ENERGY INDUSTRY INSIDER

Q4 2019 | Pulse
Renewable Heating and Cooling

FutureBridge

WHAT'S INSIDE!

- Discussion on role of geothermal resources in space heating.
- Analysis of various Geothermal exploration activities world-wide.
- Description of unique renewable energy-based heating applications

01 Emerging trends

European countries are considering geothermal energy for heating applications. Funds are being released for promoting geothermal resource utilization. Similarly, in Australia, Geothermal resources are being explored to meet heating and cooling requirements.

Developments: Geothermal technology for renewable heating applications

Australia and Europe

- In this Quarter, Eden and EGS Energy has secured a £16.8m funding for geothermal heat and power project in England.
- As reported, Scotland has to double their public spending on home energy efficiency to meet climate targets especially on renewable heating as it shares half of Scotland's energy use.
- In Serbia, under the project 'Energy Solutions for Cities of the Future', IRENA organized a conference on latest solutions for integration of renewable energy sources into district energy systems in Southeast Europe
- Recently, ARENA has announced funding for developing pathways to lower emissions from the Heating, Ventilation, Air-Conditioning and Refrigeration sector.
- Australia has launched iHub to develop HVAC&R technology using renewable resources.

DEVELOPMENTS

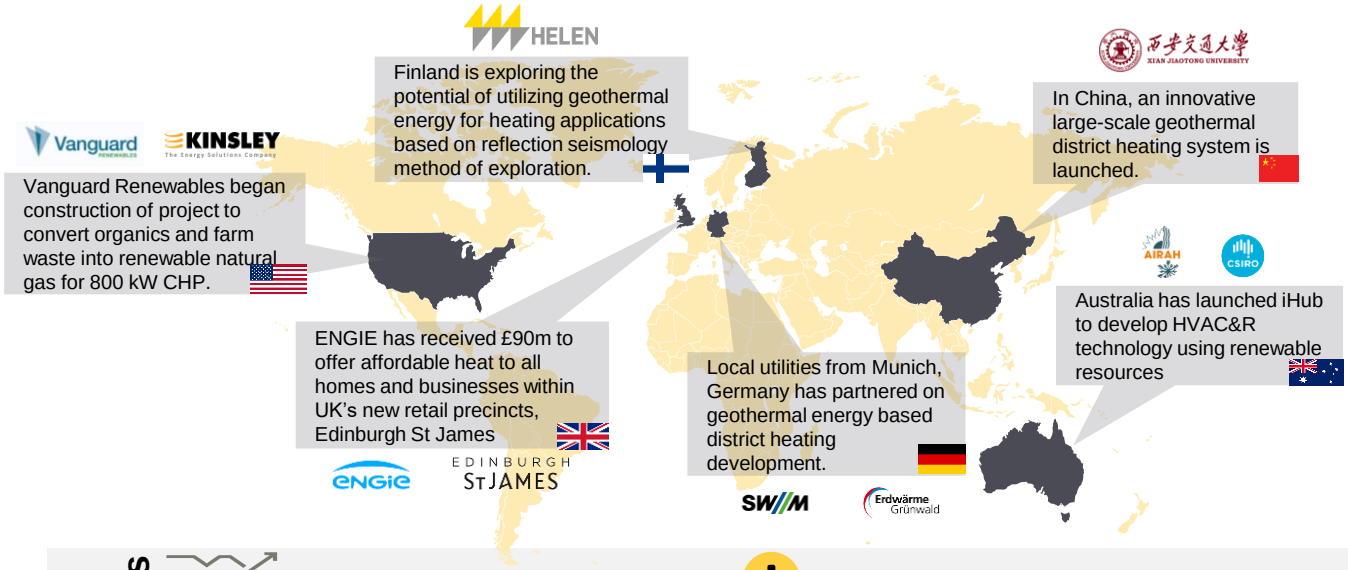
Emerging Trends

In this quarter, multiple funding has been released in Australia and Europe for geothermal based heating project and capacity building. These funding will support in R&D and piloting the technology. The countries with geothermal resources are putting efforts to move the renewable heating and cooling sector after years of stagnation. For example, the conference on integrating renewable energy sources in District Heating and Cooling Systems targeted Southeast Europe are addressed specific barriers and needs of the region.

FutureBridge Insight & What should you investigate ?

Geothermal energy resources are being explored to meet heating requirement cost-effectively and in recent years world-wide project development activities have been observed. Geothermal resource is expected to play crucial role in transition from fossil to renewable and reduce carbon footprint of heating applications.

