# Super Energy Saver Heat Pump

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## Technology Summary

ORNL researchers developed a broad class of dynamic hybrid phase change materials and coupled them to residential heat pumps, inventing a super energy saver heat pump. This invention significantly improves heating/cooling efficiency in existing pumps and decreases greenhouse gases, due to reduced energy consumption.

The ORNL invention uses what are essentially off-the-shelf components to obtain substantially higher performance than conventional technology. The key feature of this invention is the production, packaging, and configuration of the hybrid phase change material in the heat pump cycle. The material combines Group I and II halides with silica gel. This is then placed around a finned heat exchanger, housed in a porous drainage pipe. The device permits the heat pump to extract and store heat from ground and air via the dynamic exchange of water between soil solution, water vapor, and phase change material. The design reduces inefficiencies in the heat pump, enables load shifting, and saves electricity.

The phase change materials are made from halides, compounds of a halogen such as fluorine, chlorine, bromine and iodine. This is the only group in the periodic table that contains elements in all three states of matter (solid, liquid, and gas) at standard temperature and pressure. When such materials change from solid to liquid and back again, they are capable of storing and releasing large amounts of energy.

## Advantages

- Lowers prime energy usage in residential and commercial buildings
- Reduces systemic inefficiencies in the heat pump, enables load shifting, and saves electricity
- Fulfills many attributes recommended for residential and commercial heating and cooling technologies over the next 50 years

## Potential Applications

- Residential and commercial buildings
- New construction, replacement units, remodeling and retrofitting projects

## Patent

Moonis Raza Ally and Clifford Keith Rice, *Super Energy Saver Heat Pump with Dynamic Hybrid Phase Change Material,* U.S. Patent 7,757,508, issued July 20, 2010.

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