



**BRENMILLER**  
THERMAL ENERGY STORAGE

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# bGen ZERO

Next generation Power-to-Heat

**AUGUST 2023**

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# ABOUT **Brenmiller Energy**

Nasdaq: BNRG +

We are a clean-tech company that develops, manufactures and sells our Thermal Energy Storage (“TES”) solutions to decarbonize heat in industrial and power plants

**\$100M** Capital Investments since inception to date

**60** Employees

**2012** Founded

**4** Installed Projects

**4** Strategic Partnerships



**Decarbonization of heat is the low-hanging fruit of fighting climate change**

# GLOBAL ENERGY USE BY SECTOR

Heat for industry, homes and commercial buildings is the largest energy end-use

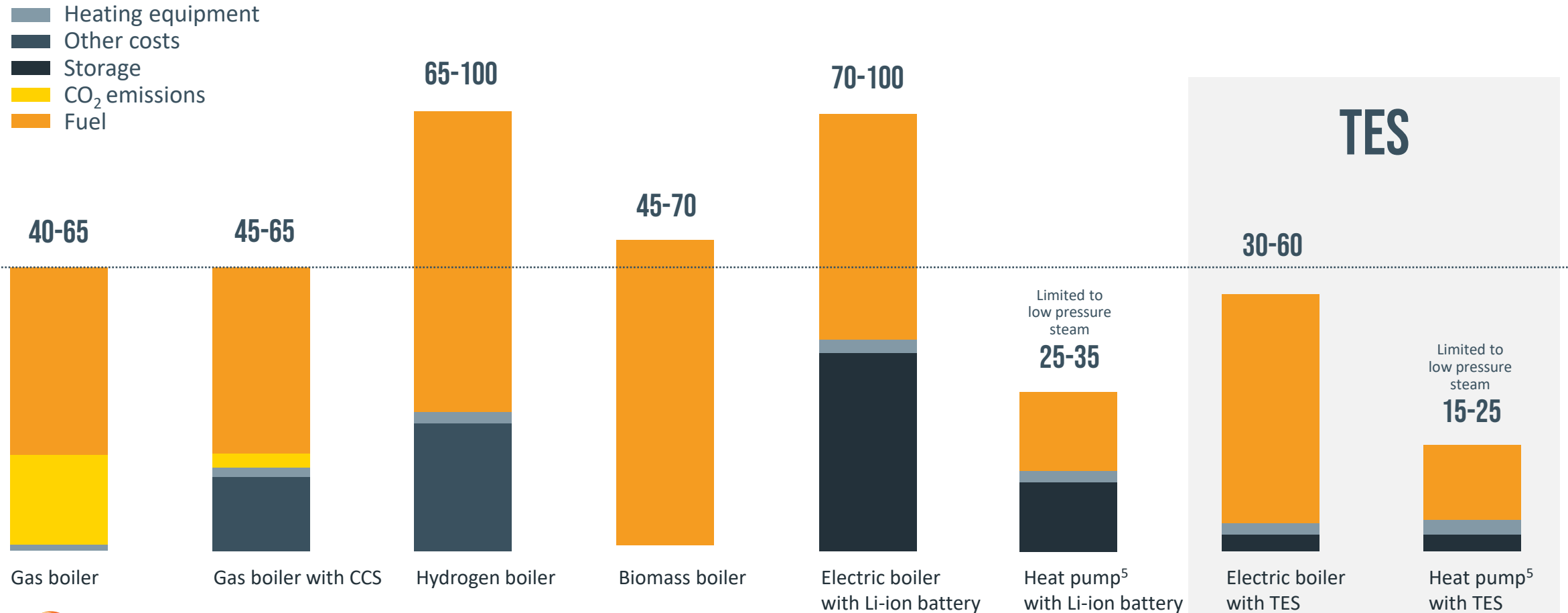


**ELECTRICITY - 17%**

**HEATING & COOLING - 51%**

**TRANSPORTATION - 32%**

# ACCORDING TO MCKINSEY, TES WITH ELECTRIC BOILERS OR HEAT PUMPS, IS THE MOST COMPETITIVE WAY TO REPLACE NATURAL GAS AND DECARBONIZE INDUSTRIAL PROCESSES



