

ENDURING Thermal Energy Storage System (TES)

*THE PATH TO AFFORDABLE &
SUSTAINABLE ENERGY*

*From Material Supplier to Global Technology
Partner – Homerun Energy USA Inc.*



Website
www.homerunenergy.com



Homerun's Elevated Role in the **ENDURING** System

From Raw Material Supplier To Global Technology Partner

- **Global IP Agreement** with NREL (U.S. Department of Energy's National Lab)
- **New Joint Patent Application** filed
- **AI Energy Management System** "The Hub" direct integration
- **Exclusive Option** for Global Commercialization Rights

Homerun is now the technology integrator, IP steward, and commercialization leader for the Enduring System

Did you know this partnership began with an idea from Homerun's CEO, Brian Leeners in November of 2023? Shortly after, Homerun was included in the CRADA (No. CRD-23-24168) between Homerun, NREL and Babcock & Wilcox Company.



Homerun's Integrated Strategic Position

Multiple Revenue Streams, Diverse, Scalable Business Model

| Multiple Revenue Streams

➤ Silica Sand Sales:

Raw material to Enduring Systems

➤ System Sales:

Turnkey Enduring installations

➤ License Fees:

Technology licensing to third-party manufacturers / operators

➤ EMS Subscriptions:

Recurring software revenue from AI EMS

➤ Purified Silica Sales:

High-margin output from dual-purpose process



No competitor controls all 4 layers – Homerun has unmatched vertical integration

1

Raw material –
Homerun's own silica
sand quarries

2

Technology IP –
Exclusive option on 5
patents + 1 joint
patent

3

System Integration
– turnkey Enduring
system deployment

4

Digital layer - AI
EMS for
optimization and
grid services

What is the **ENDURING** System?

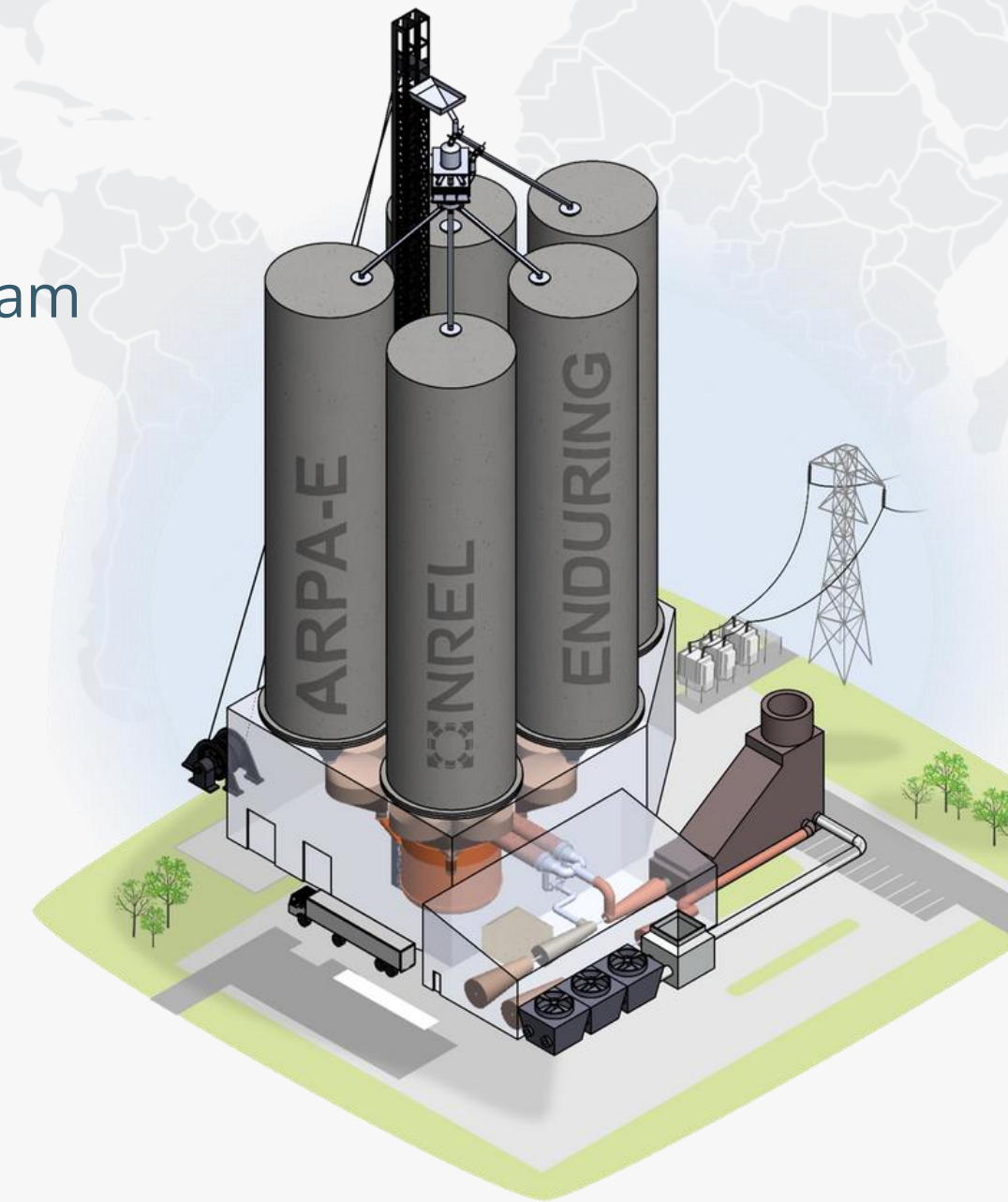
ENDURING: Economic Long-Duration Thermal Energy Storage

