

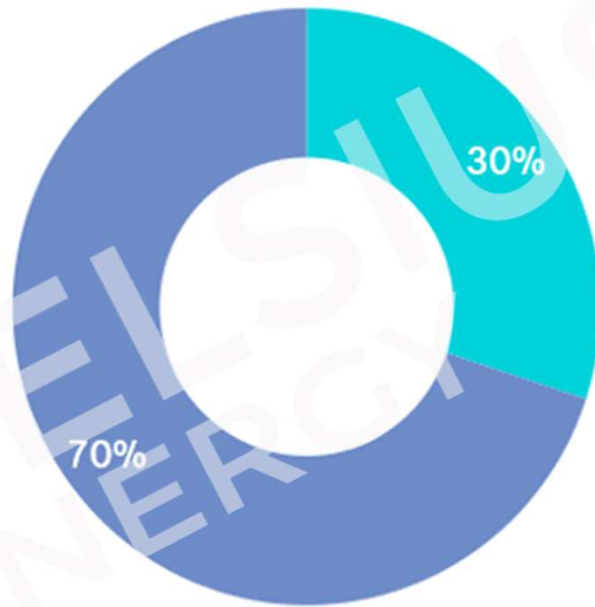


# A Decarbonization Solution for Buildings

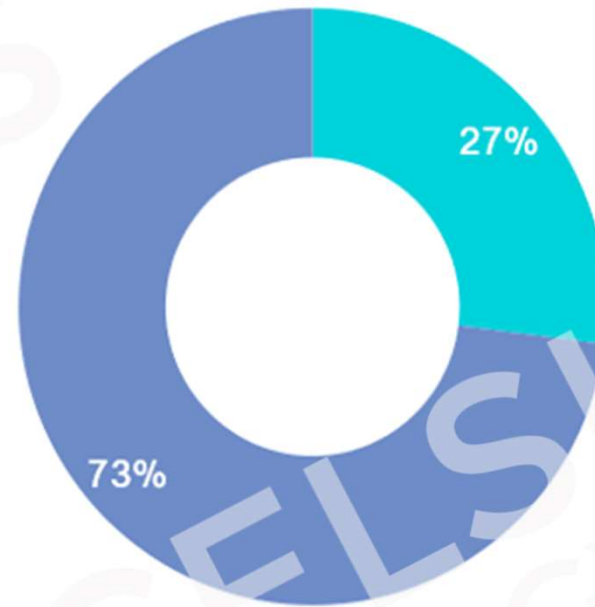
29-Mar-2023 | BuildingEnergy - Boston



Final Energy usage  
[World : 450 EJ]



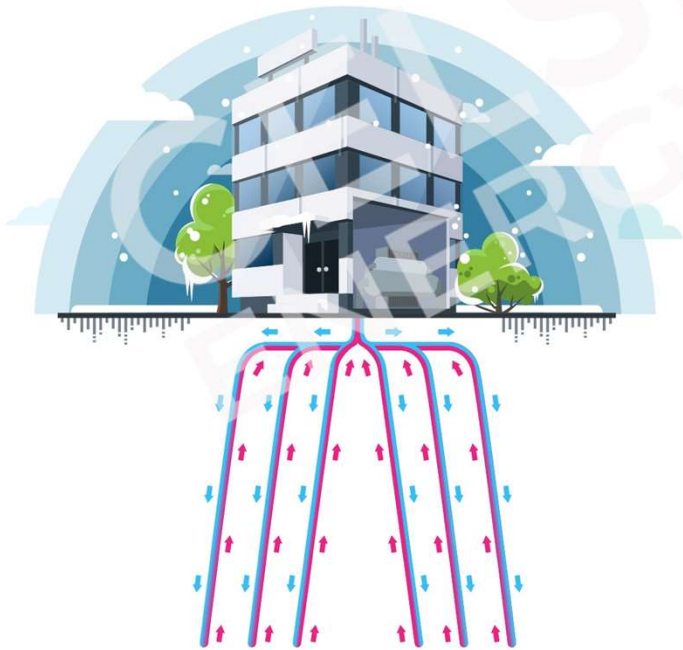
CO<sub>2</sub> emissions  
[World : 37,12 Gt]



Buildings  
Other use

*In 2021 the operation (excluding then the CO<sub>2</sub> emitted by the cement, steel and other materials used in construction) of buildings accounted for 30% of global final energy consumption and 27% of total energy sector emissions (8% being direct emissions in buildings and 19% indirect emissions from the production of electricity and heat used in buildings). In 2021 direct and indirect emissions from buildings operation rebounded to about 10 Gt CO<sub>2</sub>. (IEA - International Energy Agency, 2022)*

# A Decarbonization Solution for Buildings



## Why?

Building heating and cooling is one of the largest contributors to GHG emissions worldwide.

