ENERGY earthshots
U.S. DEPARTMENT OF ENERGY

# INDUSTRIAL HEAT SHOT™

## ITIAC Meeting

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*March 21, 2024*

# Energy Earthshots™ Portfolio

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## Generation & Grid

- Floating Offshore Wind
- Enhanced Geothermal
- Long Duration Storage

## Industry

- Industrial Heat
- Clean Fuels & Products
- Hydrogen

## Transportation

## Buildings

- Affordable Home Energy

## Removing Carbon

Carbon Negative

**Achieving the Energy Earthshots™ can save $850 billion and avoid ~3.9 Gt $CO_2$**

Independent analysis by Third Way for the *Cumulative and Combined Impacts* (2021-2050) *(Published before CFP and AHE Shots)*

Announced June 2021- October 2023

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# INDUSTRIAL HEAT SHOT

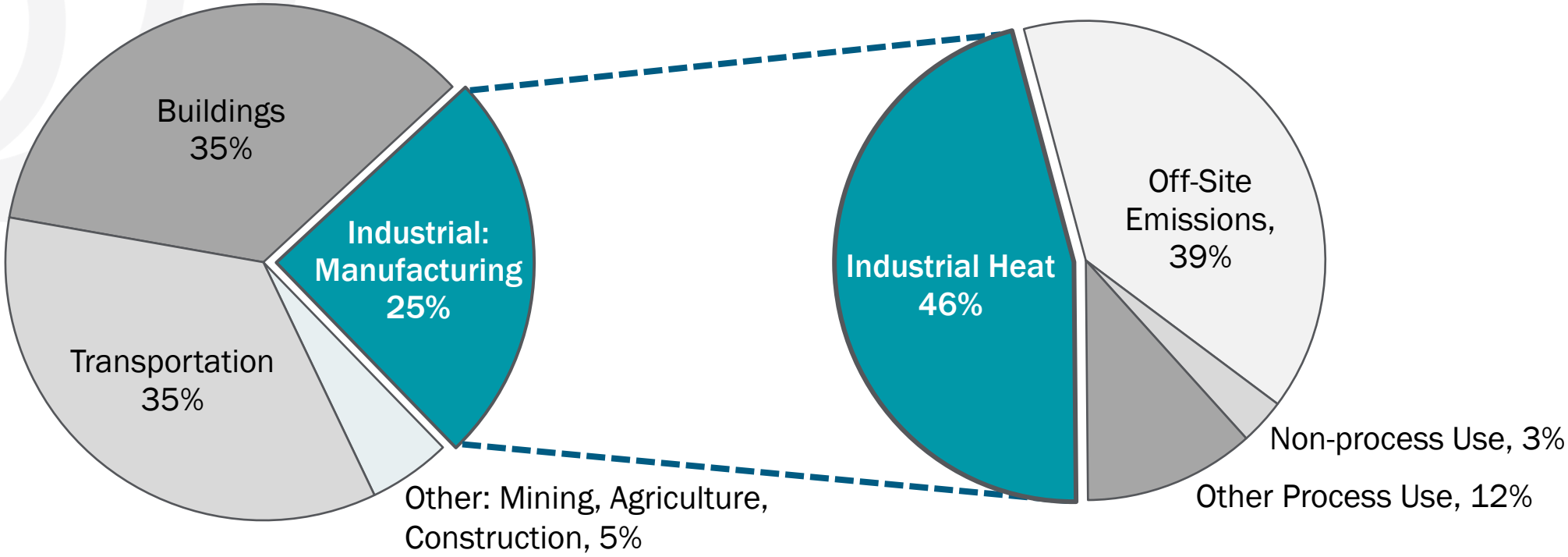

**85%** Reduction

**2035**

The sixth Energy Earthshot – **Industrial Heat Shot™** – was announced on September 21, 2022 and is a Department-wide initiative to develop cost-competitive industrial heat decarbonization technologies with at least 85% lower greenhouse gas emissions by 2035.

# Why Industrial Heat?

## U.S. Energy-Related Emissions:
## ~11% Attributable to Industrial Heat




*2020 Energy-Related $CO_2$ Emissions by U.S. Economic Sector*

*2020 Estimated Industrial: Manufacturing Energy-Related $CO_2$ Emissions by Source*



*Sources: EIA Annual Energy Outlook (2021); AMO 2018 Manufacturing Energy and Carbon Footprints (2022)*

# Why Industrial Heat?

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**Industrial Heat is <u>Essential</u> and <u>Pervasive</u>:**

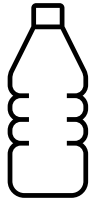
**Every major industry subsector uses heat in <u>different ways</u> to make products…**

**drying**
paper, batteries

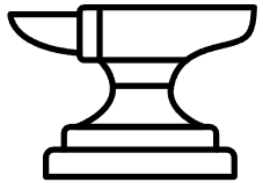
**steam**
pasteurized food

**distillation**
high purity chemicals

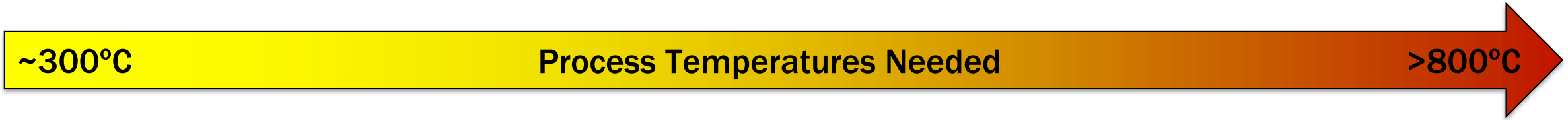
**melting**
formed plastics, semiconductors



**smelting**
iron, copper, vehicle bodies



**calcining**
cement, fuel cell catalysts



# Three Pathways

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**Goal:** Reduce the amount of heat and/or emissions from heat to make cleaner products

## Generate Heat from Clean Electricity

**Reduce Emissions:**
electrify equipment & use clean electricity, improve energy efficiency

**Examples:**
resistive heating, heat pumps, microwave heating, thermal storage, etc.

## Integrate Clean Heat from Alternative Sources

**Reduce Emissions:**
switch to low-emissions heat sources

**Examples:**
solar thermal, nuclear, geothermal, hydrogen, some sustainable fuels

## Innovative Low- or No-Heat Process Technologies

**Reduce Emissions:**
new chemistry and emerging biotechnology processes to reduce heat demand

**Examples:**
bio-based manufacturing, electrolysis, ultraviolet curing, advanced separations, etc.

**Enabling technologies and systems:** energy storage, materials, modeling, data analytics, etc.

# Key Investments

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**Electrified Processes for Industry without Carbon** *(IEDO, May 2023)*
*Awarded EPIXC $70 million* over 5 years to develop electrified industrial heating processes, supporting technologies, and a skilled workforce

**Industrial Efficiency and Decarbonization** *(IEDO, June 2023)*
*Announced awards for RD&D projects* that advance industrial heat pumps, thermal storage, and other technologies to decarbonize thermal processes

**EERCs & Science Foundations for Energy Earthshots** *(SC, September 2023)*
*$264 million awarded for Basic Research in Support of Energy Earthshots,* including 2 Research Centers and 6 Science Foundations projects for IHS

**IEDO FY24 FOAs** *(IEDO, Currently Open)*
*Advancing technologies to decarbonize industrial heat*, including cross-sector approaches and targeted investments in energy-intensive industries

Other DOE offices also support the Heat Shot: DOE Industrial Technologies