| Breakthrough Climate Technology

- **+15 Years & USD \$20M** RD&D efforts supported by DOE and ARPA-E days program
- **5 Awarded Patents** & 8 published journal papers

| Key Innovation

- **Uses Homerun's high-purity silica sand** as thermal energy storage medium
- **Stores electricity as heat**, converts back to power
- **Multi-day storage duration**
- **No geological** or geographical limitations

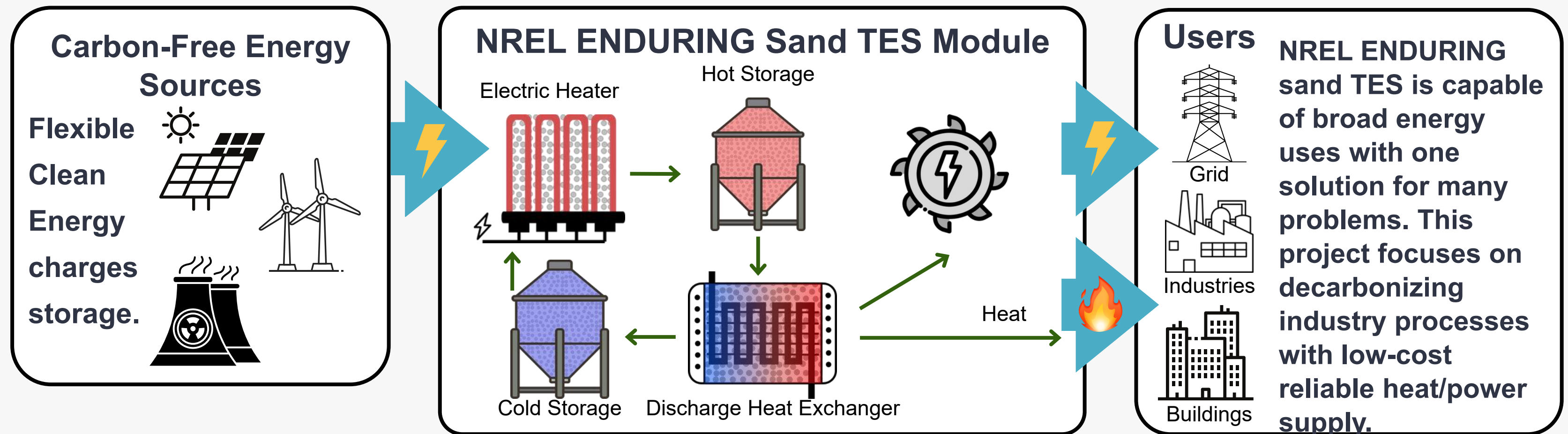


Applications:

Utilities, Data Centers, Industrial Heat, Renewable Energy Integration

How the ENDURING System Works

- Electric in—Heat/Electric out, use sand as storage media
- Modular drop-in TES design for industry decarbonization
- Integrate with cheap renewable power to replace fossil fuels in supplying heat and power at a fraction cost of batteries and hydrogen.
- Safe, reliable, efficient, low cost, and small footprint over other TES technologies.
- Scalable for broad applications from onsite MWh storage to utility GWh long duration storage without geologic/geographical limit.





