Advanced Research Projects Agency • ENERGY

BEETIT PROJECT

SHEETAK

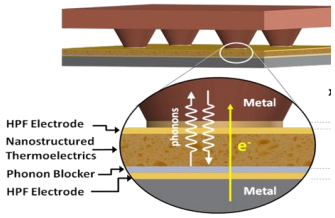
HIGH-EFFICIENCY SOLID STATE COOLING TECHNOLOGIES

PROJECT TITLE:	Non-Equilibrium Asymmetic Thermoelectrics (NEAT) Devices		
ORGANIZATION:	Sheetak, Inc.	LOCATION:	Austin, TX
PROGRAM:	BEETIT	ARPA-E AWARD:	$1,465,118
TECH TOPIC:	Building Efficiency	PROJECT TERM:	9/1/10 – 8/31/12
WEBSITE:	www.sheetak.com		

CRITICAL NEED

More efficient cooling methods are needed to reduce building energy consumption and environmental impact. Buildings currently account for 72% of the nation's electricity use and 40% of our carbon dioxide (CO_2) emissions each year, 5% of which comes from air conditioning. The refrigerants used in air conditioners are potent greenhouse gases (GHGs) that may contribute to global climate change. Because most cooling systems run on electricity, and most U.S. electricity comes from coal-fired power plants which produce CO_2, there is a pressing need to support improvements that increase the efficiency of these technologies and reduce the use of GHG refrigerants.

PROJECT INNOVATION + ADVANTAGES



Sheetak is developing a thermoelectric-based solid state cooling system to replace typical air conditioners that use vapor compression to cool air. With noisy mechanical components, vapor compression systems use a liquid refrigerant to circulate within the air conditioner, absorb heat, and pump the heat out into the external environment. With no noisy moving parts or polluting refrigerants, thermoelectric systems rely on an electrical current being passed through the junction of the two different conducting materials to change temperature. Using advanced semiconductor technology, Sheetak is improving solid state cooling systems by using proprietary thermoelectric materials along with other innovations to achieve significant energy efficiency. Sheetak's new design displaces compressor-based technology; improves reliability; and decreases energy usage. Sheetak's use of semiconductor manufacturing methods leads to less material use—facilitating cheaper production.

IMPACT

If successful, Sheetak's new improvements to solid state cooling technology could allow for more cost effective, energy efficient air conditioning systems that use no polluting refrigerants.

- SECURITY: Increased energy efficiency would decrease U.S. energy demand and reduce reliance on fossil fuels—strengthening U.S. energy security.
- ENVIRONMENT: Refrigerants with polluting emissions could account for up to 10%-20% of global warming by year 2050. Sheetak's technology could eliminate the use of these refrigerants.
- ECONOMY: Widespread adoption of this technology could reduce energy consumption for air conditioning of buildings—providing consumers with cost savings on energy bills.
- JOBS: As new technologies develop, there will be new job opportunities in the design, installation, testing, and maintenance of efficient heating and cooling systems.

CONTACTS

ARPA-E Program Director:
Dr. Eric Toone,
eric.toone@hq.doe.gov

Project Contact:
Dr. Uttam Ghoshal,
ghoshal@sheetak.com