# REGULATORY SUPPORT

## SUBSTANTIAL INCENTIVES AND AGGRESSIVE STEPS TO REDUCE GAS CONSUMPTION

### Funding Notice: Industrial Demonstrations

Office of Clean Energy Demonstrations

Office of Clean Energy Demonstrations » Funding Notice: Industrial Demonstrations

Office: Office of Clean Energy Demonstrations

FOA number: DE-FOA-0002936

Access the FOA: [OCED eXCHANGE](#)

FOA Amount: Approximately \$6 Billion

#### Background Information

On March 8, 2023, the U.S. Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED) issued a Funding Opportunity Announcement (FOA) for approximately \$6 billion to significantly reduce greenhouse gas emissions in energy-intensive industrial subsectors through transformational, commercial-scale demonstration projects. This FOA seeks to demonstrate the technical and commercial viability of industrial decarbonization approaches to promote widespread technology implementation and help the U.S. lead in low- and net-zero carbon manufacturing. DOE will provide financial assistance through cooperative agreements to fund up

The New York Times



### New York to Ban Natural Gas, Including Stoves, in New Buildings

Gov. Kathy Hochul announced a state budget deal on Thursday with the first statewide ban on the use of natural gas in new buildings.



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### Spain launches €280 million grants for standalone energy storage, thermal and PHES

By [Jonathan Tourino](#)

July 24, 2023

Europe Grid Scale Business, Policy



Saverio Zefelippo  
Fabio Ranghino

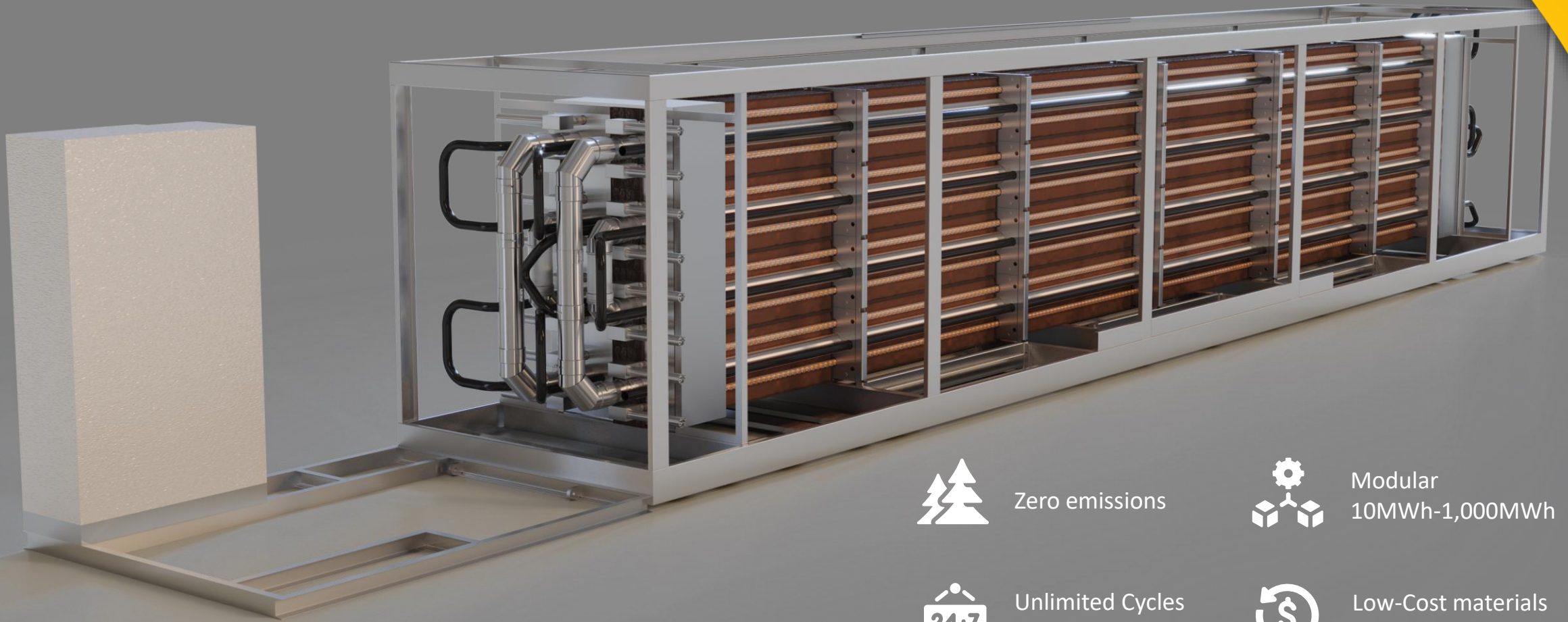
### Electrifying Industrial Heat: A Trillion Euro Opportunity Hiding in Plain Sight