Why the ENDURING System Matters

Addressing Critical Energy Challenges

Long-Duration Energy Storage (LDES)

- Enables large-scale integration of wind and solar
- Provides power for several days
- Low-cost high-performance storage cycles
- Solution to data center buildout

Industrial Decarbonization

- Replaces fossil fuels in industrial heating
- Temperature range $<0^{\circ}\text{C}$ to $>1000^{\circ}\text{C}$
- Targets billions of tons of CO₂ emissions globally

Scalable & Flexible

- Modular 1-10 Mwe units
- Utility-scale 10-100 Mwe 100+ MWh storage
- No geographical limits

ENDURING System Advantages

Why Enduring Outperforms Competing Technologies

Vs. Other Thermal Energy Storage

- **Circulating sand particles** (high heat capacity) vs air in competitors
- **Separate storage** from charging/discharging enables free capacity scaling
- **Silica sand at cost** = <\$10/kWht storage cost
- **Far cheaper** than firebricks >\$1/kg in Rondo
- **Safer than graphite** – no fire hazards like Antora

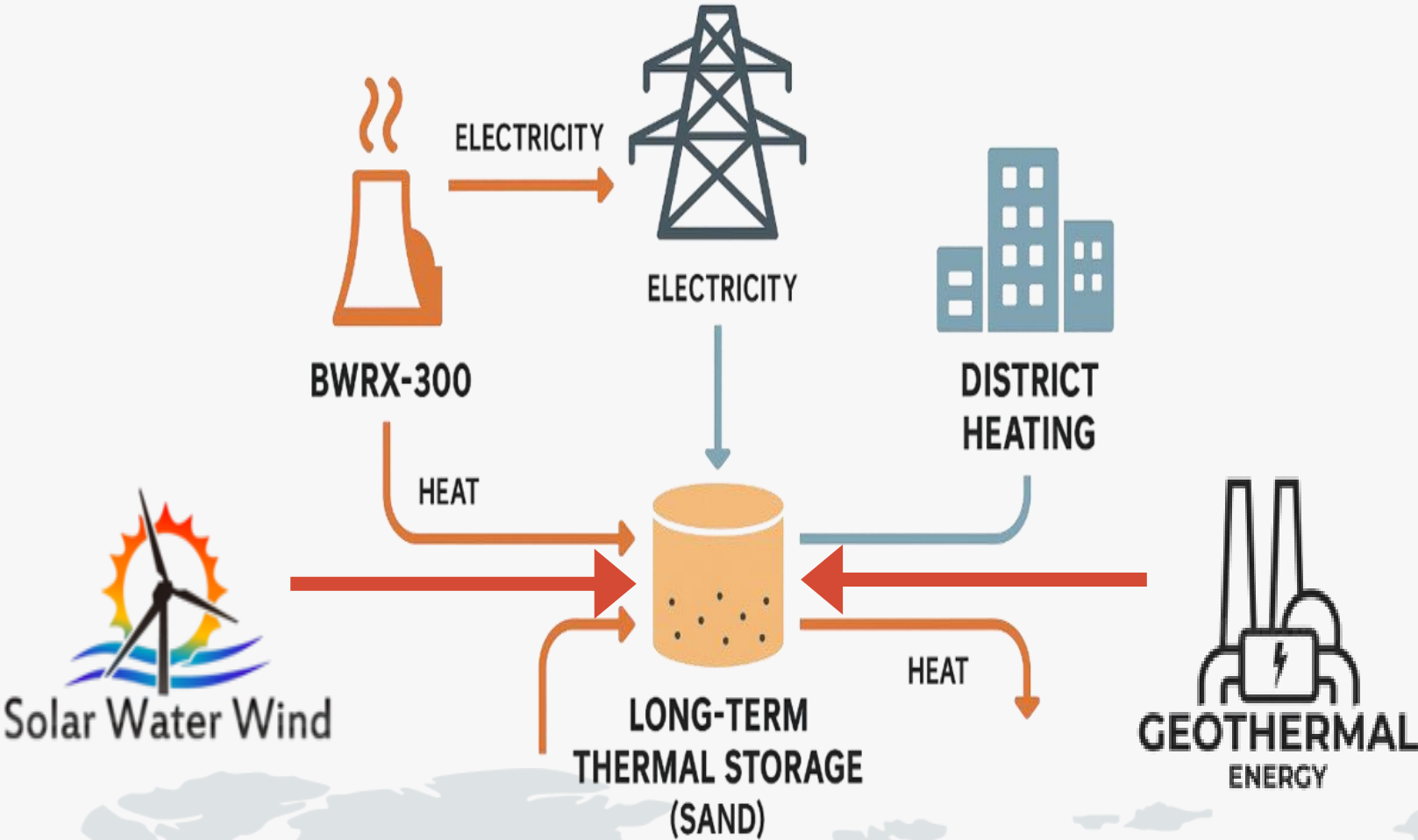
Vs. Batteries

- **Lower cost per kWh** for long-duration storage
- **Longer lifespan**
- **Abundant safe materials**

