COMPASS
SUMMER SCHOOL

The COMPASS Project

Challenges and opportunities in superhot geothermal development

Amel Barich (GEORG) and Lilja Tryggvadóttir (Orkuveitan)

COMPASS Summer School

14 - 15 May 2025

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement nº. 101084623

Welcome to the COMPASS Summer School!

Day 1

Session 1 – Technical and Operational Innovations in Superhot Geothermal Development		
08:30 – 09:00	**Introduction to the COMPASS Project** **Challenges and Opportunities in Superhot Geothermal Development**	Amel Barich, GEORG Lilja Tryggvadóttir, Orkuveitan
09:00 – 10:30	**Cost-Effective Corrosion, Thermal, and Mechanical Stress Mitigation of Well Casings**	Sigrún Nanna Karlsdóttir, University of Iceland Tomaso Maccio, TWI Gunnar Skúlason Kaldal, ISOR Axel-Pierre Bois, CURISTEC and XGS ENERGY
10:30 – 10:45	**Coffee Break**	
10:45 – 11:45	**Advanced Tools for Decision Support in Well Design and Cost and Environmental Impact Estimators for Well Completion utilising hot or superhot geo-resources**	Hieu Nguyen Hoang, SINTEF Hye Chowdhury, TECHNOVATIVE SOLUTIONS
11:45 – 12:00	Short Q&A Session	

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Day 1

Day 1: Session 2 – Sustainability and Social Dimensions of Geothermal Development		
13:00 – 14:30	**Cost and Environmental Impact Estimators for Surface Plant utilising hot or superhot geo-resources** ***(this includes environmental and financial performances, spillover effect and circularity of COMPASS solutions)***	*Hye Chowdhury, Technovative Solutions* Dario Ingi Di Rienzo, *Orkuveitan* Steinþór Níelsson, *ISOR*
14:30 – 14:45	**Coffee Break**	
14:45 – 15:45	***Achieving Social Acceptance and Engaging Local Communities in geothermal projects: relationship with society, good practices and guidelines for effective communication***	Adele Manzella, *CNR* Dario Bonciani, *COSVIG* Amel Barich, *GEORG*
15:45 – 16:00	Short Q&A Session	
16:00 – 17:00	Poster Session and Interactive Group Session	Networking at Posters Session (Get to Know the Cohort)

Day 2: Field trip

Exploring Superhot Geothermal Sites in Reykjanes Peninsula

🗓️ Thursday, 15 May 2025
🚌 09:00–16:00 (bus transport included)

This full-day field trip will take participants through several key geothermal locations that highlight the history, development, and future potential of **superhot and high-enthalpy geothermal systems in Iceland**.

🧭 Itinerary

09:40 – Departure from Reykjavík
We depart for the Reykjanes Peninsula via private coach.

10:20 – Stop 1: Seltún Geothermal Area
Exploring the Seltún high-temperature geothermal field and walking to the Krýsuvík drill site.

11:40 – Stop 2: Lunch in Grindavík
13:00 – Stop 3: Svartsengi – Lecture and Tour
We will receive an on-site technical briefing and tour of the Svartsengi Power Plant, a key facility in Iceland's geothermal landscape and a historic site for the IDDP-2 well. Learn about the power production process, resource management, and future outlook. Lecture and tour will be delivered by Lárus Thorvaldsson, Chief Reservoir Engineer at HS Orka.

14:30 (Optional) – Stop 4: Gunnuhver Geothermal Area (time permitting)
If time allows, we will visit Gunnuhver, a geothermal area near Reykjanes known for its dramatic steam vents and geological features. This stop is optional based on the day's progress.

15:30–16:00 – Return to Reykjavík

📌 Practical Notes

- 🚌 Transportation from and back to the venue (09:40–16:00).
- 🍽️ Lunch in Grindavík (at own cost – a variety of local options will be available, and we'll enjoy a relaxed break together).
- 🥾 Please wear appropriate clothing and shoes for walking outdoors in variable Icelandic weather.
- ☁️ Field conditions may be wet, windy, and uneven — bring layers and a waterproof jacket.