## What?

A sustainable alternative to traditional heating and cooling.

## How?

Using the geothermal energy right under our feet!

# Geoenenergy: How it works



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HOW GEOENERGY

REDUCES CO<sub>2</sub> BUILDING EMISSIONS BY 90%

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# Benefits from Geoenenergy Heating & Cooling



Comfort

- Invisible
- Quiet
- Resilient



Sustainable

- 90% Less CO<sub>2</sub>
- 60% Less Energy
- No Heat Island



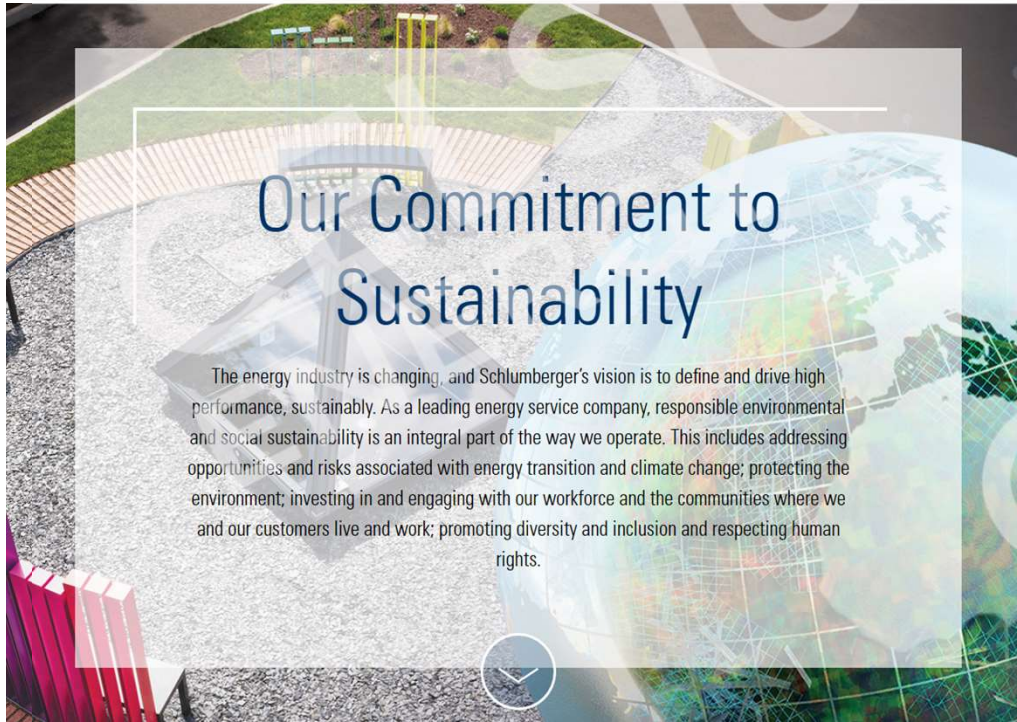
Scalable

- Single Building
- District
- Community



# A SLB New Energy Business

World's leading technology provider for energy industry



4/4/2023



Reservoir  
Characterization  
Drilling  
Production  
Processing



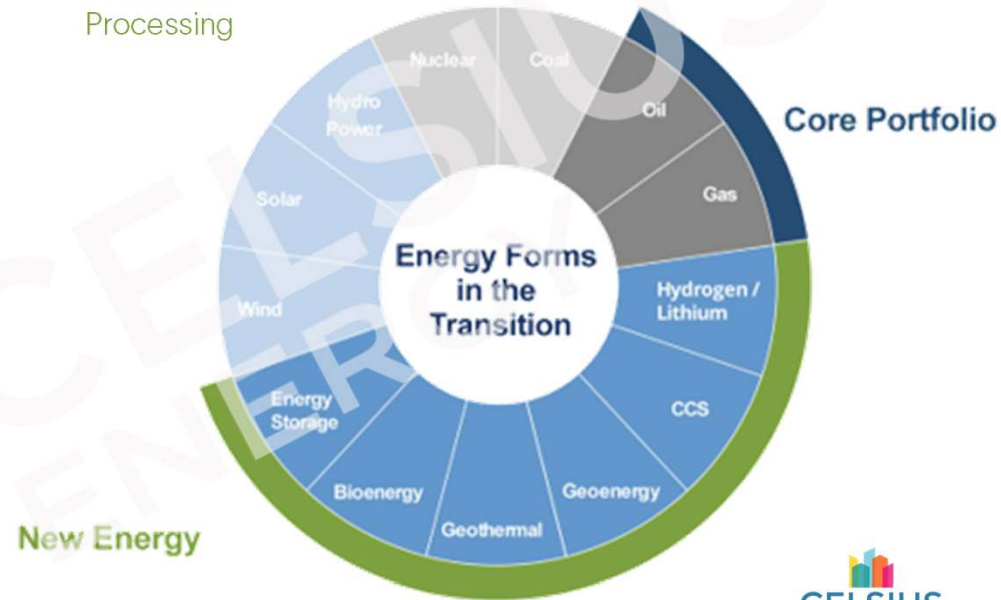
100,000+  
Employees



120+  
Countries



\$26B+  
Revenue



# A Scalable Turnkey Solution for Heating & Cooling



At Building Scale

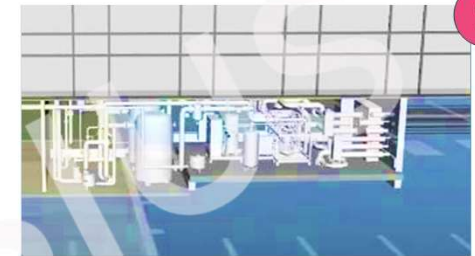
