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## Presentation title

Hydrocarbon geothermal coproduction challenges in Eastern Europe: Geothermal Pilot Projects for Heat and Electricity in Serbia (GOSPEL Project)

Abstract, 12 pages:

Hydrocarbon geothermal coproduction from low temperature reservoirs ( $100^{\circ}\text{C}$ ) is under evaluation in the Pannonian Basin. Technical, scientific and economic challenges related to the geological and geothermal conditions encountered in this area are investigated in the framework of a Serbia-French program, GOSPEL.

Coordinated by ES Géothermie in partnership with IEL (Initiatives & Energies Locales), the GOSPEL (Geothermal Serbian Pilot projects for hEat and eLectricity) program aims at the emergence of geothermal projects in Serbia. This program is partly funded by French government and supported by Serbian Autonomous province of Vojvodina. It will run for two years.

Launched in May 2017, the project involves a Serbia-French consortium, combining local

The task started with a state of the art to capture the lessons learned and feedbacks from existing coproduction experiences to be applied on the Serbian case study.

An identification of the possible synergies between oil & gas and geothermal energy along the value chain of underground projects allowed defining possible production concepts. A preliminary coproduction projects mapping has also been performed to highlight the various energy usages, resource features, project types and developed technologies, showing a large panel of coproduction opportunities.

In addition, a survey of the initiatives aiming at characterizing production potential on a global scale has been initiated and showed that coproduction is a growing topic for many countries.

A preliminary SWOT analysis has been drafted to give an overview for decision makers of the main Strengths, Weaknesses, Opportunities and Threats associated with hydrocarbon and geothermal coproduction.

A review of the main findings and operational feedbacks from production projects will be carried out, addressing the following research questions:

- . How to optimize co-production wells scheme to both maintain the oil or gas production and secure a sustainable heat and/or power generation from geothermal energy?
- . What are the typical corrosion and scaling processes that may be specific to co production sites?
- . What are the coproduction associated technologies?
- . What are typical thermal and hydraulic conditions encountered in production sites?
- . What are the issues related to wells conversion and workover?
- . How to adapt the oil & gas and water collection and separation process to integrate the geothermal energy production cycle?