Growing Geothermal exploration projects and activities



DEVELOPMENTS Emerging Trends

Similar to previous quarter, this quarter also witnessed various new project launches and advancements for renewable heating applications. European nations have demonstrated major project based developments to provide affordable and sustainable heat to residential and C&I consumers. The waste to heat segment also witnessed project development in US based on renewable natural gas.

FutureBridge Insight & What should you investigate ?

FutureBridge Insight on Renewable Heating & Cooling

- The activities related to renewable heating and cooling are trending. The major push to these activities are being offered from government's support schemes and financing aids, without which it will be extremely difficult to replace low cost fossil fuels.
- Waste-to-heat and geothermal energy are the direct source of renewable heat and implementation of such projects is expected to increase in the coming year especially in colder regions.
- Along with geothermal resource, Solar thermal is also gaining attention as studies reported feasibility of attaining higher temperature with solar thermal.

What should you investigate ?

Which are the new drilling technologies being adopted worldwide for deep geothermal?

Which are the specific barriers associated with renewable heating uptake?

What are the various schemes and policies supporting adoption of Renewable heating?

ARENA to fund Glaciem Cooling Technologies to demonstrate the benefits of thermal energy storage integrated with renewables for HVAC&R applications

Advancing Renewables with PCM Thermal Energy Storage

ARENA has provided funds to Glaciem Cooling Technologies to demonstrate the technical and economic value of integrating thermal energy storage with renewable energy into Heating, Ventilation, Air Conditioning and Refrigeration (HVAC&R) applications.

ARENA
Australian Government
Australian Renewable Energy Agency

University of South Australia

GLACIEM COOLING TECHNOLOGIES

ThermCOLD Thermal Energy Storage

Utilizes the development of new Phase Change Materials (PCM's) developed by UniSA and Glaciem, that will store and discharge energy using a heat transfer process.
These solutions are targeted at providing high efficiency thermal energy storage at temperatures suited to a range of commercial and industrial applications.

Glaciem's technology also uses an advanced control and forecasting system to optimize the system's operation based on weather forecasts, electricity price forecasts, and customer demand forecasts to optimize the storage system to maximize customer savings.

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Quarterly review of early-stage research / Project Tracker / Regulatory Policy Updates

Eden's Deep Geothermal Energy Project for space heating application has received funding

eden project

In this quarter, The Eden Project has received **£16.8m** by the **European Union, Cornwall Council** and an institutional investor. The project site consists of two wells and a geothermal plant, that will supply heat from the site using the heat from the granite underground.

Funding Agencies

CORNWALL COUNCIL

HM Government

Introduction

The project plans for a 3 – 4 MW geothermal power plant, and completion of second phase would enable Eden to generate sufficient renewable energy to become carbon positive by 2023 as well as aiming to be able to provide heat and power for the local area.

How it works?

The cold water is injected in one borehole which absorbs heat from the rock and is pumped back to the surface with at about 180°C temperature. This hot water is then used to supply heat and also run a binary cycle turbine to make electricity.

Players involved

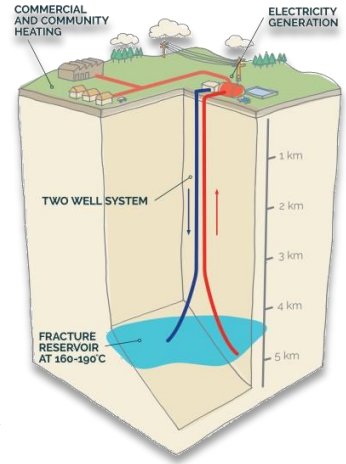
eden geothermal

egs ENERGY ENGINEERED GEOTHERMAL SYSTEMS

BESTEC UK best technology for nature

Engineered Geothermal System

Two boreholes, each around 25cm wide, with water being pumped down one borehole into the natural fractures in the rock to create an engineered heat exchanger between the two boreholes.



First Phase
A single 4.5km well into the rock.

Heat for Eden's Biomes, offices and nursery greenhouses

Second Phase
A second well and electricity plant

Exporting outside renewable electricity and heat

Location: Cornwall, United Kingdom

Dandelion Energy's unique Home Geothermal Systems for heating and cooling service in Long Island

Home Geothermal Systems for heating and cooling service

DANDELION

Dandelion Air
Available in 3/ 4/ 5 Ton sizes

Introduction

In this quarter, Dandelion Energy has **launched** its **unique Home Geothermal Systems** for heating and cooling service in **Long Island**, which will provide efficient heating, air conditioning, and hot water at significant savings over older fossil fuel burning devices.

