



District Heating – The Road Ahead

– A city's view on challenges and opportunities in deep decarbonization

Ivan Ivanković, M.Eng.

Head of energy, energy management and sustainable energy development

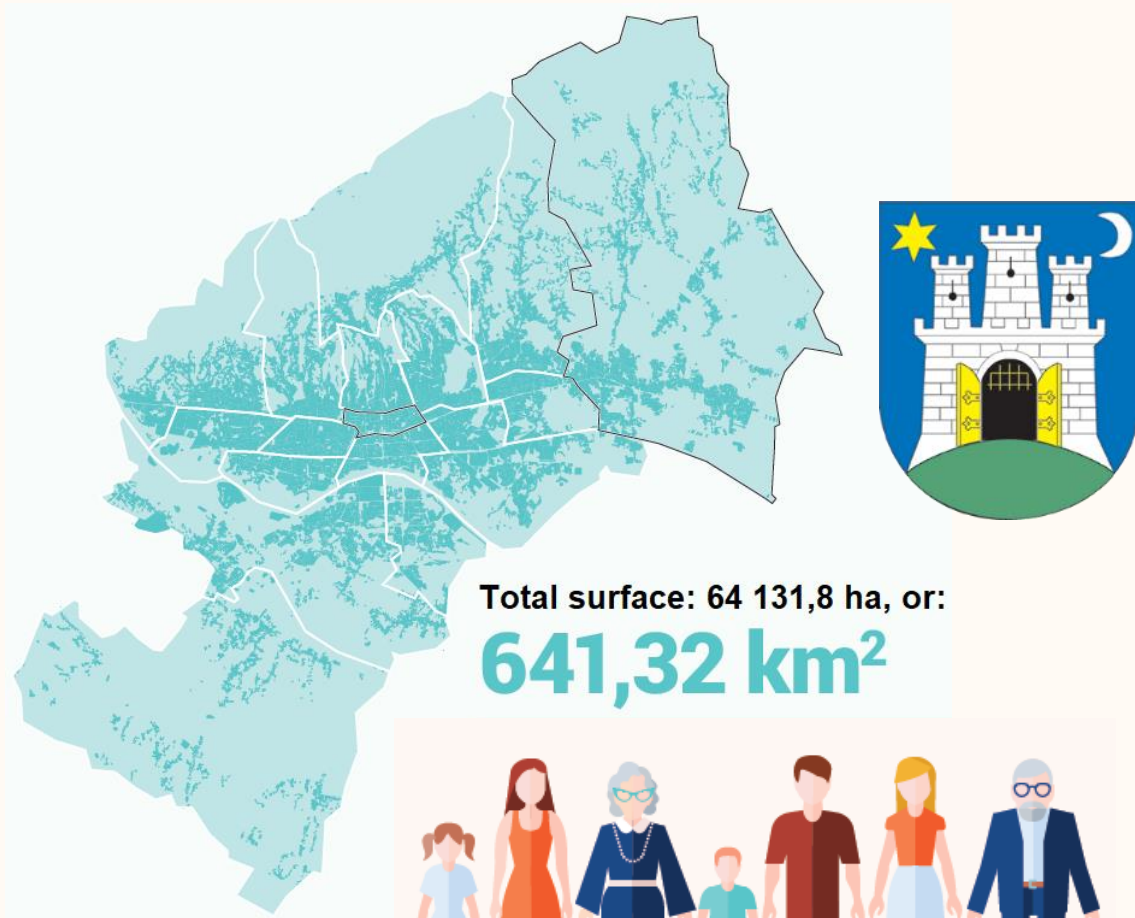
ivan.ivankovic@zagreb.hr



City of Zagreb

City Office for Economy, Energy and Environment Protection

03.04.2019.



Total surface: 64 131,8 ha, or:

641,32 km²



Population:

802 762

ECONOMY

Nominal gross domestic product, 2015.



**113 199 mil.
kn**

Zagreb

141 379 kn

GDP per capita



**338 975 mil.
kn**

Croatia

80 555 kn

GDP per capita

Tourism, 2017.



2,3 mil.
tourist nights

+ 14,8%

2017./2016.



