



CLEAG

Zero Emission

CLEAG Geothermal

Pilot Plant in Croatia

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Power Plays: Geothermal Energy in Oil and Gas Fields

May 20, 2015. SMU Campus in Dallas, Texas

1.

Geology

2.

Technology

3.

Possibilities in the USA

The premise of the new technology:

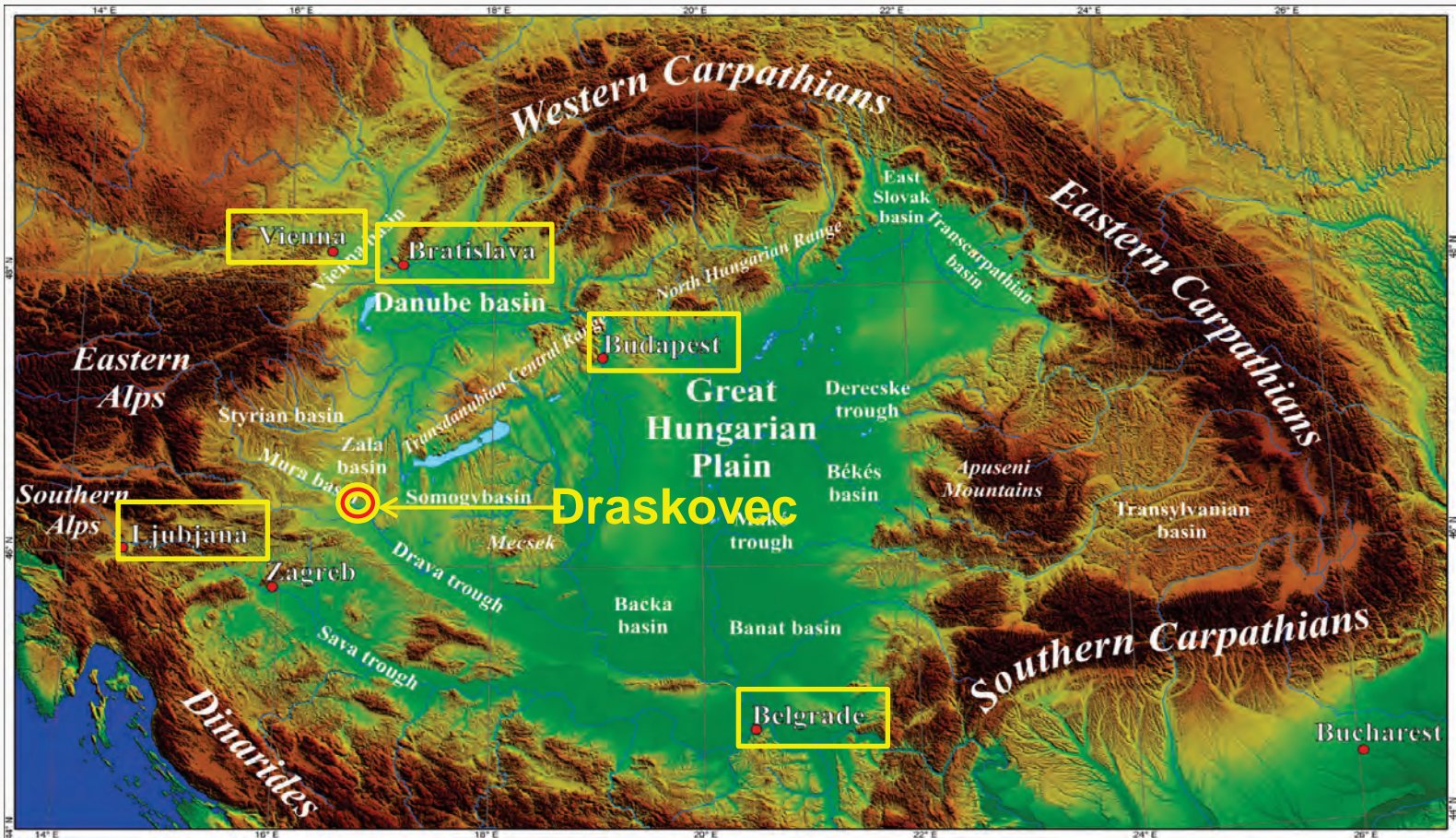
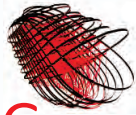
Rich thermal aquifers with increased methane (CH₄) content > 2 Nm³/ m³

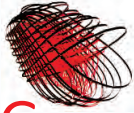
These conditions are in the Pannonian Basin in particular mass available.