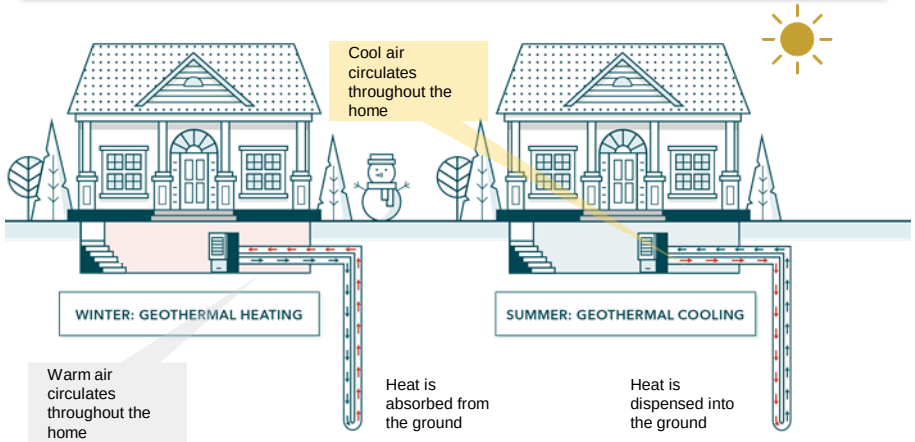
How it works?

The home geothermal system replaces the existing air conditioning and heating equipment with a powerful heat pump and safe, underground pipes that move heat between the earth and home. In the winter, the ground loops move heat stored in the ground into the home and in summer, the ground loops returns heat from the surface to the ground.

Incentives

The system qualifies for **Federal and State incentives** and comes under PSE&G's offer of up to **$2,000 per ton** of installed geothermal.

- The Dandelion Energy's Home Geothermal Systems can be purchased by paying upfront or with the available financing.
- By installing this system, the homeowners are expected to save over 50% in annual heating and cooling operating costs compared to fuel oil heating which will ultimately provide a payback period of less than seven years.



ARNEA's has launched advanced renewables project for HVAC&R industry

In November 2019, ARENA has launched a 3 year Program for energy transformation within the HVAC&R sector.

i-Hub applications are open and looking for industry participants who have suitable demonstration projects that require co-funding. The i-Hub has prioritized the sectors for i-Hub projects i.e. Healthcare, Education and Data centers.

Objective:

The objective of i-Hub is to support HVAC&R industry with **knowledge dissemination, skills-development and capacity-building**. The funding will be allotted, as part of **3-year AU$18 Million project**. AIRAH will engage with a range of industry stakeholders to trial renewable energy technologies and demonstrate how heating and cooling can be coordinated and controlled to provide demand response.

i-Hub: The Innovation Hub for Affordable Heating and Cooling

Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH), CSIRO, Queensland University of Technology (QUT), the University of Melbourne, the University of Wollongong and supported by ARENA

AUD6.5 million (US$4.4 million) released out of AUD18 million (US$12.2 million)

Three year project

Targeting: Knowledge dissemination, Skills-development and Capacity-building

Focus areas:

- Smart Building Data Clearing House
- Living Laboratories
- Integrated Design Studios

03 Startup Tracker highlights

Startup Tracker summary Q4 2019

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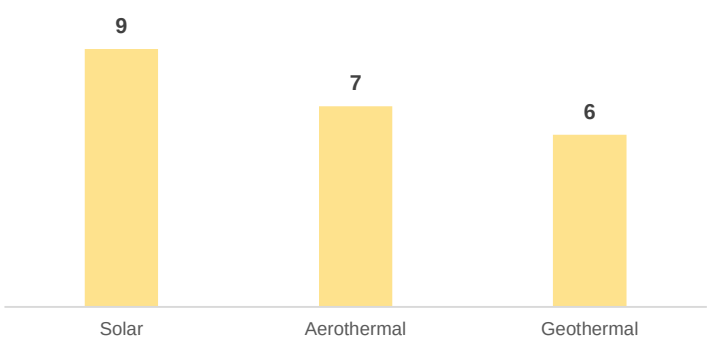
Total Startups

Solis, KINSLEY, Brightcore, FERVO ENERGY, Cedar Renewables, Loki Geothermal, DANDELION, Savosolar, Eavor, EnergySolaris, NOVUS, Naked Energy.