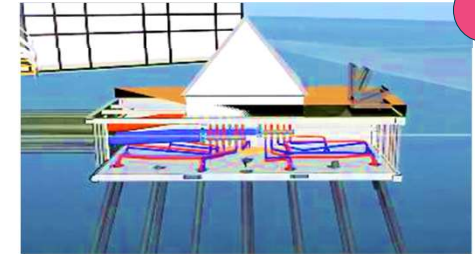


At Community Scale



New & Renovation

Zero Upfront Cost



# Benefits from Geoenery Heating & Cooling



Comfort

- Invisible
- Quiet
- Resilient



Sustainable

- 90% Less CO<sub>2</sub>
- 60% Less Energy
- No Heat Island



Scalable

- Single Building
- District
- Community



# Celsius Energy – Benefits Beyond the Norm



30% Less Bores  
70% Less Piping  
40% Less OPEX



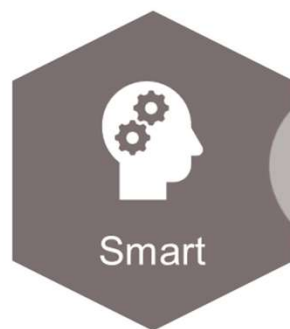
90% Less CO<sub>2</sub>  
60% Less Energy  
No Heat Island



200 SF Land Impact  
Preserve Real Estate  
Retrofit Flexibility



Invisible  
Quiet  
Resilient



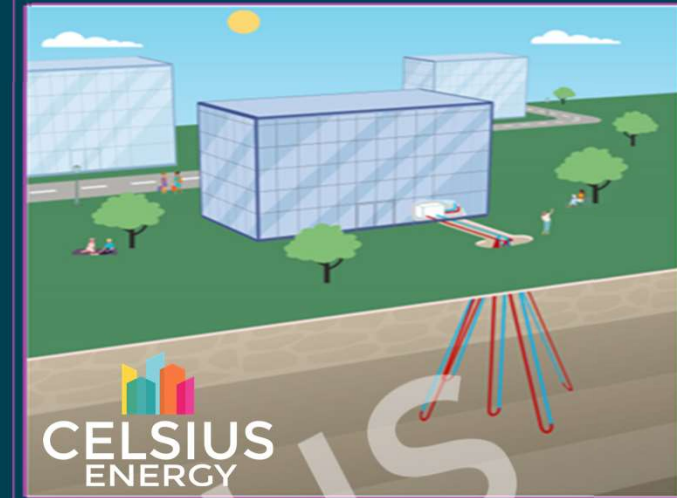
Optimized Design  
Digital Control  
Turnkey Solution



Single Building  
District  
Community

# Optimized Borehole Heat Exchanger

- 30% less wells
- 70% less horizontal piping
- 90% less site impact
- Preservation of real estate
- Flexible construction planning - Non critical path
- COST EFFICIENCY!