Industrial heat is largely invisible to consumers but represents about 20% of global final energy demand and 10% of the world's CO<sub>2</sub> emissions. That is 2.5 times more than air and maritime transportation emissions combined and not far off those of road transportation. Switching from fossil-based heating systems to those directly powered by renewable electricity in industry can eliminate 100% of CO<sub>2</sub> and air pollutants emissions and reduce primary energy demand by up to 70%. It can also deliver a € 1 Tn investment opportunity.

But things are starting to change. Barriers to adoption for industrial electric heating are becoming anachronistic. On one hand, geopolitics and carbon prices are making cheap, reliable fossil fuel supplies a thing of the past. As industry leaders and engineers inevitably embrace decarbonization, fossil fuels will tip into permanent decline. On the other, renewables are on a fast track to growth and affordability, which will lower the emission intensity of grids and simplify access to clean energy.

# bGen ZERO

POWER-TO-HEAT THERMAL ENERGY STORAGE



Zero emissions



Modular  
10MWh-1,000MWh



Unlimited Cycles  
30+ years



Low-Cost materials  
Simple O&M



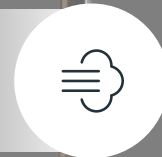
# ELECTRIC HEATING & STORAGE IN ONE



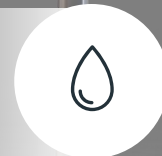
97% Round trip efficiency



High-efficiency embedded electric heaters



100°C-500°C  
Steam



Hot Water

# bGen ZERO

IMPROVED CHARGING PERFORMANCE  
DESIGNED FOR GRID SERVICES

**100%**

Electricity  
for charging

**40%**

Increase in  
charging  
power\*

**1**

Second response  
rate for fast  
charging

# bGen ZERO

## IMPROVED EFFICIENCY

**34%**

Improvement  
in energy  
density\*

**33%**

Reduction  
in Heat  
loss\*

**99%**

Charging  
Efficiency

**97%**

Power-to-Heat  
Cycle efficiency

# bGen ZERO

## IMPROVED ECONOMICS

**40%**

Improvement in  
discharge  
power\*

**98%**

Year-round  
Availability

**90%**

Pre-fabricated  
components



# FROM ROCKS TO THERMAL ENERGY STORAGE

- Rocks are crushed to small bits
- Thin metal cells (“bCells”) are filled with the crushed rocks
- bCells are stacked in to 12 meters modules
- Electrical heaters are embedded
- Modules are assembled on-site to a structure
- Structure is insulated and connected to plant



# WORLD'S FIRST GIGAFACTORY FOR THERMAL ENERGY STORAGE



## PRODUCTION PLANT: READY TO RAMP REVENUES



- European Investment Bank credit facility funding capital expenditure for automated factory and increasing production capacity
- Plant is designed to produce storage modules with an annual capacity of up to 4,000 MWh and will be able to support orders for 2023-2024
- Production capacity is to potentially support sales of up to \$200 million per year
- Factory is planned according to industry 4.0 standards, and would help the company to meet future demand and expected to increase profitability margins



# BUSINESS MODEL #1 – EQUIPMENT SALE

## SALE OF THERMAL ENERGY STORAGE SOLUTIONS TO INDUSTRIAL FACILITIES AND POWER PLANTS

- Gross profit target - 30%
- After sale services - up to 5% of equipment sale
  - Warranty
  - Maintenance
  - Optimization