84,0%
foreign tourists



16,0%
domestic tourists

Quick overview of Zagreb's energy policy

- In effect since March 2008
- Legal mandate (*Law on Energy Efficiency, OJ 127/14 & 116/18*):
 - Energy efficiency plans – every year
 - Energy efficiency action plans – every 3 years
- **Covenant of Mayors framework** (2008 as baseline):
 - Sustainable Energy Action Plan (**SEAP**): 2010 – 2020
 - 21% CO₂ reduction by 2020.
 - Sustainable Energy and Climate Action Plan (**SECAP**): 2030
 - **40% CO₂ reduction by 2030.**
 - **Significant increase in climate change adaptation**
 - Public consultation currently under way (25.03. – 25.04.2019.)
 - Expected SECAP adoption on City Assembly May session



So far, we were pretty good. 😊

However... 🎵 we ain't seen nothin' yet 🎵



European Commission

English EN

Home > News > New Renewables, Energy Efficiency and Governance legislation comes into force on 24 December 2018

European Commission - Press release

The Commission calls for a climate neutral Europe by 2050

Brussels, 28 November 2018

Today the European Commission adopted a strategic long-term vision for a prosperous, modern, competitive and climate neutral economy by 2050 – A Clean Energy Union for all.

The strategy shows how Europe can lead the way to climate neutrality by investing into realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research – while ensuring social progress for a just transition.



Clean energy for all Europeans

As a result of the new rules, in 2030 electricity consumption will be 31% lower, compared to 2021.

Clean energy for all Europeans package - state of play (27 March 2019)

	European Commission Proposal	EU Inter-institutional Negotiations	European Parliament Adoption	Council Adoption	Official Journal Publication
Energy Efficiency		Political Agreement	17/04/2018	14/05/2018	19/06/2018 - Directive (EU) 2018/844
		Political Agreement	13/11/2018	04/12/2018	21/12/2018 - Directive (EU) 2018/2001
		Political Agreement	13/11/2018	04/12/2018	21/12/2018 - Directive (EU) 2018/2002
		Political Agreement	13/11/2018	04/12/2018	21/12/2018 - Regulation (EU) 2018/1999
		Political Agreement	26/03/2019	Scheduled in May 2019	-
Renewable Energy	Electricity Directive	30/11/2016	26/03/2019	Scheduled in May 2019	-
	Renewable Energy Directive	30/11/2016	26/03/2019	Scheduled in May 2019	-
	ACER	30/11/2016	26/03/2019	Scheduled in May 2019	-

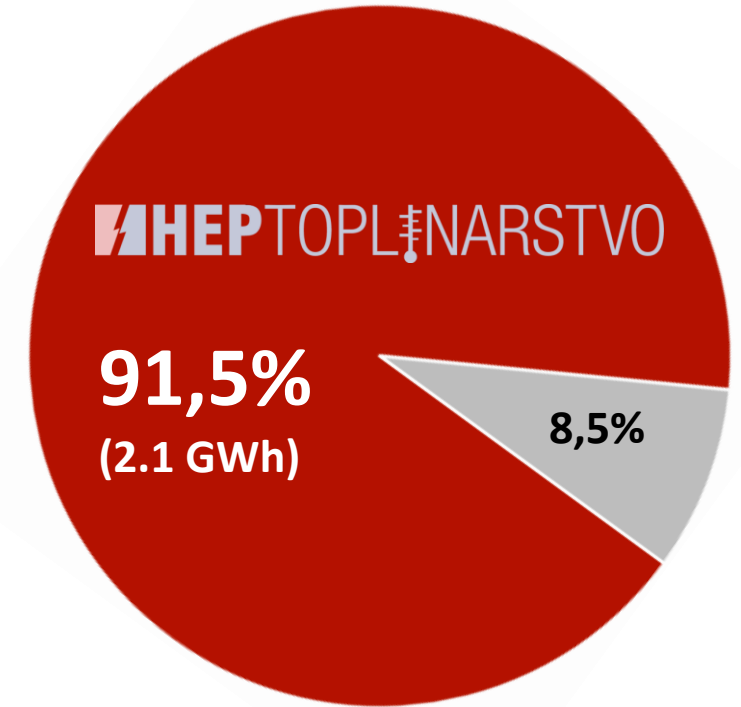
on standards for

period after 2020 – track to become

from new vans 31%

District heating system (DHS) in the City of Zagreb (1)