One solution for multiple problems – grid storage, industrial heat, building heating/cooling

Comparison of LDES Tech & Thermal Microgrid

	Particle ETES	Compressed Air Energy Storage	Pumped Hydro	Li-Ion Battery	Flow Battery
Size (MW _e)	10–400	150–500	>100	0.1–50	1–20
Duration (hours)	>10 to 100	>6 to 10	>6 to 10	1–4	4–8
Round-trip efficiency	40%–70%	40% -60%	70%–85%	85%	70%
Response time	Minutes (warm start)	Minutes	Minutes	Seconds-minutes	Seconds-minutes
Life cycle	++	++	++	+	–
Power system cost*	\$700–\$1,500/kW	\$1,000–1,500/kW	\$600–\$2,500/kW	\$300+/kWh _e	\$500/kWh _e
Energy storage cost	\$4–\$10/kWh _e	\$150–\$300/kWh _e	>\$60/kWh _e		
Siting flexibility	++	–	–	++	++



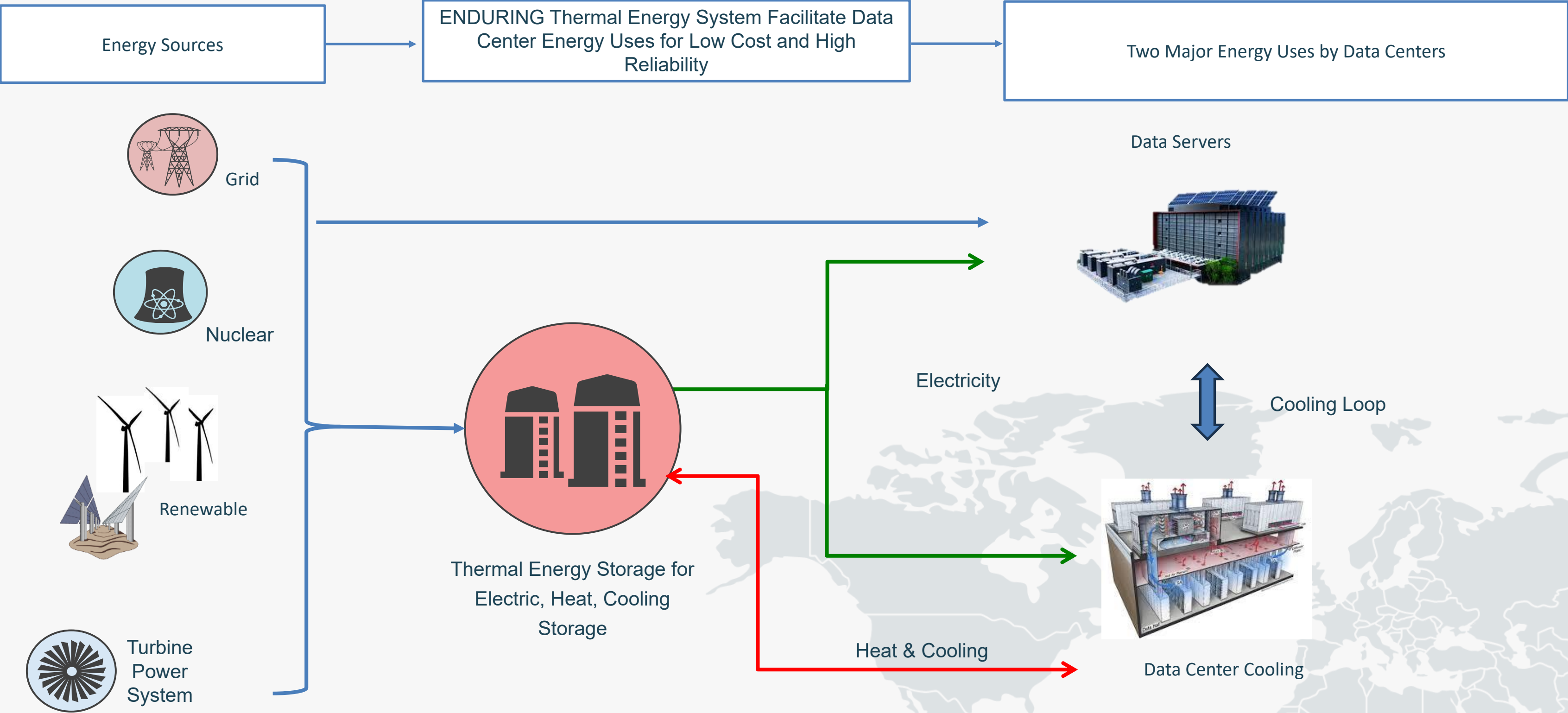
ETES Benefits: Large capacity, low storage cost, flexible siting:

- Separating power system and storage favors LDES to expand storage capacity economically.
- With spinning reserve at hot start, ETES can respond rapidly to synchronize grid demand.