- *Terrestrial heat flow **
- *Geothermal gradient **
- *Aquifer temperatures*
- *Locally elevated CH₄ content of the thermal waters*

* Generated by crustal extension in the Miocene - Pliocene

Therefore, the GEOTHERMAE project is located in Croatia, in the region of Prelog/ Draškovec

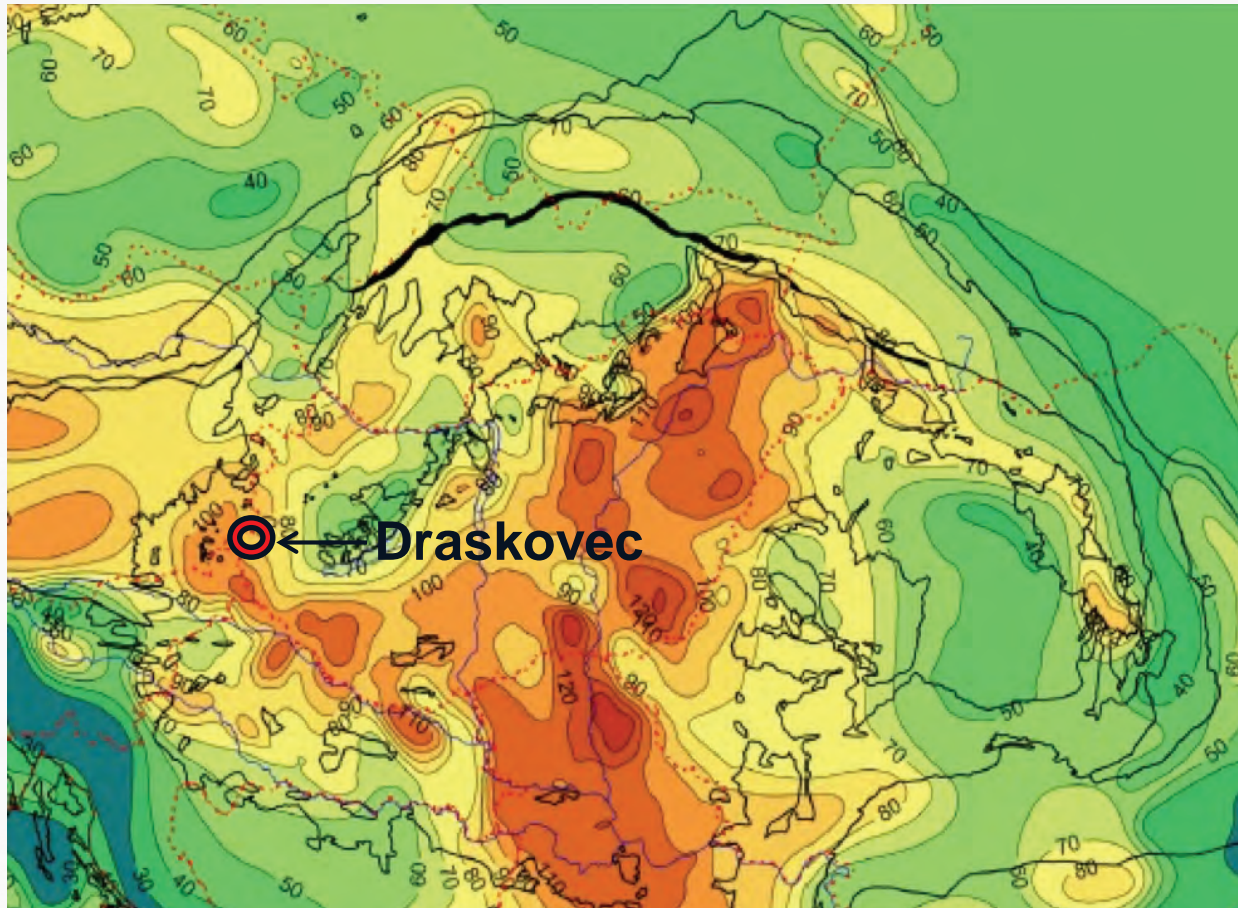




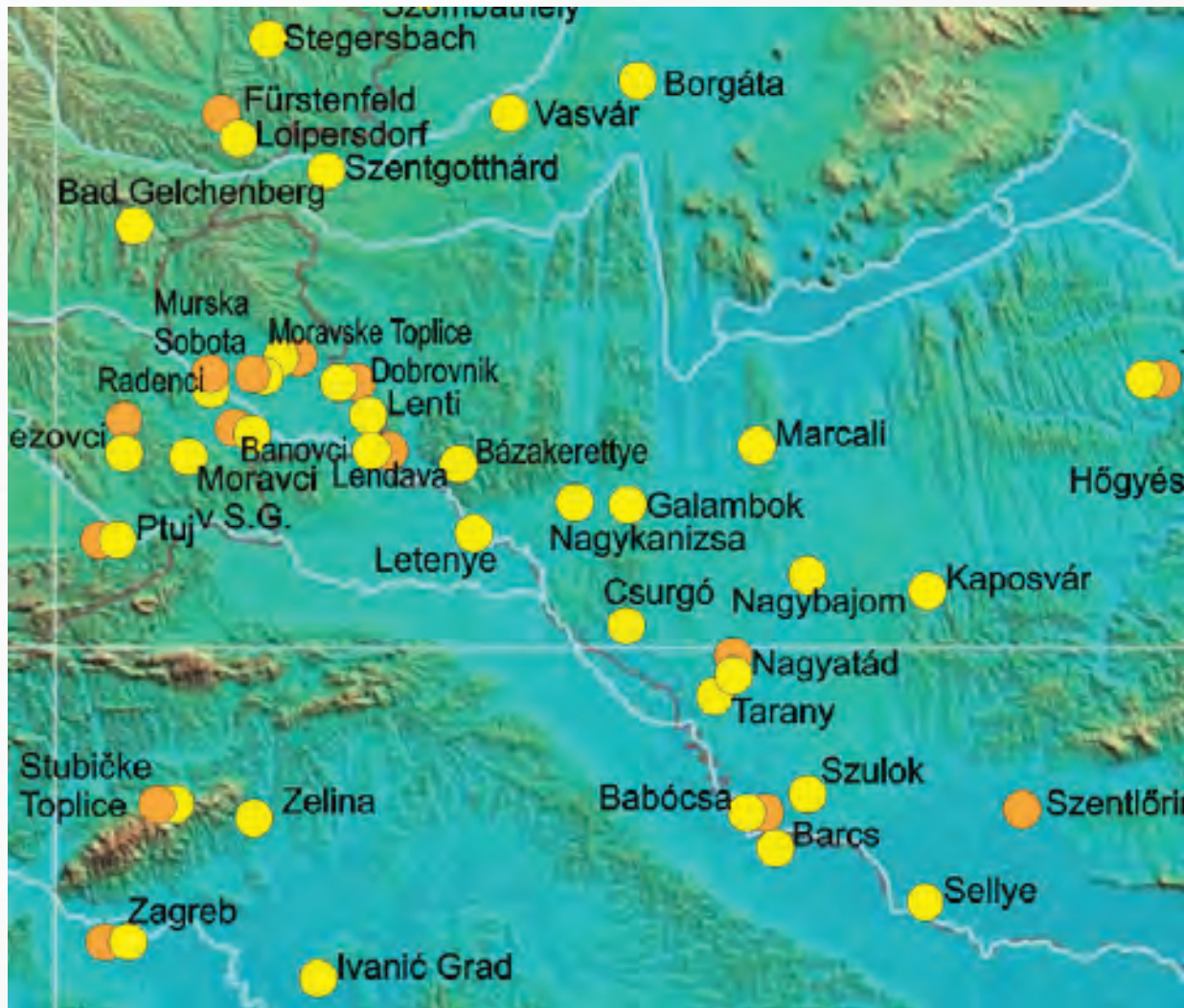
Zero Emission **CLEAG**

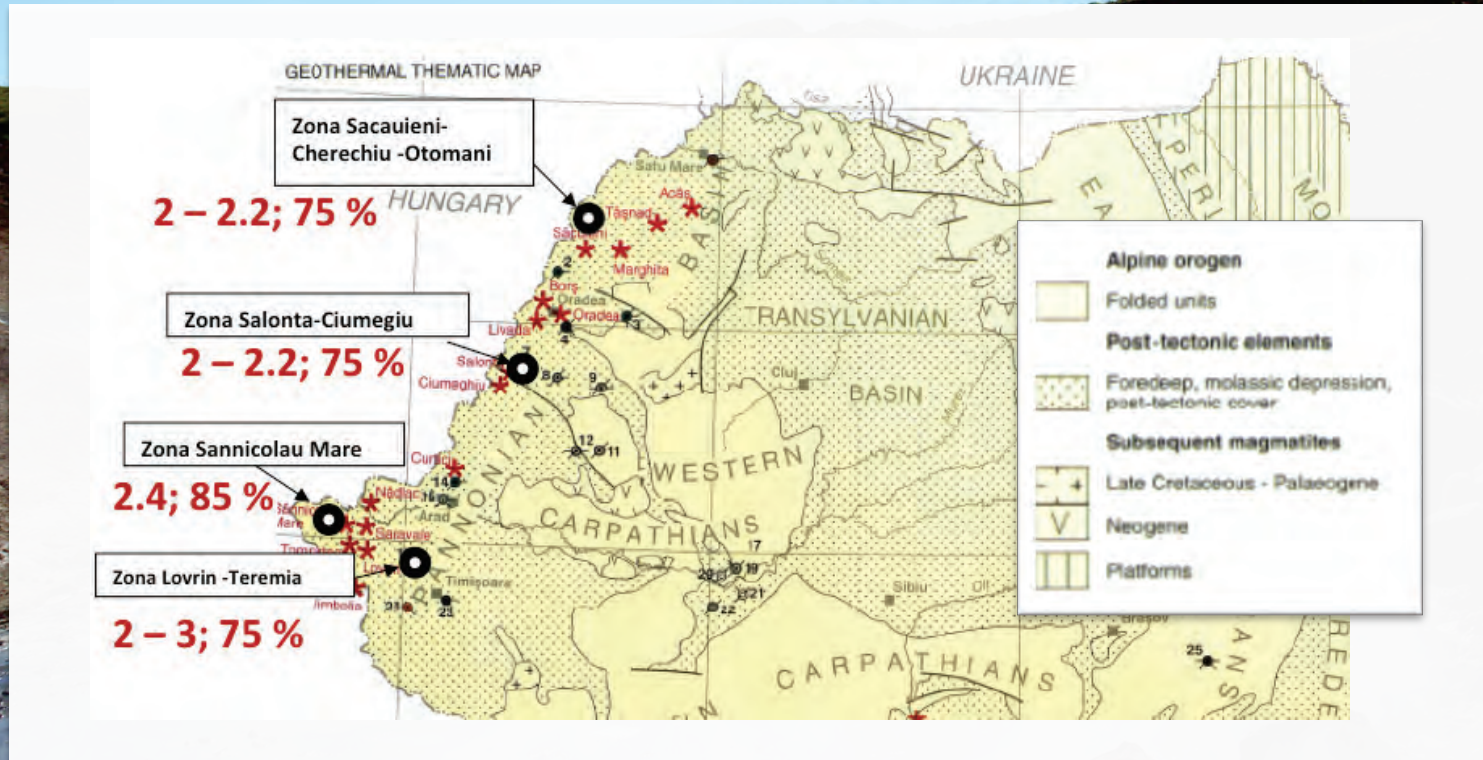