- District heating provided by **HEPTOPL** and **NARSTVO** on a 20-year concession (valid until 2026)
- Two sources of heat energy:
 - EL-TO – western part of the city: 87.8km
 - TE-TO – eastern part of the city: 139.5km
 - Total DHS network: 227.3km, built mostly until 1990.
- 101.852 end users
 - 97.251 households
 - 4.601 businesses
- 2.807 substations



Delivered thermal energy in Croatia
(source: HERA, 2016)

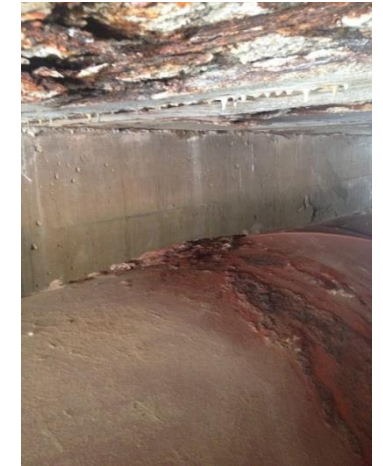
District heating system (DHS) in the City of Zagreb (2)

THE PROBLEM:

- Severe corrosion + pipe decay = ruptures of DHS pipes
 - Heat & water refilling losses in the system decreasing the efficiency of the DHS
 - Heat losses in 2017: 210.28 GWh or 15.9% of the produced thermal energy
 - 65.7% losses in TE-TO, 34.3% in EL-TO networks, respectively
 - Water refilling losses in 2017: 1,235,723 m³

THE SOLUTION:

- In order to increase the security of supply and reduce the heat and water refilling losses in the system, and consequently the number of emergency interventions, **revitalization of critical DH pipelines with preinsulated pipes is needed.**



District heating system (DHS) in the City of Zagreb (3)

„Revitalization of the Hot-Water Network aimed at the decrease of energy losses and increase of the efficiency of the district heating system in Zagreb”

- EU-cofunded major project (>50m€)
- Strategies and goals as necessary prerequisites for EU cofunding:
- Operational program Competitiveness and Cohesion (2014 – 2020)
 - Thematic objective **4** – Promotion of Energy Efficiency and RES
 - Investment priority **4c** - Supporting energy efficiency, smart energy management and renewable energy use in public infrastructure, including in the public buildings, and in the housing sector
 - Specific objective **4c3** - Increasing the Efficiency of the District Heating System
- Project delivery through Zagreb's ITI (*Integrated Territorial Investments*) mechanism:
 - Directly supporting the Zagreb Urban Agglomeration Development Strategy:
 - Measure 3.2.3 'Construction and Improvement of Infrastructure Equipment – Public System of Heating'

District heating system (DHS) in the City of Zagreb (4)

- Project goals:

Source:	Indicator	Initial value	Target value	Project contribution
OP & ITI strategy	Reduced heat losses in Zagreb DHS by 2023.	12%	8,6%	3,4%
OP	Total savings with regard to energy efficiency in DHS	0 PJ	0,2 PJ	0,2 PJ
Project indicator	The length of the revitalized Zagreb DHS network by 2023.	0 km	68,5 km	68,5 km

- Financial overview:

Total project value: **~96m €**

Eligible costs: **~77m €**

Expected cofunding: **~57m €**

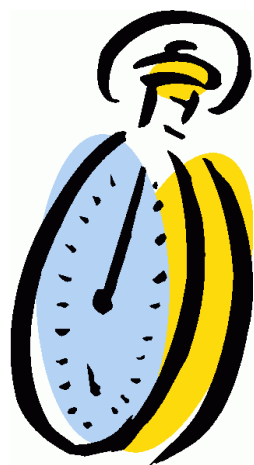


District heating system (DHS) in the City of Zagreb (5)

- Current activities:

- State Aid (pre)notification procedure @ DG COMP
- Major Project application @ DG REGIO
- Project documentation preparation (permits, ...)

68,5 km



2019. – 2023.