Reference: Ma, Z., et al. “Electric-Thermal Energy Storage Using Solid Particles as Storage Media, Joule, 2023.

From Cost Centre to Asset - Data Center Solution

ENDURING™ technology seamlessly integrates heat, power, and cooling, enabling a highly efficient tri-generation system that maximizes resource use and enhances sustainability. Data centers are evolving from traditional cost burdens into valuable grid assets. Embracing ENDURING™ technology, they can now optimize energy use and generate new revenue streams.



How ENDURING Enables Data-Center Cooling

Data centers require continuous, uninterruptible power, typically running at 95–100% uptime. The ENDURING™ system stores renewable or off-peak electricity as thermal energy in high-purity silica sand ($\approx 1,200\text{ }^{\circ}\text{C}$) for days or weeks, then dispatches electricity and heat on demand.

Combining ENDURING™ thermal storage with data centers ensures 24/7 carbon-free power, enhances waste-heat reuse, and drives operational efficiency, paving the way for sustainable digital growth.

Option A

Combined Heat and Power (CHP) + Cooling

- ENDURING acts as the thermal battery in a tri-generation system:
 - Thermal $\rightarrow$ Power (via Echogen turbine or piston expander)
 - Power $\rightarrow$ Data-center loads or grid export
 - Waste heat $\rightarrow$ Absorption or sCO_2 -driven chillers for cooling
- This architecture can achieve round-trip efficiencies $>60\%$, far exceeding separate cooling and UPS systems.

Option B

Direct Thermal Coupling

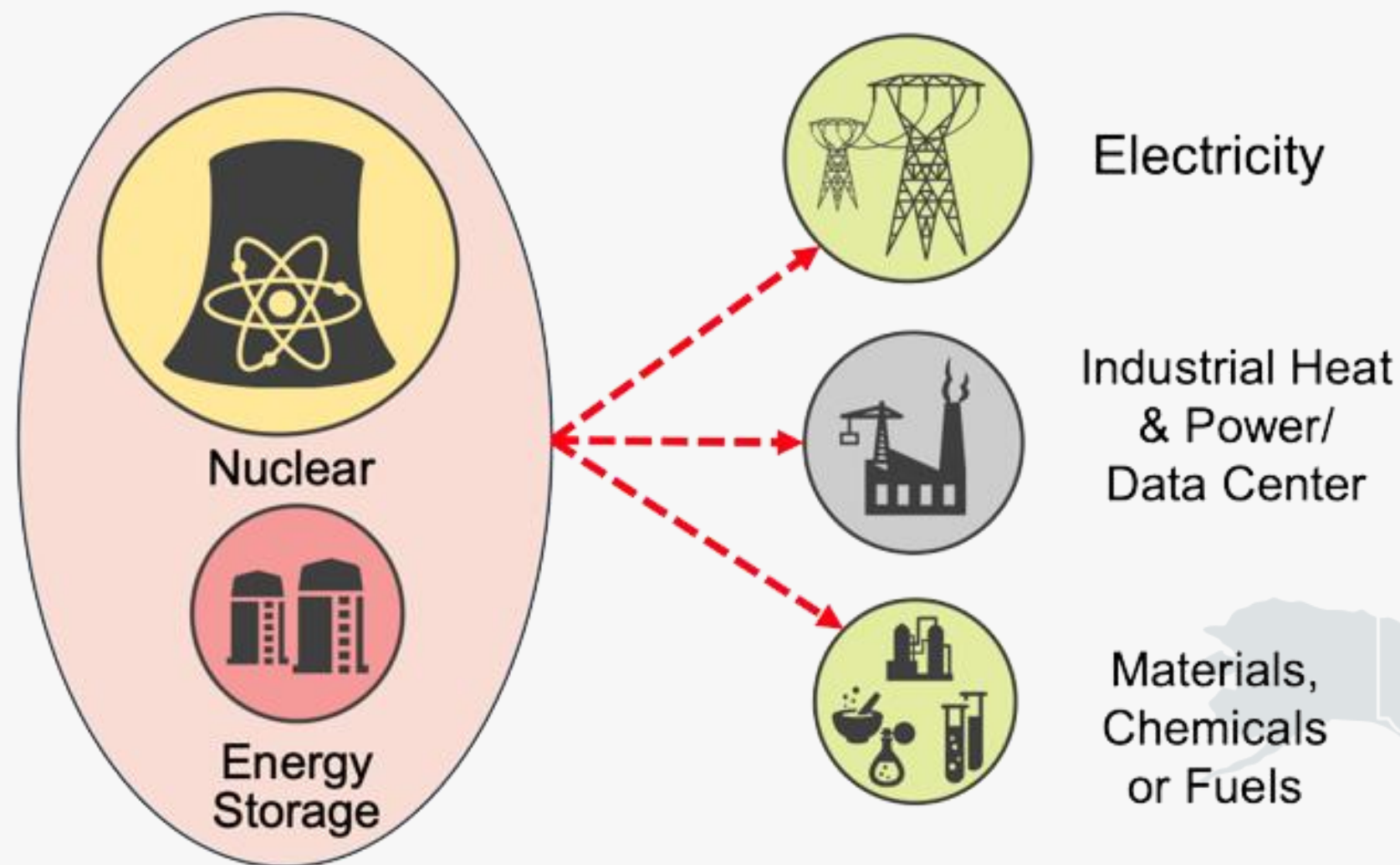
- ENDURING delivers mid-temperature heat ($\approx 200\text{--}300\text{ }^{\circ}\text{C}$) to drive the cooling cycle.
- The cycle produces chilled water or cold air ($\approx 7\text{--}15\text{ }^{\circ}\text{C}$) for rack cooling or liquid immersion systems.
- Waste heat from the loop ($\approx 80\text{--}100\text{ }^{\circ}\text{C}$) can be recirculated into ENDURING or exported to district-heating customers.