Figure 1 - Krýsuvík Drilling Site (Stop 1)

Shaping the future of geothermal wells in superhot contexts

Start Date: 01 Nov 2022
Duration: 36 months
Estimated Project Cost: 4M€
EU Contribution: 4M€

Coordinator: ON Power Iceland

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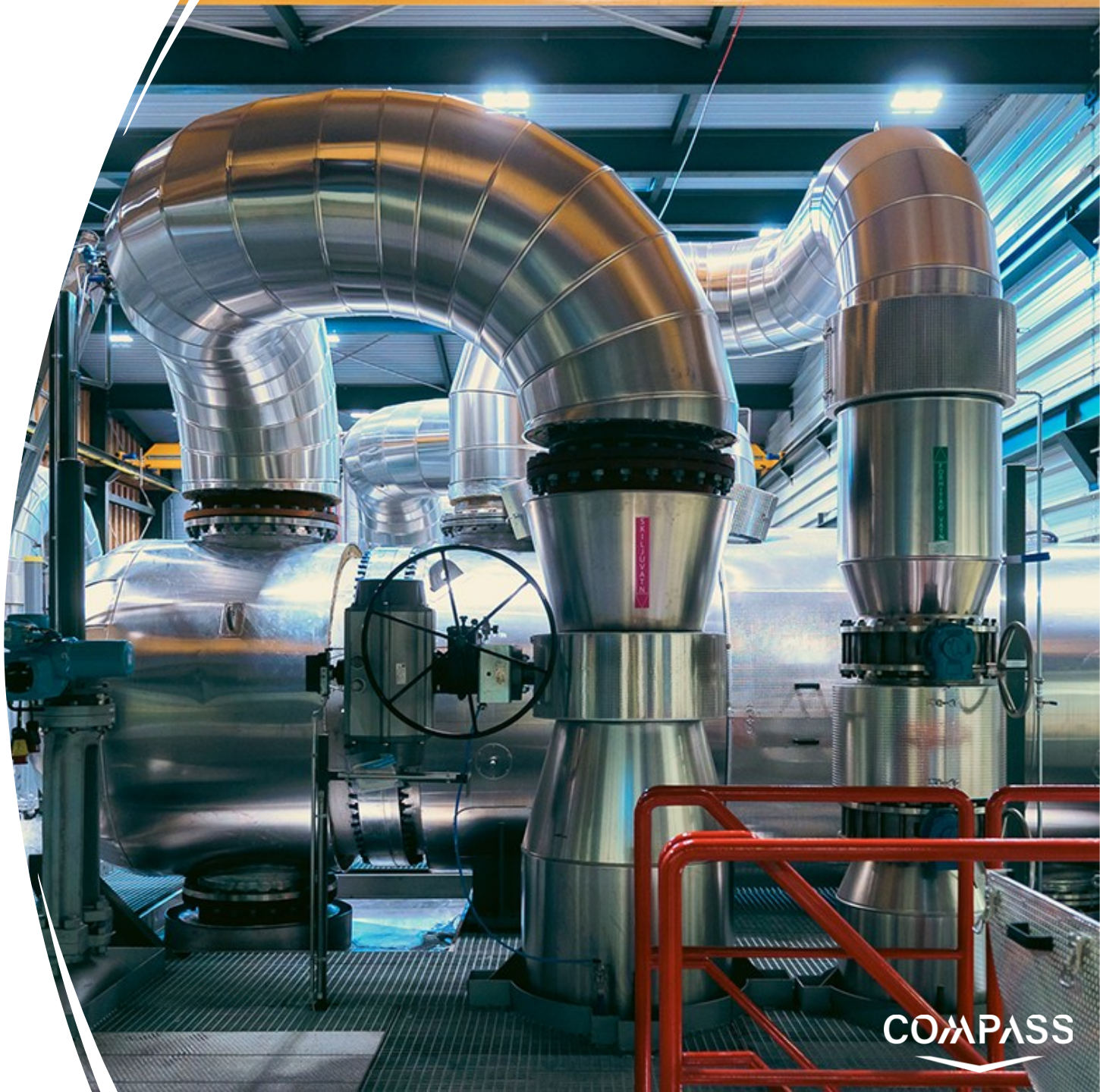
Background

The COMPASS project is inspired by global efforts to **improve utilization of geothermal** resources by enlarging production fields downwards.

Achieves **higher efficiency** without needing to expand surface infrastructure.

Wells drilled into superhot conditions are expected to yield **5-10 times more energy** than conventional wells.



