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Thor Erik Musaeus

Rock Energy AS



#18DEdays

Rock Energy

Deep Energy Wells

DHC and Renewable Energy – state of play

Ingeniously sharing the everlasting warmth of Mother Earth



Film



About

- Aiming to be a leading geothermal energy company
- Secured intellectual property rights
- Significant global potential
- Competencies in the full geothermal value chain
- Biz mod 1: Build, own and operate plants
- Biz mod 2: Deliver turn-key plants to larger energy users
- Secured widely experienced team
 - energy, heating systems, drilling, geology, finance and project management
- Secured new equity of 46.5 MNOK (2016) and a convertible bond facility of 270 MNOK (2018)
- First energy plant constructed at Oslo Airport Gardermoen in 2017/2018
 - LOI signed to build a large portfolio of energy plants for Oslo Airport Gardermoen and other Norwegian airports.
 - Projects under development: ground heat, agriculture, football fields, residential



Clean



Natural



Everlasting

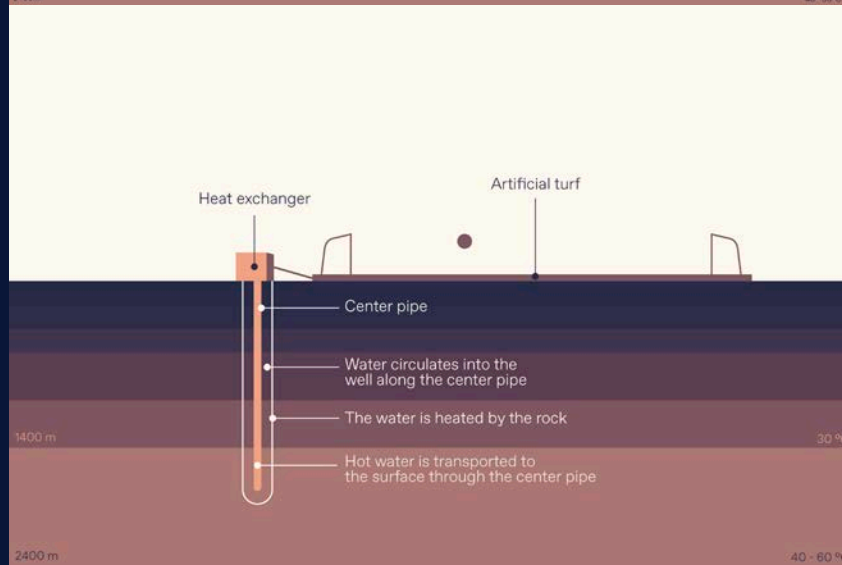
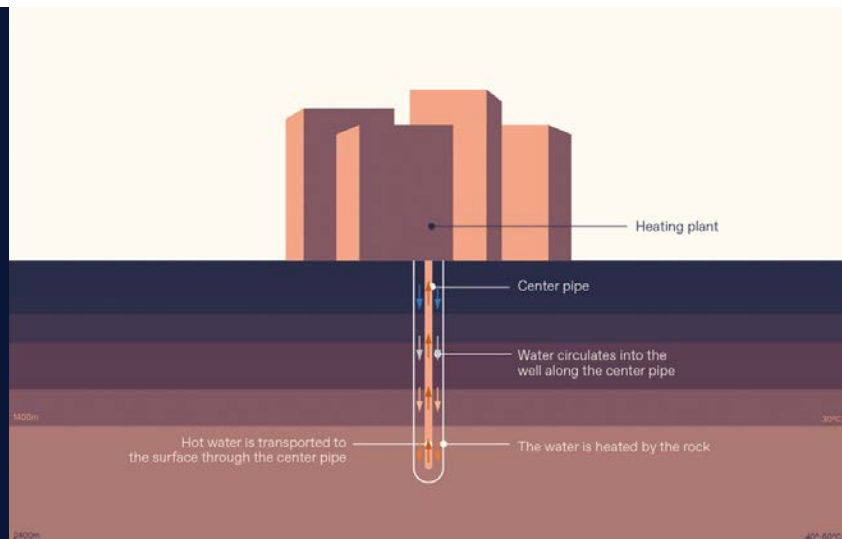
Deep Vertical Energy Wells

- An local, independent energy source, right under your feet, giving you predictable energy supply and cost the next 50-100 years
- The energy extraction from a single well at 1500 meters is equivalent to about 25 conventional shallow wells at 200 meters
- A system with deep wells requires less surface area than a large group of shallow wells



	Residential blocks	Office buildings	Sports arenas	Industrial processes
Installed capacity per well*	90 kW	100 kW	110 kW	70 kW
Equivalent usage time	4 000 hours	2 300 hours	1 500 hours	8 760 hours
Energy delivery per well	360 MWh/year	230 MWh/year	165 MWh/year	614 MWh/year
Heat pump	Yes	Yes	No	Yes

*Numbers based on 1500 meter deep wells assuming a temperature gradient of 20 °C/kilometer



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Experience and results first wells in hot dry basement rocks

Rock formation

- Sedimentary overburden 70m
- Basement rock (biotitic gneiss) from 70-1500m

Wells

- 2 x 1500m energy wells for heating of OSL Engine test area.
- Drilling as planned and completed April 2018

Energy collector

- PE pipe 110mm
- Installed in both wells during 10 days.

Energy use

- Direct heating of ground at engine test area Oslo airport.
- Expected Annual heat delivery: ca 300 000kWh.
- Circulation temp in concrete aircraft-pad: 10-15°C.
- Energy delivery operation Q4 2018



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Clients – examples:

- Airports – engine test areas, ground heating aircrafts
- District heating and local heating systems
- Football arenas
- Agriculture – green houses, chicken farms

Long term predictable energy supply and cost :

System for direct heat :

Opex: 0,03 €/kWh

IRR: 14%

Systems with heat pumps:

Opex: 0,05 €/kWh

IRR: 11%

Soft values:

- occupation of areas
- kWh price versus predictability
- long term, stable and predicable energy supply



Thank you for your attention

Rock Energy AS
Lilleakerveien 8
0282 Oslo
Norway

www.rockenergy.no