Geology

Heat Flow Map



Thermal Water Drillings: Croatia, Austria, Slovenia, Hungary





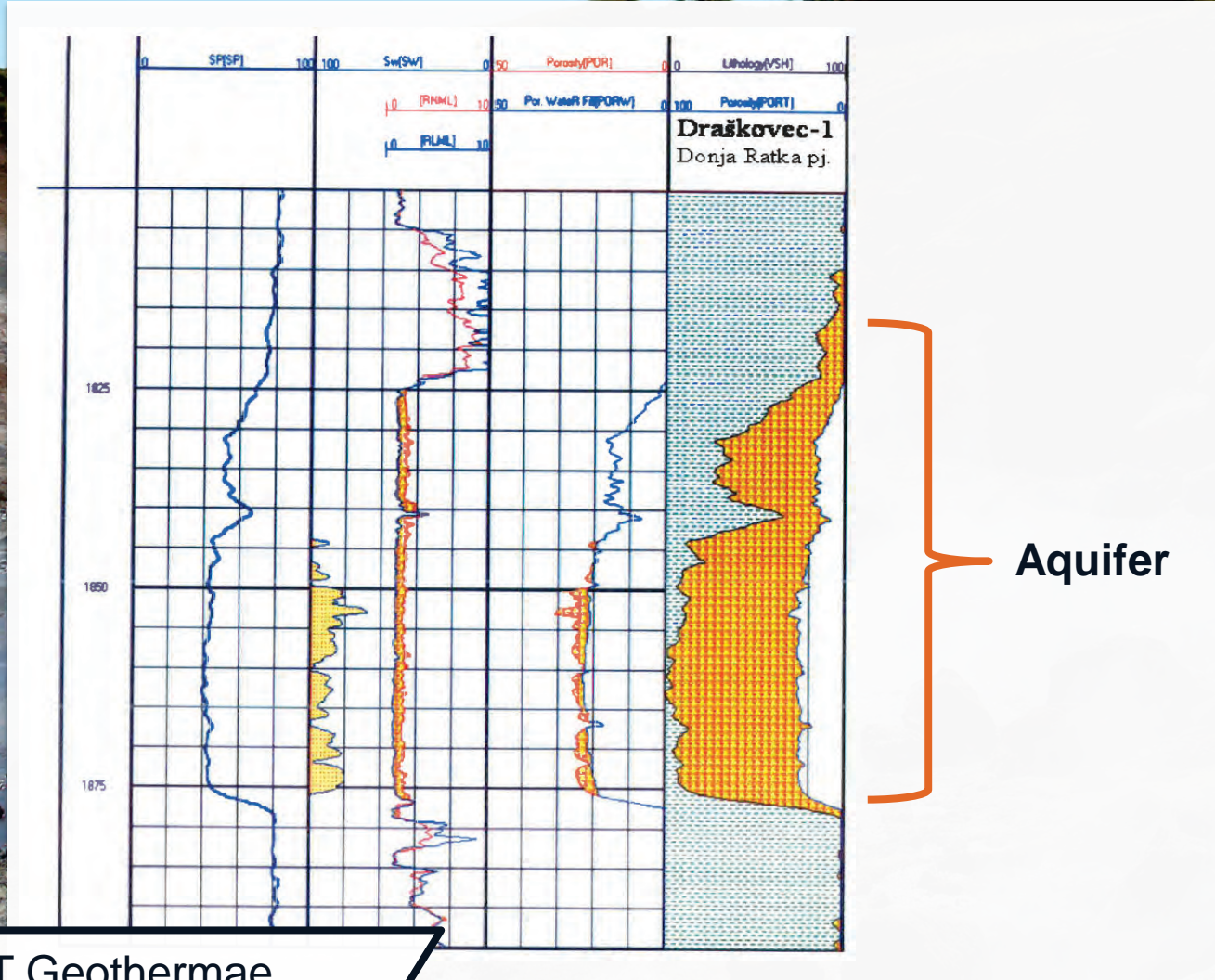
Thermal waters in the Pannonian Basin/ Romania with increased CH₄ content