Stakeholders:



Government
of the Republic
of Croatia



Meanwhile...over at EL-TO

- Large scale project to replace outdated oil- and gas-fired turbines and boilers
- Installation of two low-NOx gas turbines, two heat recovery steam generators and one back pressure steam turbine producing heat and electricity at the EL TO combined heat and power (EL TO CHP).
- The capacity of the new combined cycle gas turbine units will be 150 MW of electrical energy and 114 MW of thermal energy, with lower greenhouse gas emissions.



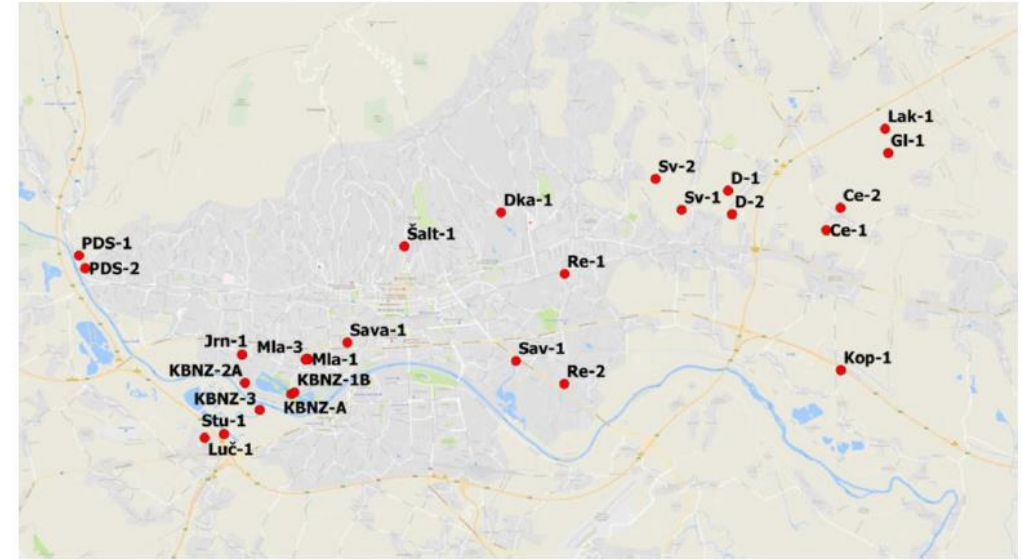


03.04.2019.

District Heating – The Road Ahead: A city's view on challenges and opportunities in deep decarbonization

District heating decarbonization (1) – brief overview

- Geothermal (GT) in Zagreb DHS
 - Discovered in 1977, covers an area of ~54km²
 - GT water supply around 77 l/s@80°C
- Legal framework: GT waters are part of the mining/mineral resources of the Republic of Croatia (regulated via the Mining Act and Water Act).
- Concessions are handled on the state, not city level.
- One active concession in GT field Zagreb: GPC INSTRUMENTATION PROCESS d.o.o.
- GT in Zagreb SECAP, mitigation measure #23: *„Use of geothermal potential within the district heating system”*



Zagreb GT field drillhole locations (*source: EIHP*)

District heating decarbonization (2) – brief overview

- EU set a target of increasing RES in heating and cooling by 1.3% p.a. starting in 2021. Currently only 18% of heating in the EU is renewable.
- Considering the prevalence of gas heat, there is a huge market <-> policy mismatch.
- **Solutions:**

Solar Thermal:

Solar district heating @ 25 €/MWh (daily heat storage) – 35 €/MWh (seasonal storage) vs. 45 EUR/MWh gas-fired/coal boilers across Western Balkans *(source: ReDEWeB & PlanEnergi)*

Waste Heat Recovery

High Efficiency, Properly-Sized, and Condensing Boilers

Smart Monitoring and Controls

High Efficiency Compressed Air Systems and Alternatives

Properly-Sized and Variable Speed Motors

Energy Management Systems

Design for a Circular Economy

Education and Technical Assistance

Financing

Mandatory Targets

Equipment Standards

Financing Incentives



Thank you!

Ivan Ivanković, M.Eng.

Head of energy, energy management and
sustainable energy development

ivan.ivankovic@zagreb.hr



City of Zagreb

**City Office for Economy, Energy and
Environment Protection**

03.04.2019.