# BUSINESS MODEL #2 – ENERGY AS A SERVICE

## JV WITH LEADING GLOBAL CLEAN ENERGY UTILITIES TO PROVIDE CLEAN STEAM AND GRID SERVICES

- Brenmiller to provide the technology and integration
- Partner will provide the clean electricity and finance
- JV sells energy and grid balancing services

### Customer benefits:

- No capital expenditures
- Reducing operational risk
- Green certificates and carbon emission savings

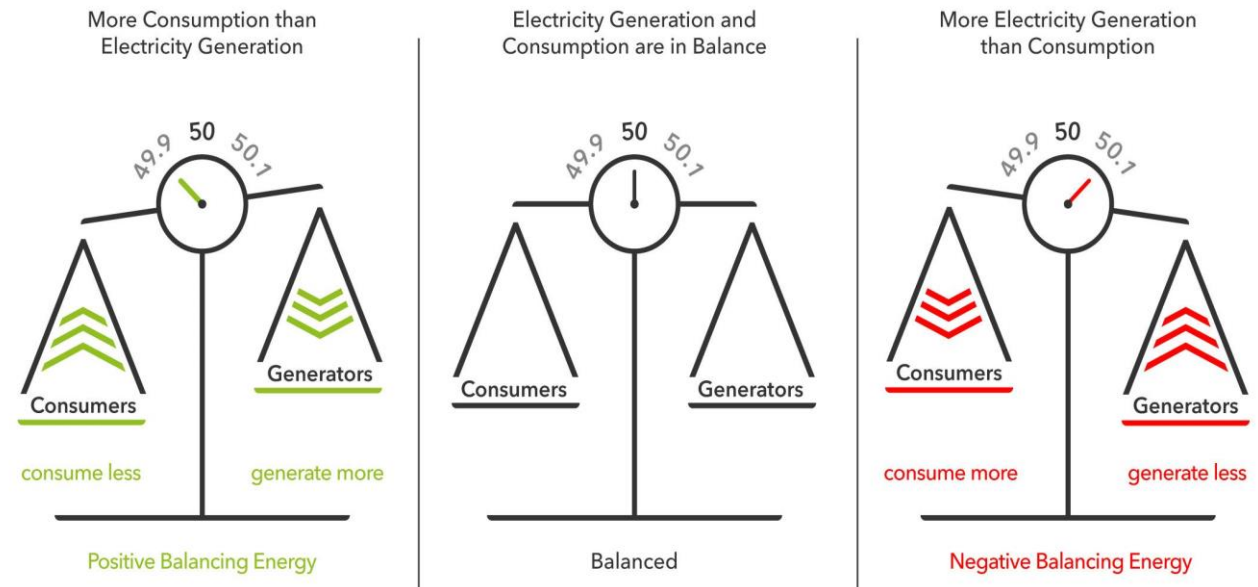


# GRID SERVICES

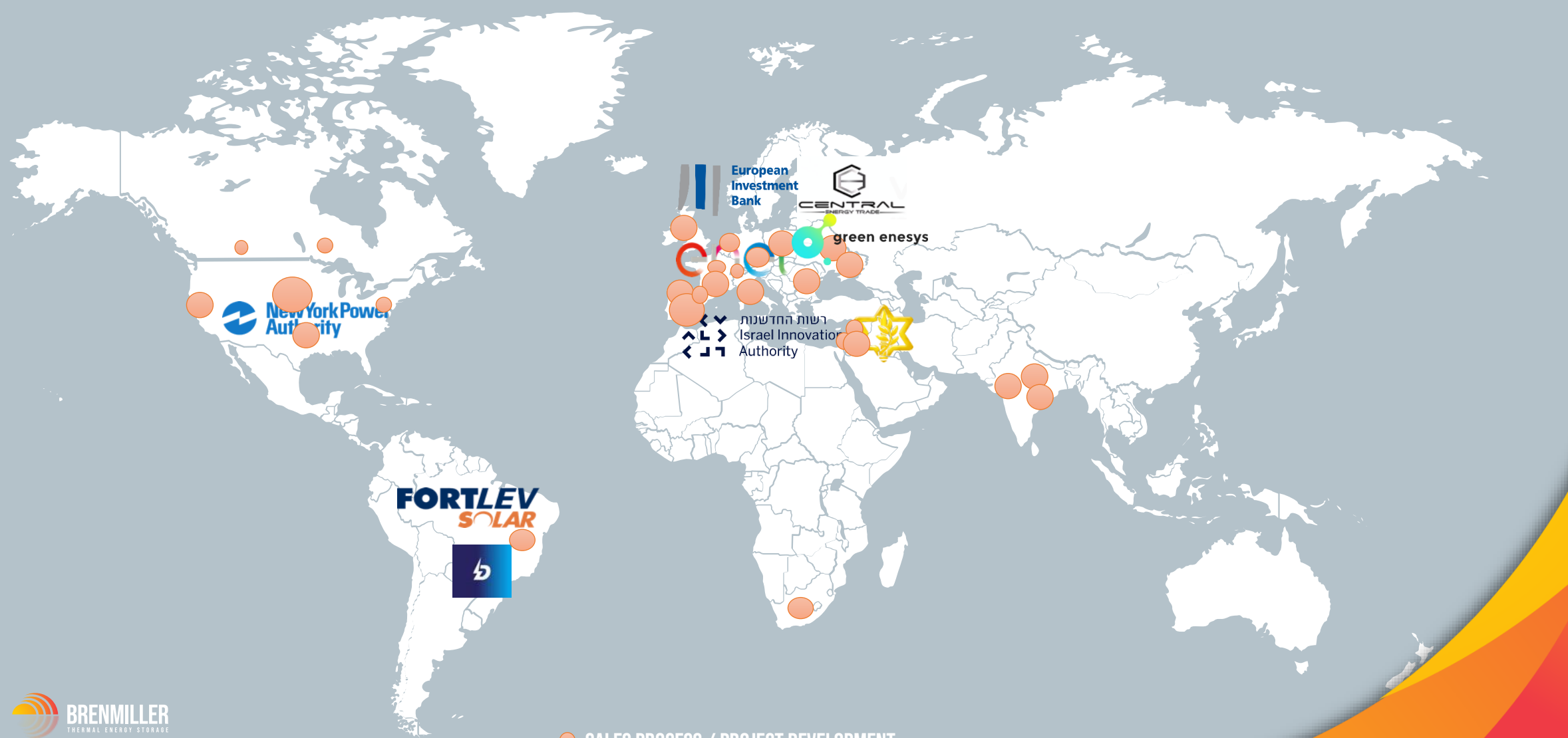
## SUBSTANTIAL REVENUE STREAMS FOR TES

- **Grid flexibility and stabilization:**  
Using excess renewable energy to generate heat
- **Demand-side management:**  
Balancing electricity demand by shifting it to the heat sector
- **Utilization of curtailed energy:**  
Preventing renewable energy waste

### Balance between electricity generation and electricity consumption



# BUILDING THE PIPELINE – FOCUS ON EUROPE AND US





## LARGEST TES SYSTEM IN THE WORLD CONNECTED TO A GAS POWER PLANT

- Storage capacity of up to 24MWh
- Enables shifting energy from off-peak hours to peak hours – improving revenues from energy sales
- The power plant will generate additional revenue streams by improved response times to the grid







# NEW PROJECTS & AGREEMENTS

## Leading Beverages Manufacturer: 32 MWh bGen TES to replace fossil fuel

- One of Israel's largest beverage companies
- Partially owned by Heineken International B.V.
- Received approval for \$610 K grant from Israel Ministry of Environmental Protection

## Global Energy Utility: 9 Clean Energy with 2 GWh Capacity

- Non-binding term sheet signed with one of the world's largest producers of clean energy and Green Enesys Group
- To jointly identify, build, and accelerate electrification by using renewable energies and Brenmiller's TES system to electrify heat and achieve full decarbonization



# TO FIGHT CLIMATE CHANGE – THERMAL ENERGY STORAGE IS CRUCIAL

## The bGen™ ZERO

- Enables electrification of heat
- Enables the use of intermittent RE sources to provide stable reliable heat
- Utilizes and support the electricity grid



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**THANK YOU**

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