Gas concentrations in Nm³ / m³; amount of methane in%

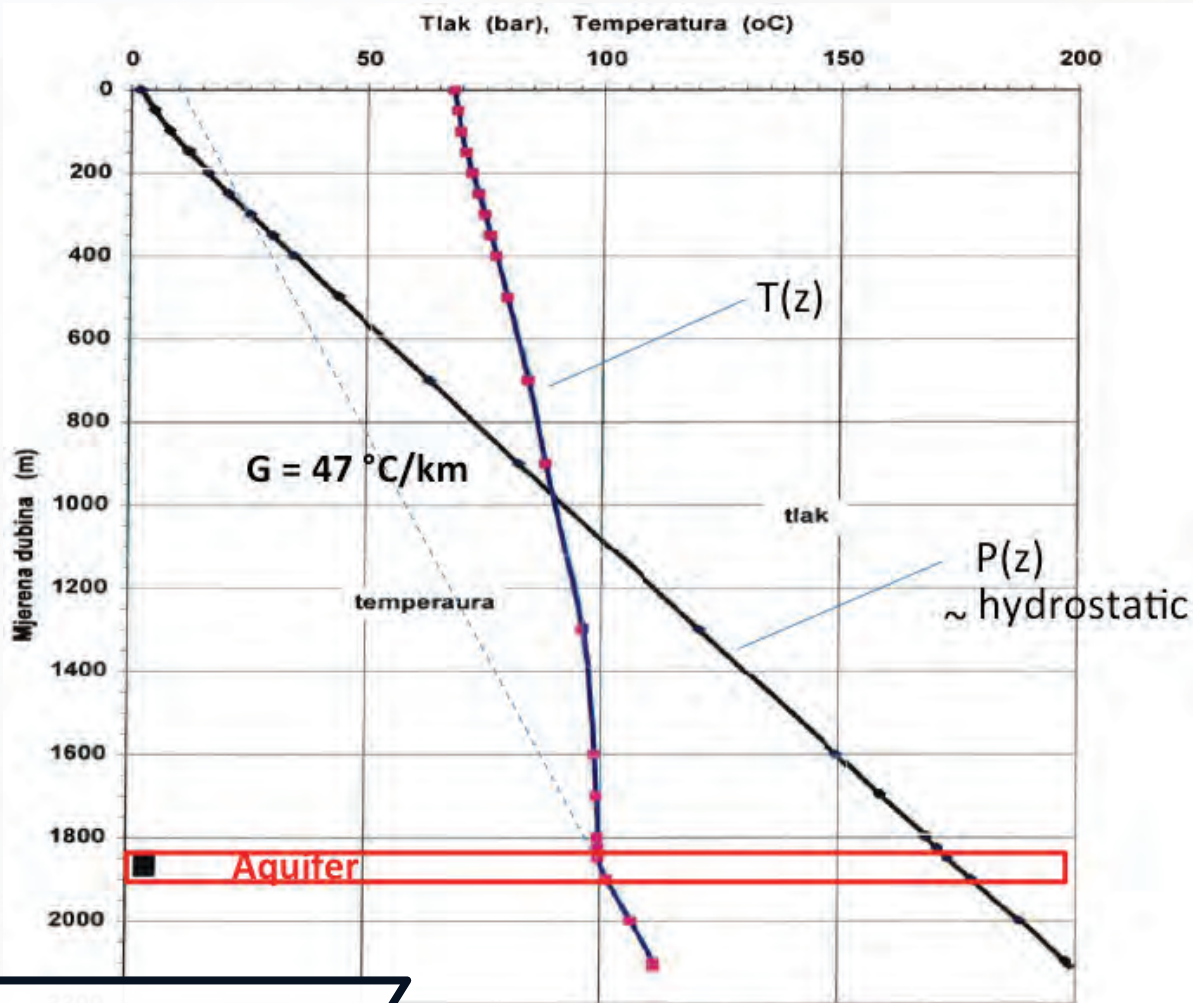
Aquifer Properties – Around Draškovec-1

Lithology:	Sandstone ("Donja Ratka"/ Tertiary)
Thickness:	46 m (average), max. 230 m
Porosity:	24% (average)
Permeability:	21-54 mD (max 200 mD.)
Flow rate:	13.1 l/ s (artesian, bore Draškovec-1)
Formation temperature:	100 ° C
Salinity:	12 g /l TDS (NaCl/ HCO ₃)
Gas content:	3 - 3.5 Nm ³ / m ³
Gas composition:	94% CH ₄ , 6% CO ₂