Challenge

Major challenges involve maintaining **well integrity** under extreme conditions.

Issues arise due to significant **temperature fluctuations and corrosive fluid chemistry**.

In the Iceland Deep Drilling Project (IDDP), two out of three wells experienced severe casing failures.

Existing well designs, often adapted from oil and gas industries, are insufficient for geothermal applications.

Numerous conventional geothermal wells have faced similar casing failures, underscoring the **need for improved well concepts** specific to geothermal energy.

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Innovation

Innovative Well Casing Technologies:
COMPASS is developing advanced solutions to address well integrity challenges.

Foam Cement Solutions:
Novel foam cement suitable for high-temperature formations will be developed, working with flexible couplings to reduce high-temperature-induced stresses and prevent casing failures.

Laser Cladding for Corrosion Protection:
Cost-effective laser cladding will enhance corrosion resistance inside casing pipes.

Comprehensive Well Design:
The project integrates these innovations into a robust well design, reducing project risk and lowering the Levelized Cost of Energy (LCOE).

Expanding Geothermal Potential:
The new well concept will enable cost-effective geothermal developments in diverse geological settings and new regions.

COMPASS

The Team

The COMPASS consortium contains a diverse team of major geothermal research institutes and leading industry players.

ON ORKA NÁTTÚRUNNAR · Reykjavík Energy · GEORG · HORNET laser cladding · ÍSOR · SINTEF · CURISTEC · COSVIG · TECHNOVATIVE SOLUTIONS · TWI · COMPASS

External Expert Advisory Board Members

Lilja Magnúsdóttir

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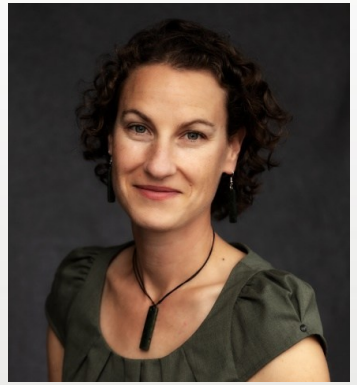


Marlene Villeneuve

Tatiana Pyatina

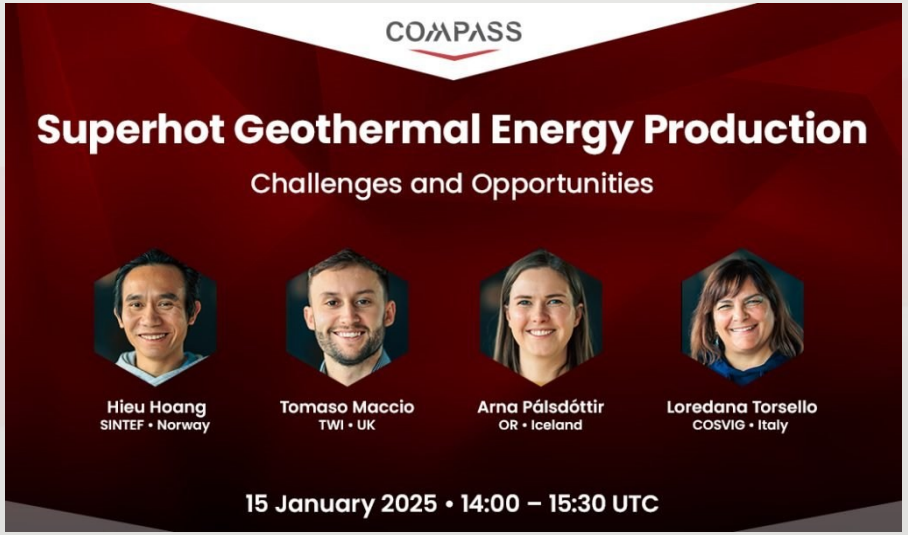
Bjarni Pálsson

Sigrún Nanna Karlsdóttir

Mariane Peter-Borie

Project Outreach

- COMPASS Iceland Week
- Regional Stakeholder Workshops (Italy and Iceland)
  - Italian Geothermal Forum (March 2025)
  - Dedicated Icelandic Superhot Geothermal Energy Workshop (May 2025)
- Upcoming social engagement workshops in Canary Islands (July 2025) and Greek islands.
- Capacity Building (Summer School)
- Webinars
- Articles and presentations at various events
- Final event planned at the EGC2025, several articles accepted



Thank you!

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