Option C

Hybrid DC Microgrid Integration

- Cooling control loops can be digitally coupled with IT workload scheduling — i.e., AI-based load balancing that aligns compute intensity with available cooling and energy.

Use Cases of Nuclear Energy Integrated With Energy Storage



Utility grid power (~100-300MWe)

- Electrification growth
- Dispatchable energy solution
- Combined heat and power
- Deferring transmission with LDES integration

Distributed energy (~10-80 MWe)

- Mining and Heavy Industry
- On and Off Grid
- Data centers
- Synthetic fuels, chemicals
- Hydrogen Economy

Island/Remote Communities (~1-10 MWe) Micro Modular Reactors - <25 MWe)

- Combined heat and power
- Desalination, food production
- Energy Security

The Breakthrough: Global IP Agreement

Homerun Secures Exclusive Option for NREL Technology

| Intellectual Property Agreement (IPA) Signed

Partners: Homerun Energy USA Inc. + Alliance for Sustainable Energy LLC (NREL Operator)



| Scope

5

Existing Patents covering the Enduring System

1

New joint patent application for silica purification + energy storage



Global commercialization right available

12

12-month exclusive option period to negotiate full license



Commercial terms based on revenue share or royalties

| Homerun controls IP deployment globally

Strategic Impact: Homerun transforms from supplier to IP holder and technology leader

New Joint Patent Application

Dual-Value Innovation: Energy Storage + Silica Purification

| **Patent Filed:** Joint application by Homerun Energy USA Inc. and NREL combining thermal energy storage with in-situ silica purification

| Breakthrough Innovation

- **Energy Storage:** Raw silica sand stores heat during charging cycles
- **Purification Process:** Thermal cycling removes impurities (metals, organic matter) from the sand, upgrading it to ultra high-purity silica