Log Analysis Display of Reservoir Section



Source: AAT Geothermae

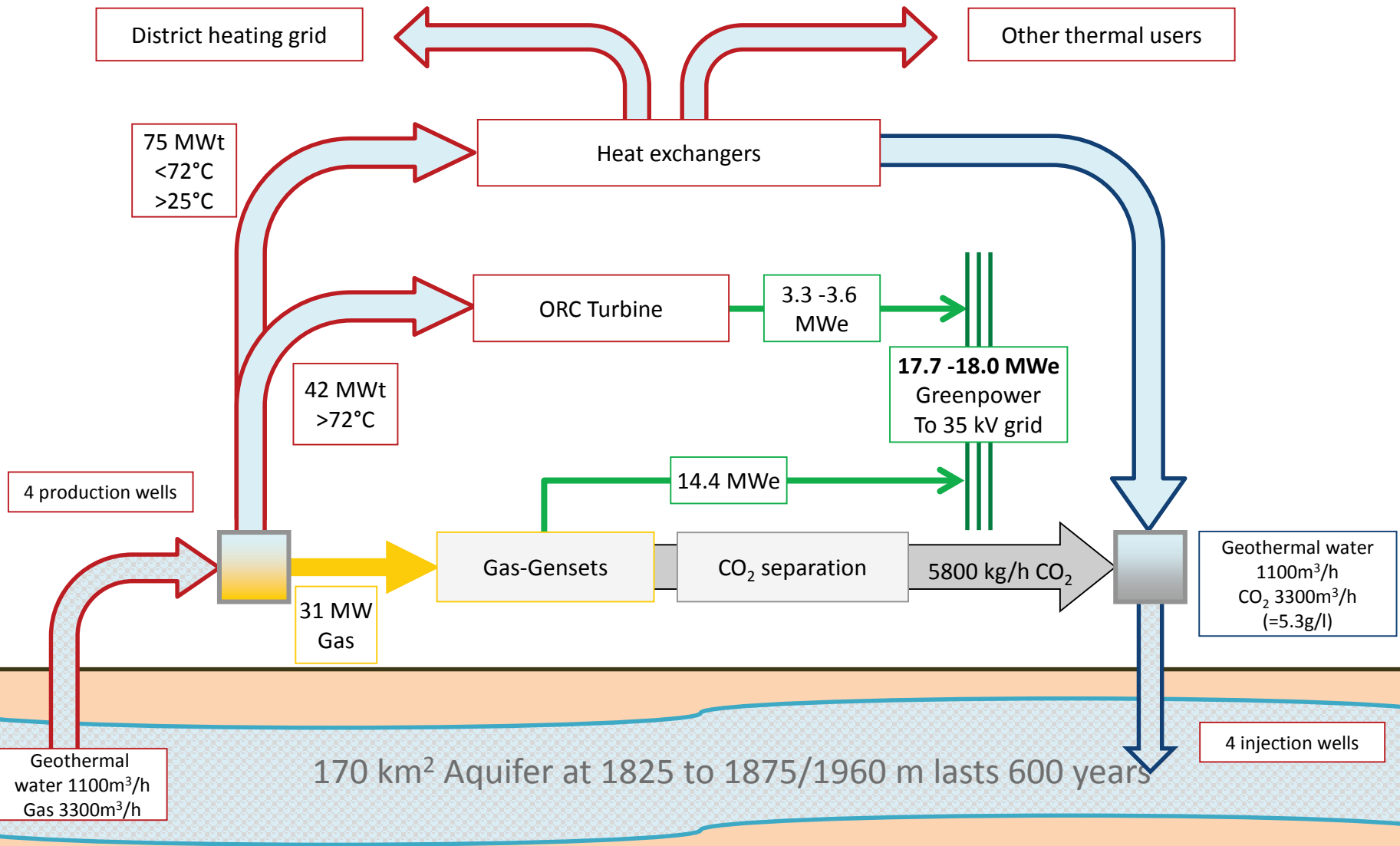




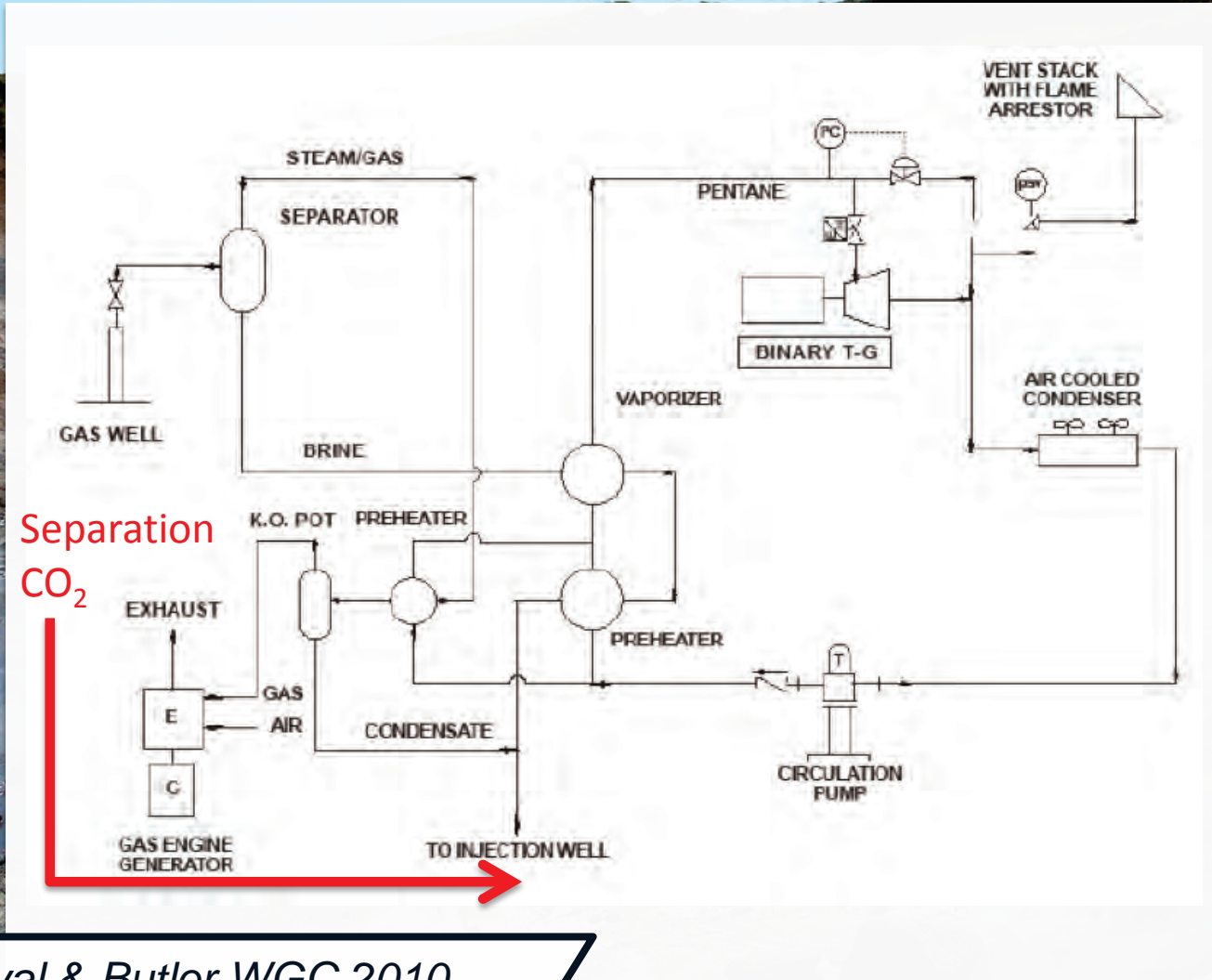
