### Velika Ciglena geothermal field, power plant and district heating potential

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CITIES / KeepWarm / UniZG workshop

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# **GT** gradient in Croatia

2.5

Mapped via oil & gas wells

Pannonian basin = 0,049°C/m

 $2000 \text{ m} \rightarrow 98^{\circ}\text{C}$  $3000 \text{ m} \rightarrow 147^{\circ}\text{C}$ 

... permeable aquifer needed!





# **Geothermal sites in Croatia**







# Hot aquifers of oil and gas fields



d.o.o.



# Source of water: rock









# **Circulation of geothermal brine**







# T = 100 – 190°C ... ORC process







#### **GTPP Velika-1**







# **During construction**







### "Steamfield"







# **Production wells, scale inhibition**







### Heat exchangers and condensers







### **Turbines and generators**







### **Connection for future heat usage**







# **District heating opportunities**









# Local heating ideas



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#### Manufacturing

- Workshops
- Offices
- Wood drying

#### Agricultural

- Animal feed
- Greenhouses (flowers, vegetables)





# **Greenhouse Sultan, Turkey**



GT water flow rate = 50 t/h

GT water temperature =  $70 - 80^{\circ}$ C

Closed area =  $41.400 \text{ m}^2$ Tomato production = 1600 - 2000 t/y







# Reliable, stable, compact RER

- 24 h / 7 operations, whole year  $\rightarrow$  baseload energy source
- High operational reliability, low operational cost
- Compact:

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Source: energy.gov

# **Exploration**

# **Exploitation**





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