Advanced Research Projects Agency • ENERGY

FIRST OPEN SOLICITATION

UNIVERSITY OF ILLINOIS

SILICON-BASED THERMOELECTRICS

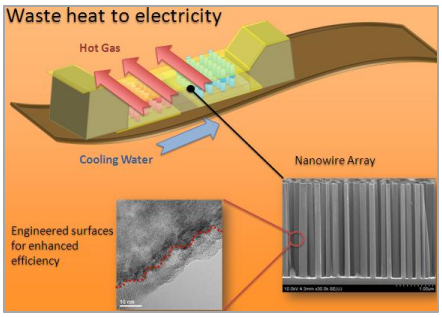
PROJECT TITLE:	Harvesting Low Quality Heat Using Economically Printed Flexible Nanostructured Stacked Thermoelectric Junctions		
ORGANIZATION:	The University of Illinois at Urbana-Champaign (UIUC)	LOCATION:	Urbana, IL
PROGRAM:	FOA1	ARPA-E AWARD:	$1,715,752
TECH TOPIC:	Waste Heat Capture	PROJECT TERM:	3/1/10 – 2/29/12
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/OtherProjects.aspx		

CRITICAL NEED

Wasted heat is an unavoidable by-product of any power produced by an engine. While a little heat from a computer or cell phone does not seem like a big deal, the cumulative loss of heat from all power generated in the U.S. each year is over 50%. In some cases, air conditioners are even used to expel waste heat, which creates more wasted energy and can cause temperatures to rise in dense urban environments. Waste heat capture, which turns excess thermal energy into electricity, has the potential to provide consumers with billions of dollars in energy savings each year.

PROJECT INNOVATION + ADVANTAGES

UIUC is experimenting with silicon-based materials to develop flexible thermoelectric devices—which convert heat into energy—that can be mass-produced at low cost. A thermoelectric device, which resembles a computer chip, creates electricity when a different temperature is applied to each of its sides. Existing commercial thermoelectric devices contain the element tellurium, which limits production levels because tellurium has become increasingly rare. UIUC is replacing this material with microscopic silicon wires that are considerably cheaper and could be equally effective. Improvements in thermoelectric device production could return enough wasted heat to add up to 23% to our current annual electricity production.



IMPACT

If successful, UIUC's project would significantly improve domestic power generation by harnessing large amounts of wasted heat throughout the country.

- SECURITY: Waste heat capture from the heating and cooling of vehicles could increase fuel economy by 10%, reducing U.S. dependence on foreign oil.
- ENVIRONMENT: Efficient waste heat capture could prevent nearly 500,000 tons of carbon dioxide from being released into the atmosphere each year, substantially reducing our impact on global climate change.
- ECONOMY: The thermoelectrics industry could grow to over $100 billion per year over the next several decades.
- JOBS: Advances in waste heat capture technology could create high-paying jobs in manufacturing, engineering and sales.

CONTACTS

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