Technology



CloZEd Loop Energy technology



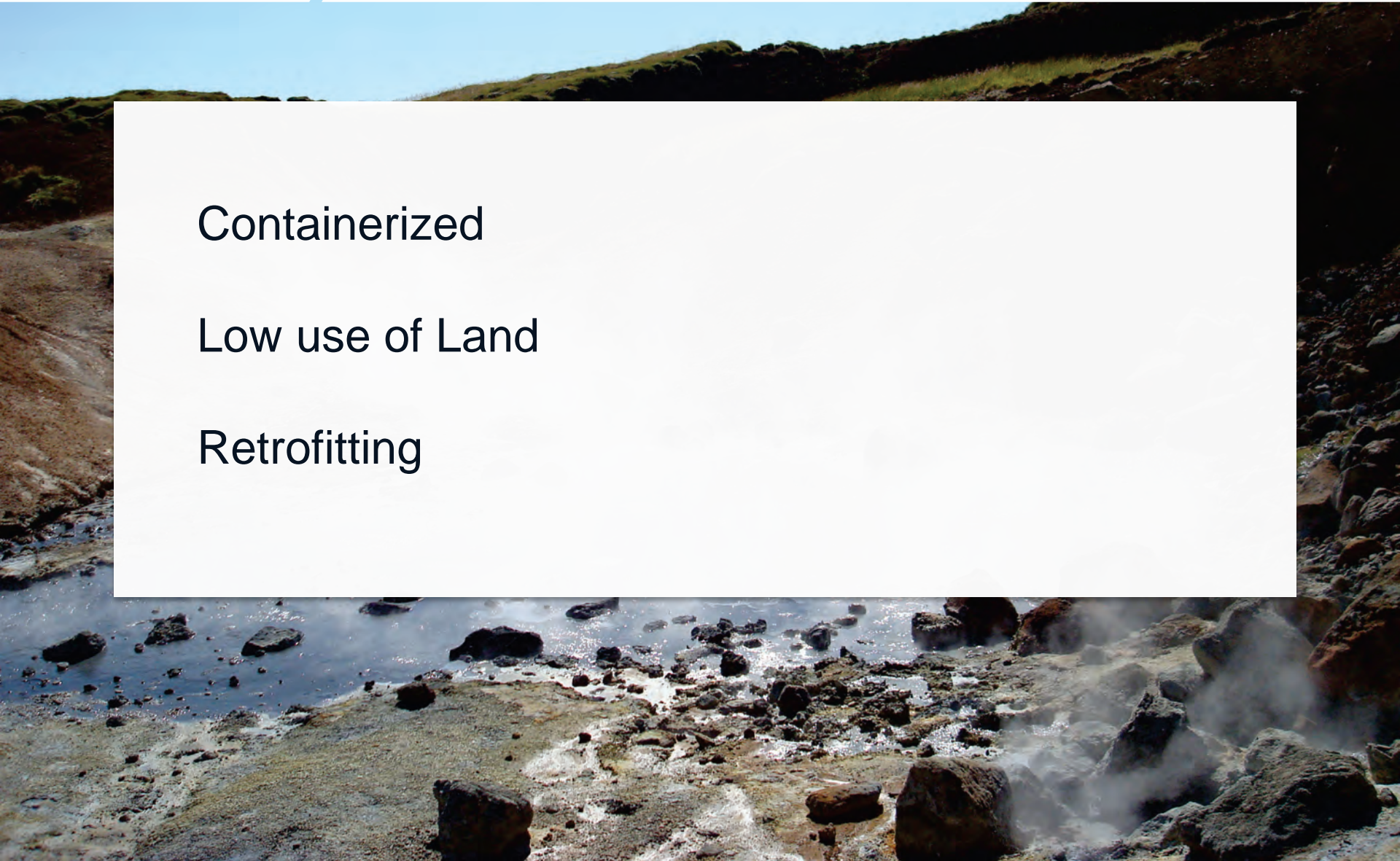
An Earlier Idea: Schematic of a Possible Hybrid Power Plant



