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# WASTE HEAT THERMAL BATTERY

## ENERGY

Climate control system that utilizes a high-power thermal battery to heat and cool a selected micro-environment.

### TECHNOLOGY TYPE

Energy Storage  
Energy Harvesting  
Thermal Battery

### STAGE OF DEVELOPMENT

- Two-cell + and 17 cell prototypes fabricated and demonstrated successfully.

- Full-scale tank prototype under development.

### IP PROTECTION

#### Nationalized PCT Pending in the United States

A Climate Control System and Associated Methods  
US20170356695A1

### FUNDING TO DATE

Received over \$2.5M from the Advanced Research Projects Agency – Energy.

### LEARN MORE

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### TECHNOLOGY SUMMARY

Heating, ventilation, and air conditioning (HVAC) systems control climates in buildings and vehicles. Most systems utilize compression and expansion of a cycled refrigerant, which consumes high amounts of energy. Thermal energy storage shows promise for harnessing and utilizing waste heat, but most thermal energy storage systems utilize intermetallic alloys, which come with high costs and low energy density.

The *waste heat thermal battery* can store and release energy in a controlled fashion to increase efficiency. The battery is charged and discharged cyclically to supply heating or cooling from stored thermochemical energy. It uses low cost ammonia and magnesium chloride to provide high heating and cooling power. The battery gathers energy from waste or ambient heat, which allows it to be powered by sources such as truck engines, solar heat, and off-peak industrial waste heat. Its characteristics facilitate use in HVAC systems for electric vehicles and long haul trucks, energy storage systems, stationary HVAC, and waste heat recovery systems.

### FEATURES AND BENEFITS

- Improves heating and cooling capabilities.
- Operates off waste heat generated in engines, as well as commercial and residential buildings.
- Stores waste heat to provide free heating and cooling.

### RECENT PUBLICATIONS

Fang, Z.Z., Zhou, C., Fan, P., Udell, K.S., Bowman, R. C. (2015). Metal hydrides based high energy density thermal battery. *Journal of Alloys and Compounds*. 645. doi: [10.1016/j.jallcom.2014.12.260](https://doi.org/10.1016/j.jallcom.2014.12.260)

### INVENTOR PROFILE

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