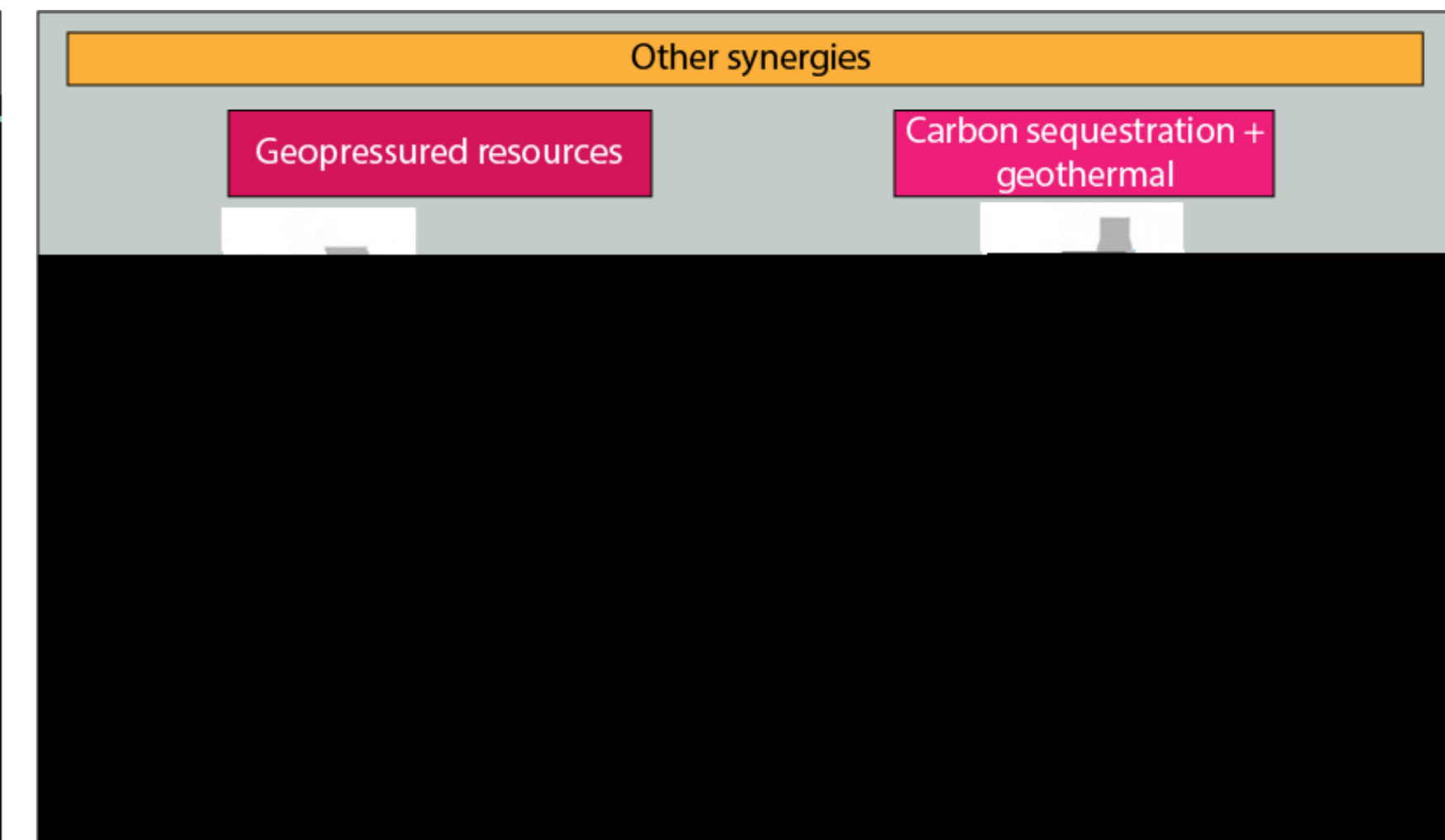
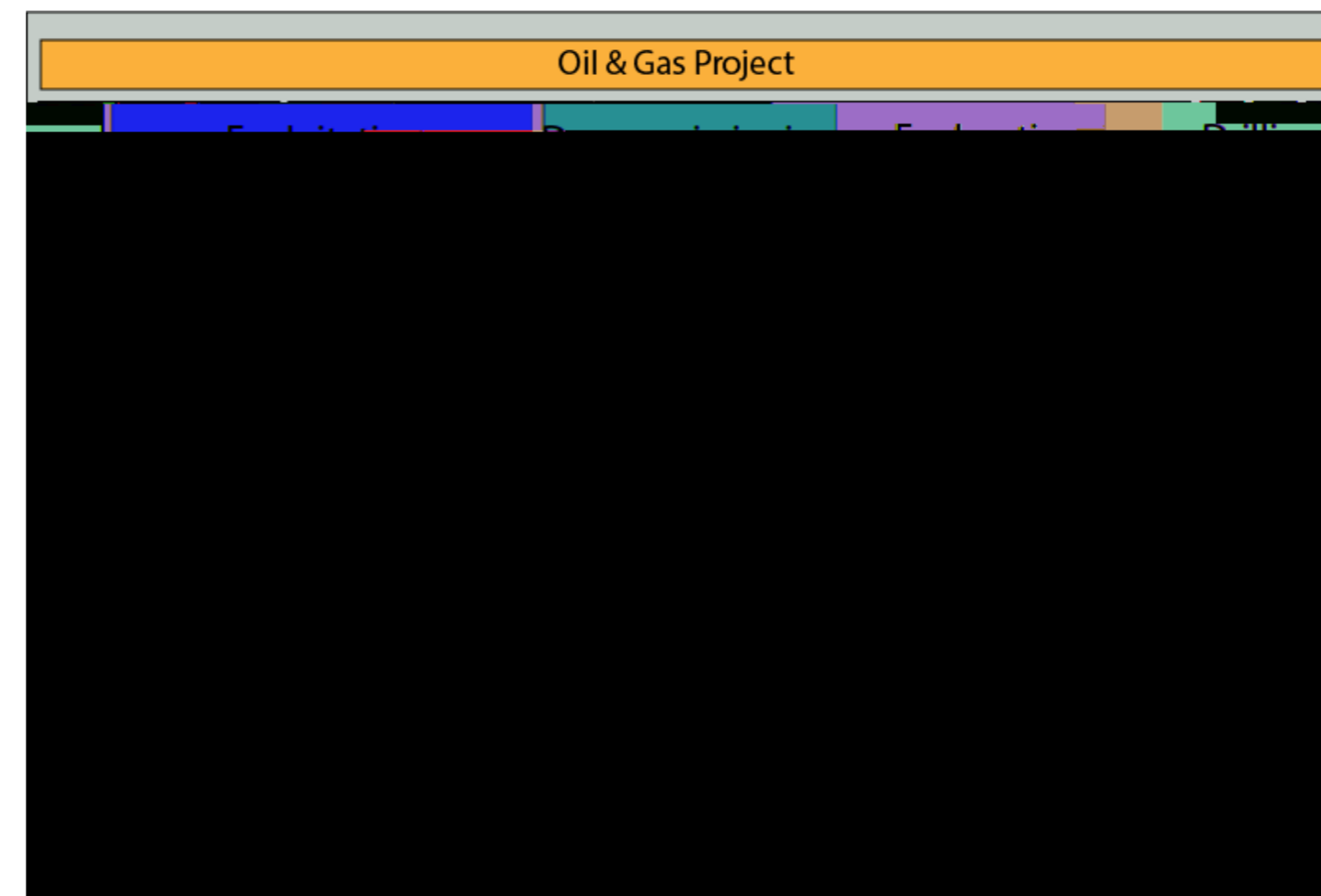
Finally, the case study of Serbia will be considered, based on the available geological, geochemical and wells data.