Containerized

Low use of Land

Retrofitting



EU-NER 300 Award

Local Support

Competitive – Lowest Levelized Cost

Cost 75 mil. Euro

93,1 MW




Total Energy Output

Thermal

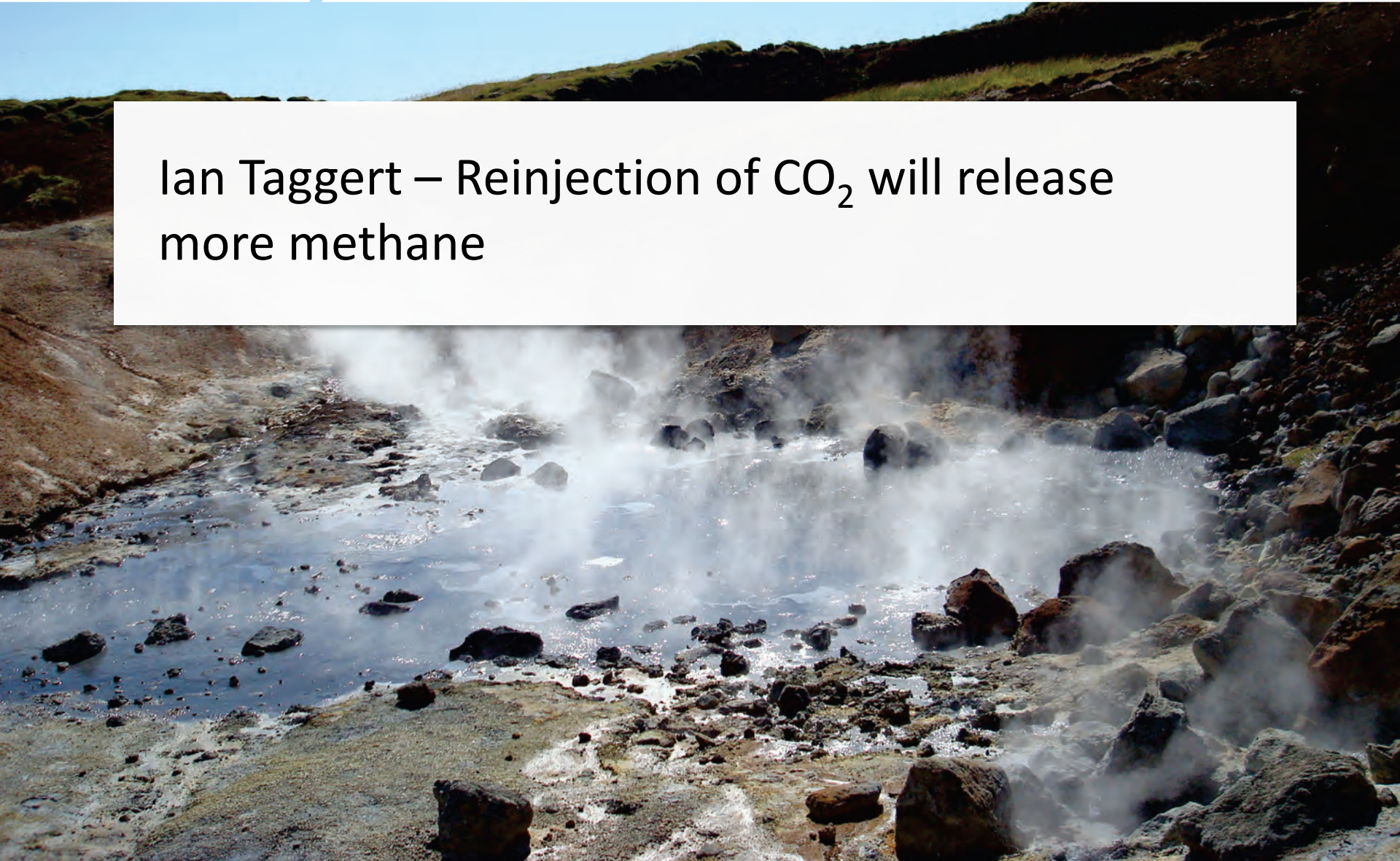
Electrical

75 MW

18,1
MW

-  = Total
-  = Thermal Heat
-  = Electricity

Ian Taggart – Reinjection of CO₂ will release more methane





Prospect USA



Oil/Gas Fields are Waterfields - Lin

- Can be reactivated
- Then run for decades profitably
- Provided there is a user of heat/ cooling in the neighbourhood

Thank you for your attention

CloZEd Loop



Energy AG

„Introducing the next generation of Geothermal Power Plants:
Significantly increasing yields, while aiming for **Zero Emission**.“