



INDUSTRIAL HEAT SHOT™

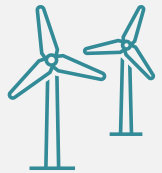
ITIAC Meeting

Joe Cresko, IEDO

March 21, 2024

Energy Earthshots™ Portfolio

Generation & Grid



Floating
Offshore
Wind



Enhanced
Geothermal



Long
Duration
Storage

Industry



Industrial
Heat



Clean Fuels &
Products



Hydrogen

Transportation

Buildings

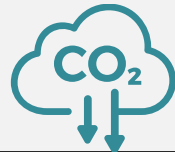


Affordable
Home
Energy

Achieving the
Energy Earthshots™
can save \$850
billion and
avoid ~3.9 Gt CO₂

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

Removing Carbon



Carbon Negative

Announced June 2021- October 2023



INDUSTRIAL HEAT SHOT



85% Reduction

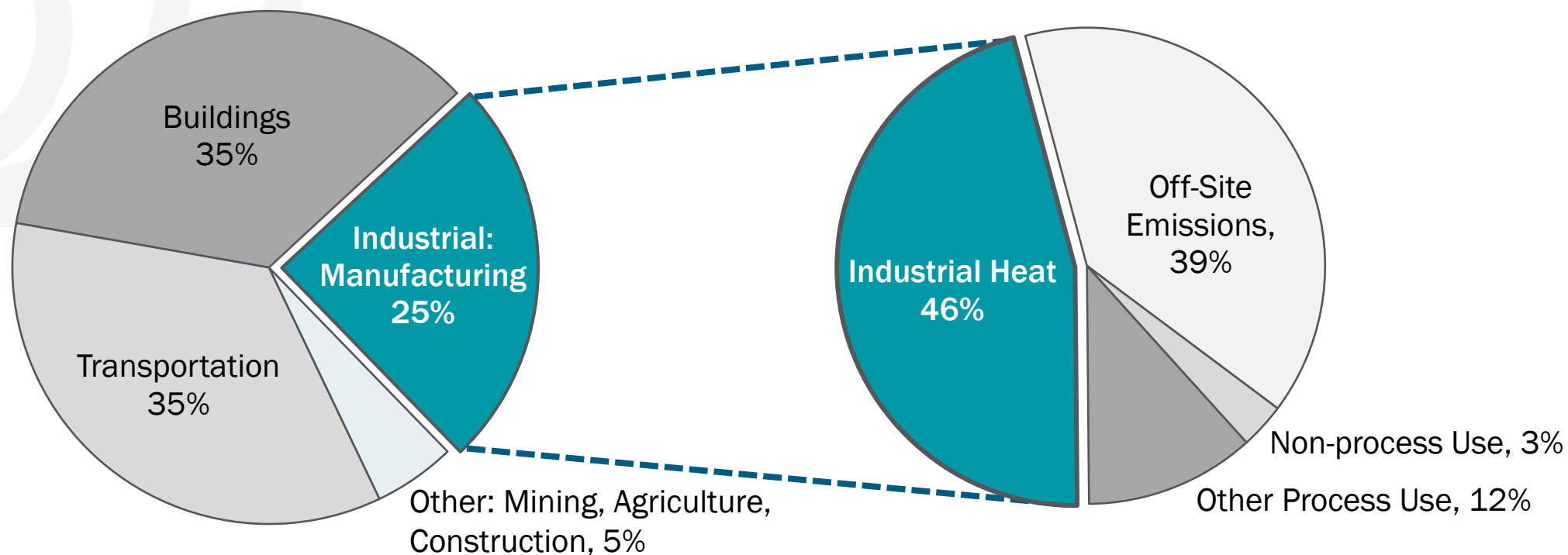


2035

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 CO₂ Emissions by
U.S. Economic Sector

2020 Estimated Industrial: Manufacturing
Energy-Related CO₂ Emissions by Source

Why Industrial Heat?

Industrial Heat is Essential and Pervasive:

Every major industry subsector uses heat in different ways 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



~300°C

Process Temperatures Needed

>800°C

Three Pathways

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



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](https://www.energy.gov/energy-earthshots-initiative)