# Optimized System Design

- Ground characterization
  - Optimize bore depth
- Pioneering digital platform
  - Digital Twin
  - Monitor, control, optimize
- Turnkey solution
  - Ground + Building + Digital
  - Eliminate "over-build"
  - Single point accountability

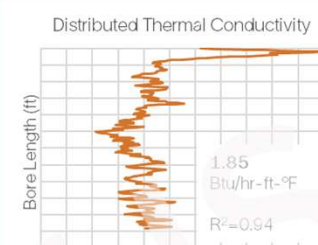
**Standard**

1.84 Btu/hr-ft      56.5 °F

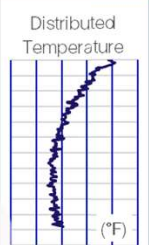


**CELSIUS ENERGY**

Distributed Thermal Conductivity



Distributed Temperature



50.0 °F OUTSIDE TEMPERATURE

68.5 °F INSIDE BUILDING TEMPERATURE

26.6 Mbtu/h GRID ELECTRICITY

1.33 Mbtu/h CELSIUS ENERGY

0 Mbtu/h ALTERNATIVE SOURCES


52.0 °F INLET TEMPERATURE

59.2 °F OUTLET TEMPERATURE



106.5 Mbtu/h GEOTHERMY

75% ENERGY SAVED

90% CO2 REDUCED



Turnkey Solution = Performance Accountability + Efficiency



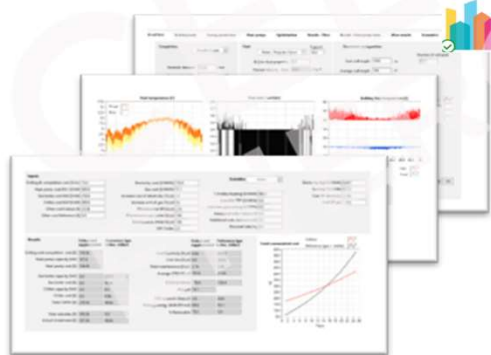
# Digital Narrative

Intelligent Planning

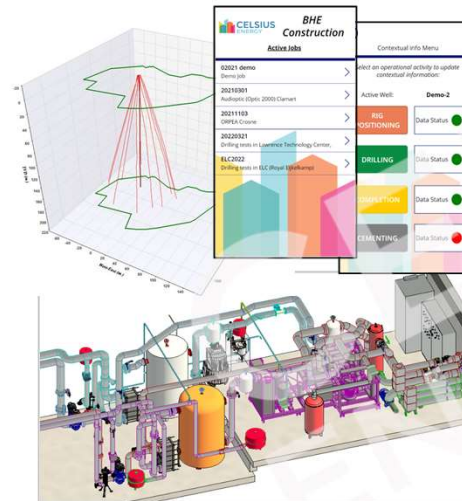
Connected Execution

Digital Twin

Design Assistant



Construction



Geoenergy Management System



- Digitally connected installations
- Proprietary ground-to-building models
- Continuity and integration of systems
- Reliability



ENERGY SAVINGS  
-59%

BUILDING NETWORK

CO<sub>2</sub> EMISSIONS  
-86%

50.0 °F  
OUTSIDE TEMPERATURE

546 Mbtu/h

71.2 °F  
INSIDE BUILDING TEMPERATURE

82 Mbtu/h

GRID ELECTRICITY

CELSIUS ENERGY

0 Mbtu/h

AUXILIARY SOURCES

55.4 °F  
INLET TEMPERATURE

464 Mbtu/h

62.6 °F  
OUTLET TEMPERATURE

GEOENERGY

# Installation Dashboard

Private hospital

Commissioning Date  
September 2020

Heat Pump Capacity  
856 Mbtu/h

Total Borehole Length  
9,281 feet

# of Borehole  
18

Building Surface Area  
71,041 ft<sup>2</sup>

# Optic 2000

Headquarters  
Clamart, IDF



## Why?

ROI  
Net Zero 2030  
Renovation



## What?

-70% CO<sub>2</sub> emissions (254TCO<sub>2</sub> per year)  
-66% energy consumption  
-60% energy bill

-66%  
energy

-70%  
CO<sub>2</sub>

-60%  
usd



## How?

8 months renovation in occupied site  
21 bores + Heat Pump + Gas

# Orpéa

Private Hospital  
Plancoët, Bretagne



## Why?

ROI  
Net Zero 2030  
ESG engagement

75,300ft<sup>2</sup>



## What?

-71% CO<sub>2</sub> emissions (254TCO<sub>2</sub> per year)  
-78% energy consumption  
-60% energy bill