A preliminary matching between the geothermal potential and the oil & gas accumulations confirmed that interesting prospects for geothermal energy production will surely be hydrocarbon-geothermal coproduced fields, notably in the northeastern part of Vojvodina.

The main elements (geological objects and processes) of the petroleum and geothermal systems will be compared in order to identify common geothermal and hydrocarbon reservoirs and determine the driving factors playing a role on geothermal and hydrocarbon fluids migration and accumulations in the southern margin of the Pannonian Basin. Data on the hydrocarbon content in geothermal fluids will be collected, as well as feedbacks from coproduction experiences in the Pannonian Basin.

Based on this case study, recommendations and guidelines, as well as likely impacts on business models of hydrocarbon geothermal co-production projects will be provided.

# Hydrocarbon-geothermal co-



## THE SERBIAN CASE STUDY

### Co-production projects inventory

- Good matching between the geothermal potential and the occurrence of Oil & Gas fields



- Comparison of the petroleum and geothermal systems in the Vojvodina Province, Pannonian Basin
  - Oil & Gas source rocks at shallow depths . Geothermal heat flow
  - Oil & Gas reservoirs rocks may also act as geothermal reservoirs (sands of the Lower Pontian, Miocene limestones, triassic fractured limestones and dolomites)
  - Hydrocarbon plays are located in local depression in which the sediments are more than 2500—3000 m thick, there is also a good consistency between the Neogene thickness and the temperature maps
- => the occurrence of Oil and Gas accumulations and geothermal potential may be closely linked
- The gas content in geothermal fluids
  - Mrazovac & Basic (2009) reported that geothermal waters (25–82° C) of the shallowest groundwater system of Vojvodina (surface to lower Pontian) have elevated gas content (> 1 Nm<sup>3</sup>/m<sup>3</sup>) with a high methane fraction (on average, about 93.3% of the total gases)
  - CO<sub>2</sub> and N<sub>2</sub> are the remaining gas species dissolved in the fluid
  - This is comparable to the elevated gas content and high methane fraction encountered in other parts of the Pannonian Basin (Romania, Croatia, Hungary)



Opportunities of Oil and Gas wells conversion towards Geothermal wells may only be possible for a limited number of wells