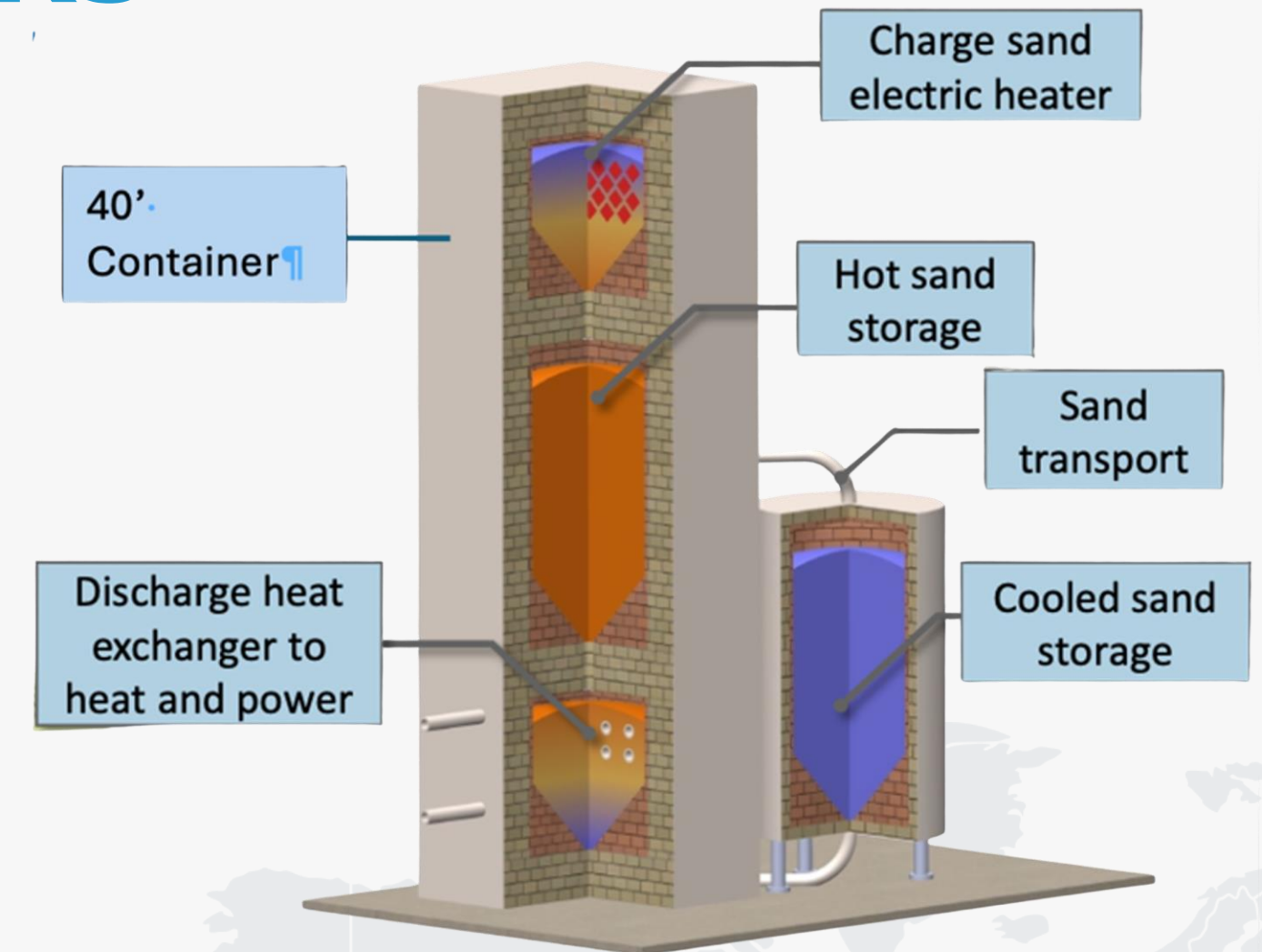
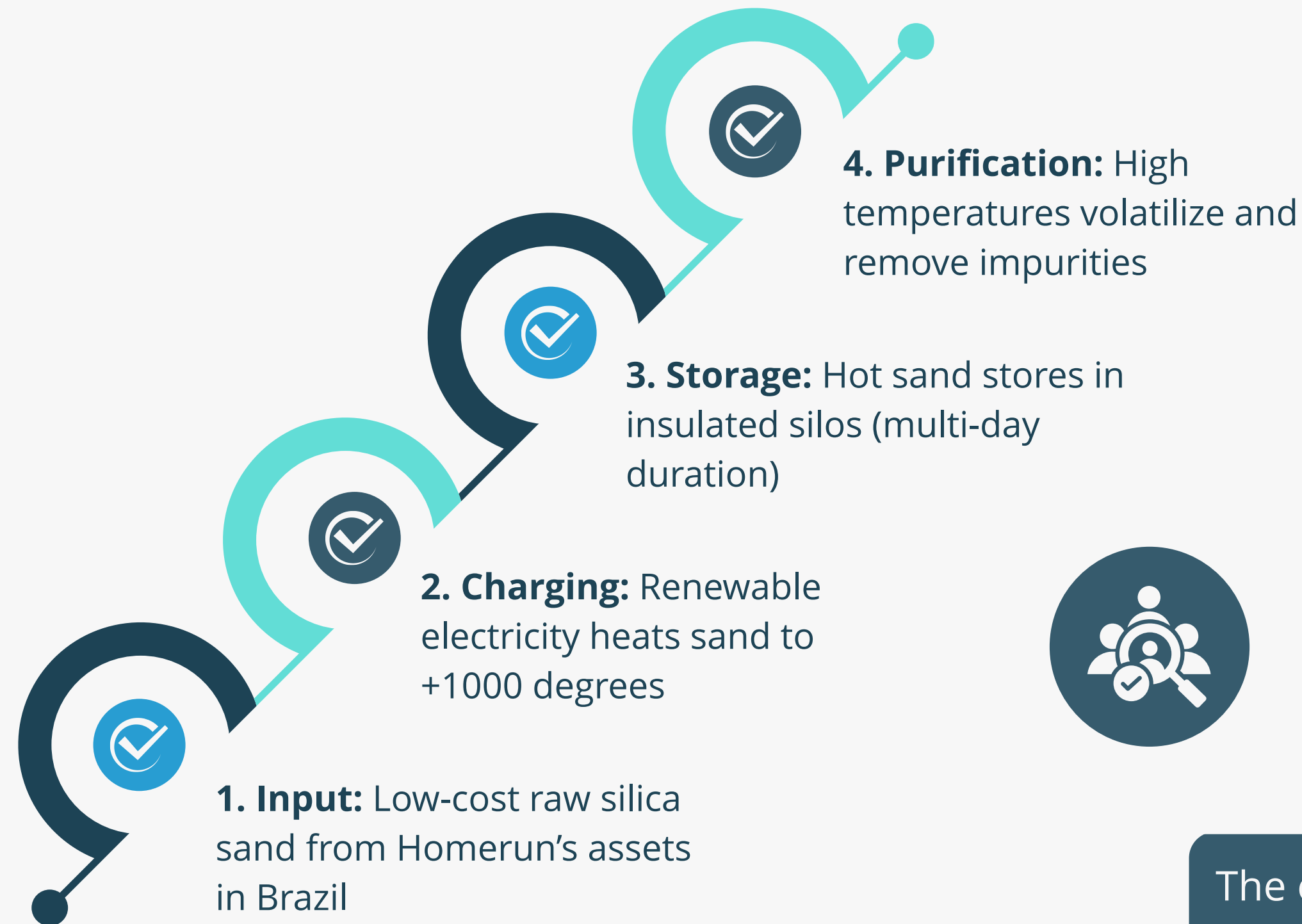
| Output Products