-78%  
energy

-71%  
CO<sub>2</sub>

-60%  
usd



## How?

8 months renovation in occupied site  
18 bores + Heat Pump + Gas

# SLB

Tech center  
Clamart, IDF



## Why?

ROI = 8 yrs  
Net Zero 2030  
ESG engagement

32,000ft<sup>2</sup>



## What?

-92% CO<sub>2</sub> emissions (254T CO<sub>2</sub> per year)  
-74% energy consumption  
-62% energy bill

-82%  
energy

-92%  
CO<sub>2</sub>

-62%  
usd



## How?

8 months renovation in occupied site  
10 bores + Heat Pump



# Geoenergy Solution Access

**We finance, develop and structure the project from A to Z.**

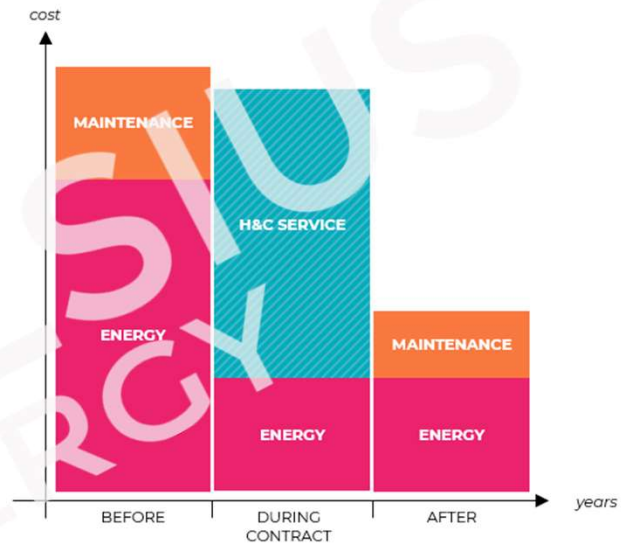
## Benefits

- The best solution without initial investment
- Reduce energy consumption
- Reduce carbon footprint without extra operational cost
- Delegate responsibility
- Ability to move cost to short-term debt in the balance sheet



Serenity thanks to geoenergy

## Example



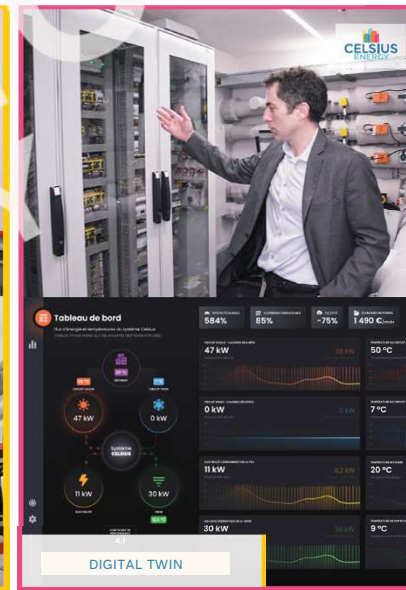
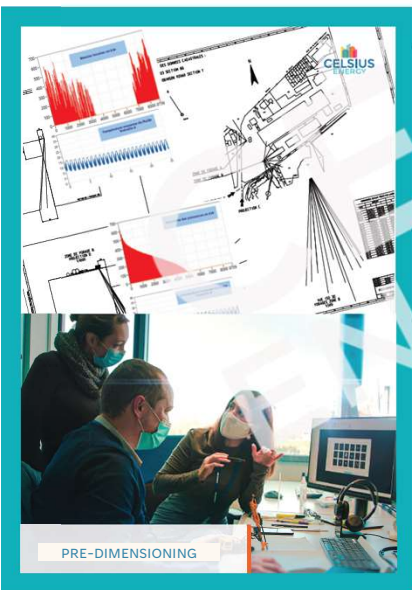
*Client signs a contract for access to geoenergy capacity with a third-party financing company to cover the initial capex, daily maintenance (P2), renovation (P3) and financing cost (P4). Electricity bill is still paid by client directly.*



# A Turnkey Geoenery Solution For Heating & Cooling

## Pre-Dimensioning

## Execution



## Feasibility

## Operation



# What's your plan?



## Helpful Resources:

### Links:

- [Celsius Energy Solution](#)
- [DOE: Geothermal Heating and Cooling](#)
- [Inflation Reduction Act Guidebook](#)
- [Property Tax Exemption for Renewable Energy Systems \(Connecticut\)](#)

### Videos:

- [Completed Project: A geoenery solution providing low-carbon heating and cooling for buildings \(3:40 min\)](#)
- [GEOENERGY: the solution to low-carbon buildings \(3:20 min\)](#)
- [6 Reasons to choose Geoenery \(1:41 min\)](#)