

Accelerating the Heating and Cooling Transition



Joint Call 2021
Kick-off meeting of granted projects

Project presentation pitch

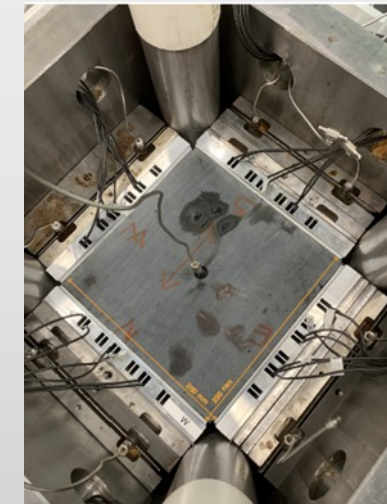
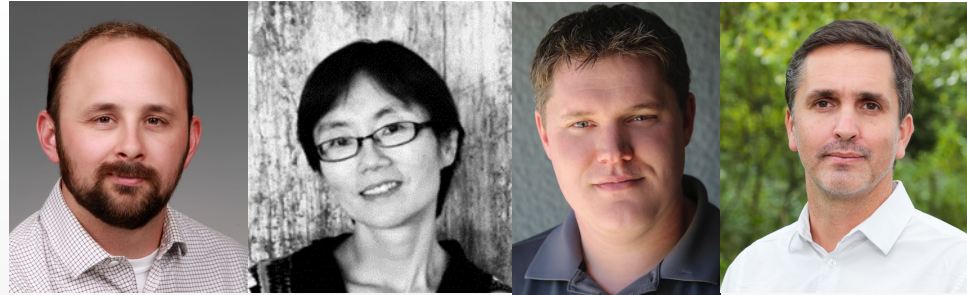
17 November 2021



Development, Monitoring, and Control of Fracture Thermal Energy Storage (FTES) in Crystalline Rock Formations (DEMO-FTES)

Project Aim: Test thermal efficiency of seasonal thermal energy storage in fracture-based heat exchanger at near full scale

Intro



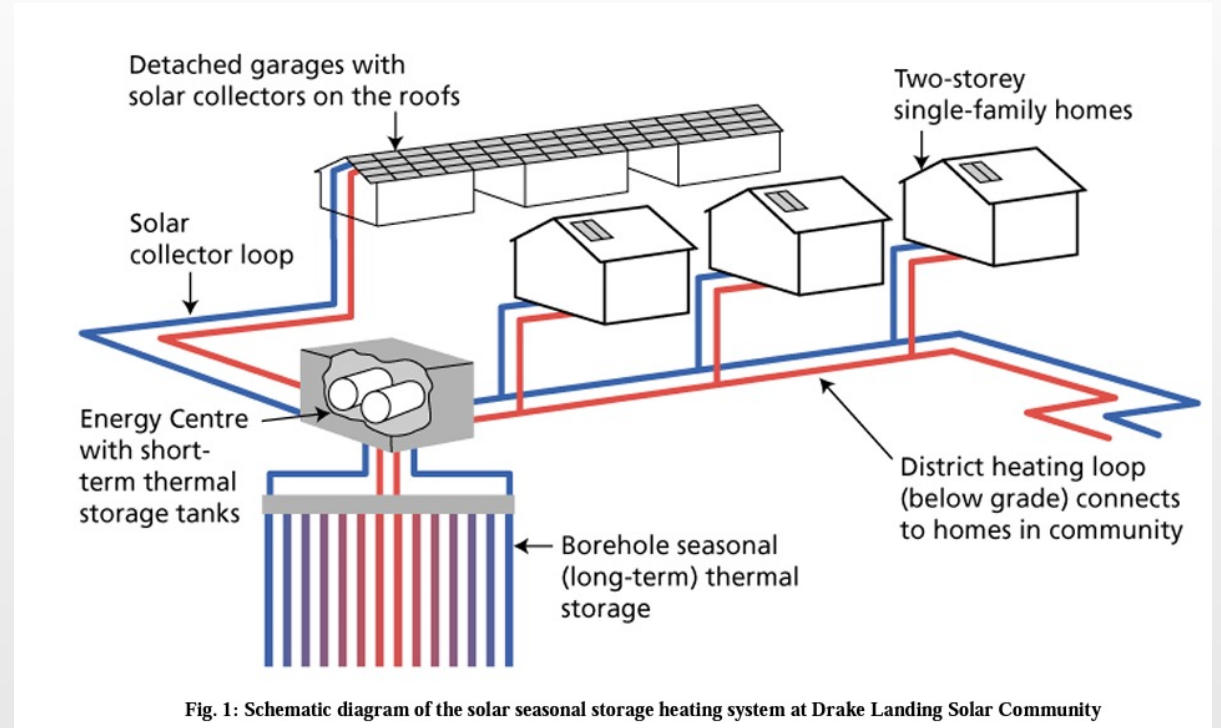
Consortium:

