

### Supercritical Carbon Dioxide/Alternative Fluids Blends for Efficiency Upgrade of Solar Power Plants



The SCARABEUS project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 814985

19 October 2022

### **Presentation structure**



- Project Summary
- Objectives & expected impact
- Scope
- Main results/outcomes
- Options for exploitation/collaboration/follow-up activities







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### **Project summary**

Funding source	Horizon 2020 Programme
Budget	€ 4,950,266.25
Duration	48 months (April 2019 – March 2023)
Start TRL	TRL4
End TRL	TRL6







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Partners



## **Objectives & expected impact**



- Demonstrate that sCO<sub>2</sub> blends in CSP plants can reduce CAPEX by 30% and OPEX by 35% with respect to SoA steam cycles, thus exceeding the reduction achievable with standard sCO<sub>2</sub> technology.
- This translates into **30% lower LCoE than currently possible.**
- Demonstrate the innovative fluid and newly developed heat-exchangers at a relevant scale (300 kW<sub>th</sub>) for 300 h in a CSP-like operating environment.







### Scope



200

80%CO2 - 20%C6F6











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#### Conventional tube

- · Aluminum fins at airside
- Smooth surface on the inside

#### DIESTA CO2 SC1

- Groovy fins at airside
- Microfins at inside (HAT enhancement: x1.5-3.2)

Kelvion

 Specifically designed and tested for condensation of sCO<sub>2</sub>-mixtures









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Validation of the SCARABEUS concept at TUW.



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# Options for exploitation/ collaboration

### • Exploitation:

- Mixture composition
- Optimised plant design
- Heat exchanger design
- Turbomachinery design/solutions
- Currently enrolled in the "Exploitation Booster" programme of the EC

- Collaboration:
  - Primary Heat Exchanger
  - New dopants (identification and testing)
  - Application to WHR
  - High temperature receiver development
  - High temperature Thermal Energy Storage
  - Hybridisation and CSP+D
  - Operation and flexibility











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