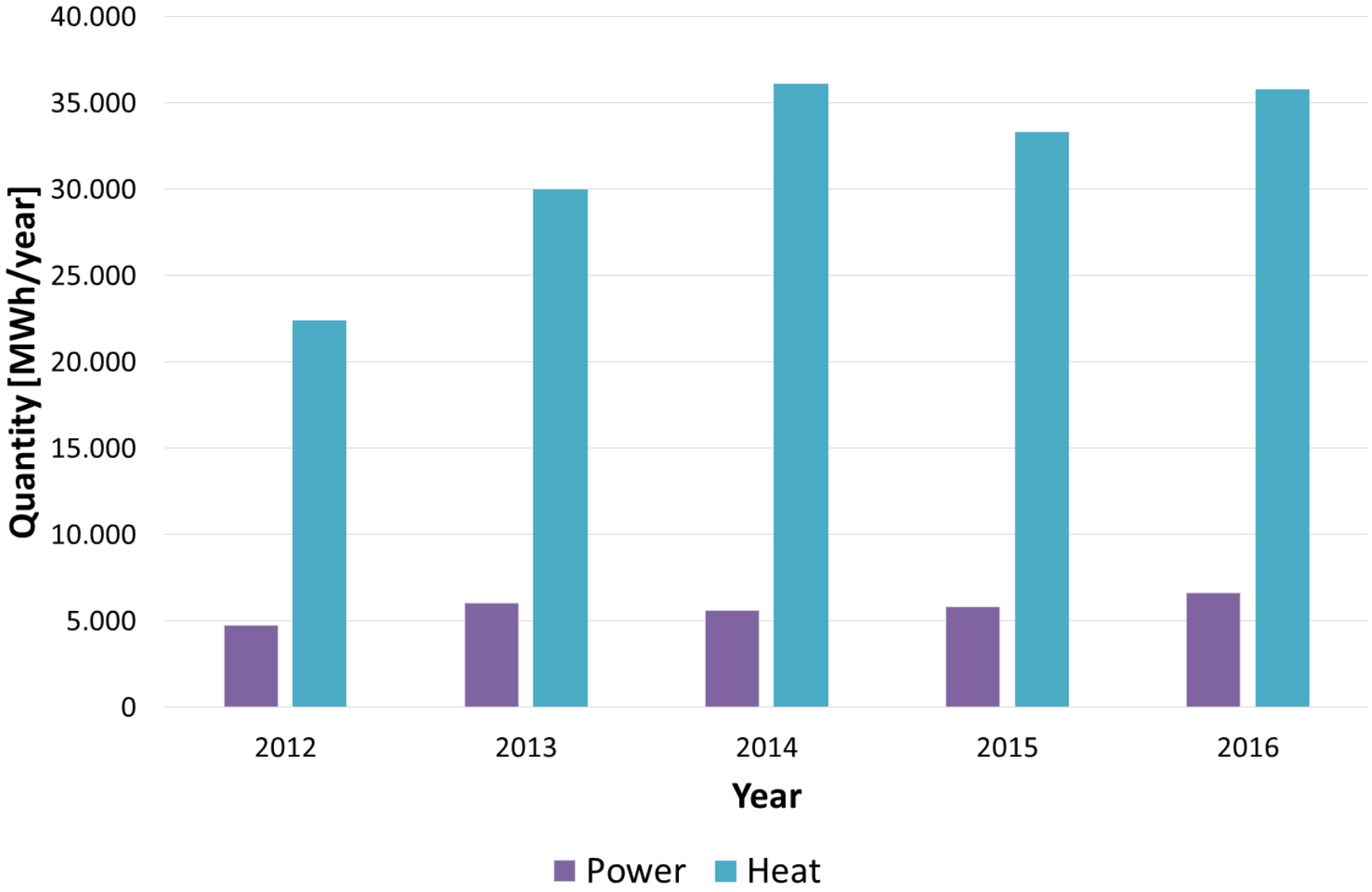
Waste treatment in recent years

Količine tretiranih otpadaka u proteklim godinama



Distribution network supplied energy in recent years

Distribucijskim sistemima predata energija u proteklim godinama



Environmental impact of Celje heating plant

Uticaj na životnu sredinu Toplane Celje

The following **environmental impacts** were identified:

- ✓ emission of substances in the air,
- ✓ emission of substances in the water,
- ✓ noise,
- ✓ electromagnetic radiation,
- ✓ residues after the thermal treatment.

✓ **ALL OF THEM WELL WITHIN EU LEGAL LIMITS!**

Positive effect for the environment

Pozitivni uticaj na životnu sredinu

- **Thermally treated on total of more than 23,000 tones of LF and SS / year.**
- **Significantly reduced the overall mass and volume of waste deposited at the landfill**
- **Heat generated by combustion is utilized for combined heat and power production.**
- **Large savings in the use of fossil fuels for district heating system (replaced natural gas)**
- **Per year on average delivered:**
    - > 5,000 MWh of electricity
    - > 35,000 MWh of heat
- **Reduced emissions of green-house gases due to:**
    - Mechanical and biological pre-treatment of mixed municipal waste
    - Thermal treatment of waste
    - Waste deposited in a landfill contains less than 3% TOC
    - Fossil fuel replacement for district heating

Thank you for your attention!

Hvala na pažnji!