- **Stored Energy:** Multi-day electricity/heat supply
- **Purified Silica:** High-value low-iron silica for advanced materials including extra-clear glass, solar glass, smart glass, optical and battery materials

Value Chain Integration: Homerun's raw silica becomes both storage medium and premium product output – The only energy storage system on the planet with ancillary revenue source

How the Dual-System Works

Silica Purification Within Energy Storage



5. Discharging: Heat exchangers convert thermal energy back to electricity to process heat

6. Output: Purified high-grade silica sand recovered after cycles

The energy storage process itself upgrades the raw material, creating dual revenue stream

AI Energy Management **Integration**

Homerun's EMS: The Digital Brain of the Enduring System

| **AI-Powered Energy Management System (The Hub EMS):**

Homerun will integrate "The Hub" as the control layer for the Enduring system commercialization

| **Capabilities**

- **Demand Forecasting:** AI predicts energy needs
- **Price Optimization:** Charges during low-cost periods, discharges during peak pricing
- **Grid Balancing:** Real-time response to renewable intermittency
- **Predictive Maintenance:** Extends system lifespan
- **Multi-site Coordination:** Managing distributed storage fleets



Homerun's Role: From hardware supplier to full-stack technology provider (materials + systems + software)

| **Value Proposition**

- **Increases Revenue** per system by 15-30%
- **Reduces Operational costs** and enables participation in advanced grid services markets

Sustainability & Decarbonization Impact

Clean Energy Leadership

| Decarbonization Benefits

Enduring directly addresses IRA, EU Green Deal, and net-zero commitments

Eliminating Fossil Fuels

- Replaces natural gas/coal in industrial processes and grid peaking plants

Efficiency Gains

- Round-trip efficiency ~50-60% (competitive with pumped hydro, better than hydrogen)

Emissions Reduction Targets

- Each 100 Mwe system offsets ~50,000 tons CO₂/year

Competitive Advantages & Market Position

Why Homerun Wins

| 8 Unique Competitive Moats

- **IP Control:** Exclusive option on patented NREL technology + joint new patent
- **First-Mover Advantage:** Only player with combined IP, materials, and system integration
- **Government Validation:** NREL/DOE backing de-risks technology for customers and investors
- **Raw Material Access:** Captive silica supply (cost advantage + supply security)
- **Dual Revenue Model:** Energy storage + purified silica output (no competitor replicates this)
- **Massive TAM:** LDES + Industrial heat = \$150B+ Market
- **Multiple Exit Paths:** Operate systems, license technology, strategic acquisition target
- **ESG Alignment:** Direct climate impact (decarbonization, renewable integration)

Market Opportunity: \$150+ billion LDES market by 2040 (BNEF estimate)—Homerun positioned to capture significant share

Get in Touch!

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| Clean Energy Storage. High-Purity Solutions. Homerun Energy.

From Silica to Solutions: Building the Energy Transition, One Particle at a Time