- Jeff Burghardt (PI), Pacific Northwest National Laboratory (PNNL)
- Mathew Ingraham, Sandia National Laboratories (SNL)
- Yingqi Zhang, Lawrence Berkeley National Laboratory (LBNL)
- Brice Lecampion, École polytechnique fédérale de Lausanne (EPFL)



Challenge you are tackling

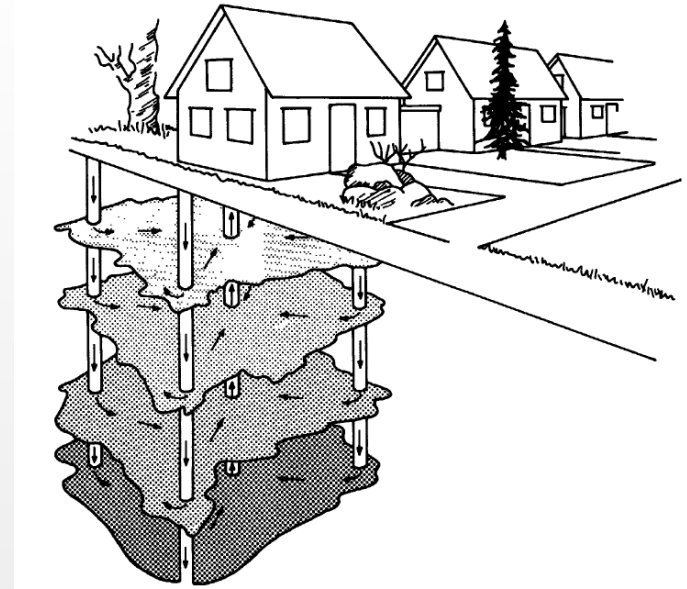
- Thermal energy storage requires heating/cooling large volumes of high specific-heat materials. Rock/soil has high specific heat and is available in large volumes anywhere.
- Subsurface storage is attractive, but existing methods require **very specific geology** (aquifer thermal energy storage (ATES)) or a **very large number of boreholes** (borehole thermal energy storage (BTES))
- We seek a solution that will **broaden the range of locations** where thermal energy storage can be implemented, while **minimizing cost and surface footprint**



From Wong & Mesquita, 2019, "Drake Landing Solar Community: Financial Summary and Lessons Learned"

Solution to be provided

- Creating a subsurface heat exchanger in locations without suitable geology for aquifer thermal energy storage could significantly expand access to efficient storage
- Prior field tests (Ramstad, 2007) demonstrated feasibility of heat exchanger construction, and numerical models suggest high thermal efficiency (Hellström, 2001)
- DEMO-FTES will validate these predictions through a scale up from laboratory (cm-scale) to meso-scale (~10 m/~3 month) thermal storage test
- Leverages existing >\$9M underground testing facility



From: Larson, 1984, "Hydraulic Fracturing in the Bohus Granite, SW-Sweden. Tests for Heat Storage and Heat Extraction"



Planned field test site, 4100 ft level of Sanford Underground Research Facility (SURF), Lead, SD