Distribution by technology segmentation



Note: Total numbers for technology distribution will be more than total number of startups as a single startup may offer multiple technologies.

Funding distribution & activities

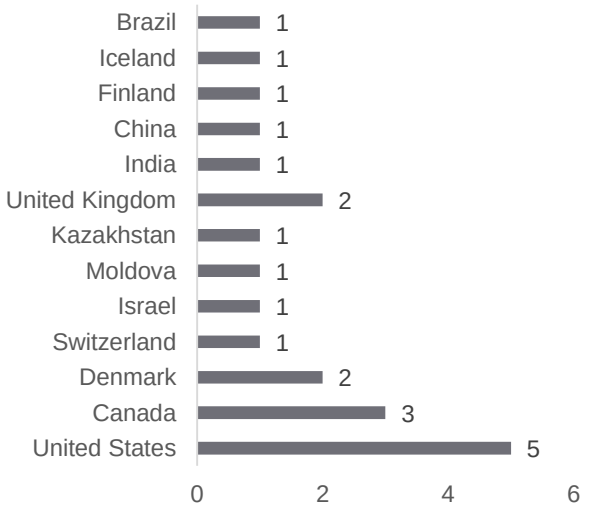
ARENA released **USD 1.35 Million** funding to **Glaciem Cooling Technologies Pty Ltd** to demonstrate the technical and economic value of integrating thermal energy storage with renewable energy into HVAC&R applications.

NYSERDA announced funding Up to **$4 Million** for innovative challenges of developing next generation HVAC Systems for Buildings.

U.S. Department of Energy (DOE) released **$7 million** for three projects for R&D of innovative technologies for geothermal drilling operations to **University of Wisconsin-Madison**, **Lawrence Berkeley National Laboratory** and **RESPEC**

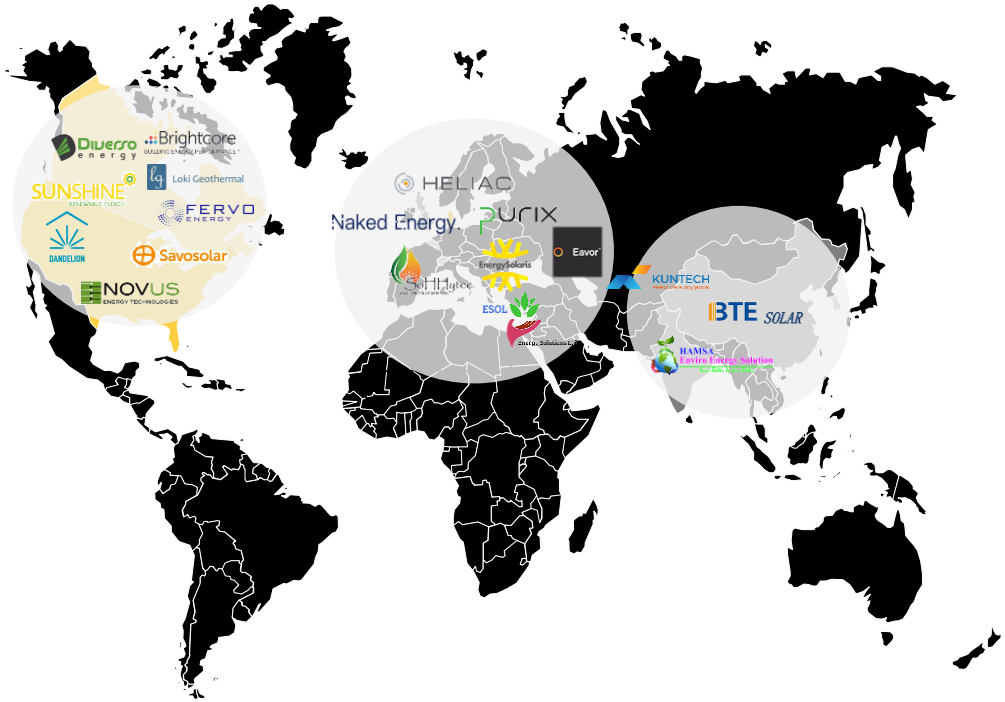
What are the hubs of startup innovation for Renewable Heating and Cooling Technology

Distribution of Start-ups by Country



- Around 38% of the startups covered are Europe-based, followed by North America with over 30% startups
- Majorly startups from Europe are into solar technology whereas startups from North America are into geothermal and aerothermal business.

Key startups from major hubs



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