Green power

OSU-Tulsa researcher developing technology to generate power from waste heat

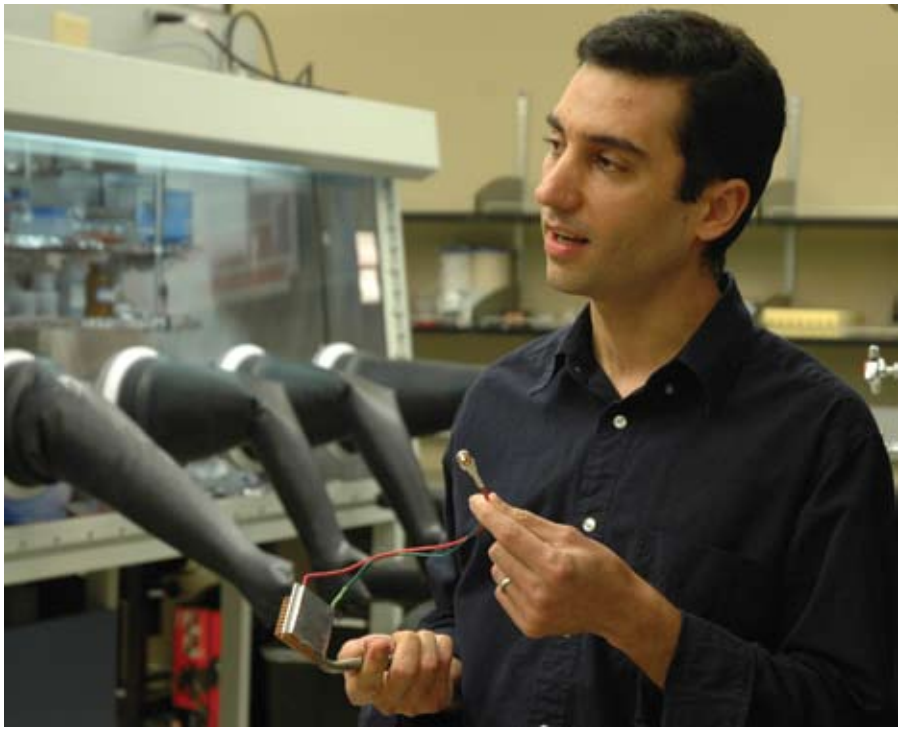
With America focused on energy alternatives and green living, Oklahoma State University-Tulsa researcher Dr. Daryoosh Vashaee is developing nanotechnology that can convert waste heat to usable energy. His process to produce a clean, alternative energy source could significantly reduce the use of fossil fuels and help move the United States toward energy independence.

Vashaee's research has recently attracted the attention of national research agencies. He has been awarded a five-year, $700,000 grant from the Air Force Office of Scientific Research (AFOSR) and a three-year, $200,000 grant from the National Science Foundation (NSF) to perform research associated with thermoelectrics.

"Nearly 60 percent of the world's useful energy is wasted as heat. Thermoelectric materials have the potential to directly convert waste heat into electrical energy," Vashaee says. "Development of highly efficient, inexpensive thermoelectric materials is a key to reduce both energy consumption and harmful emissions on a large scale."

Inside his lab in OSU-Tulsa's Helmerich Advanced Technology Research Center, Vashaee and his engineering graduate students will use the AFOSR grant to develop thermoelectric materials that will harvest wasted energy from military aircraft.

Vashaee said with the use of thermoelectric materials, heat emissions from an aircraft's engine exhaust and the temperature difference between the interior and exterior of a plane could create a potential source of electrical energy.



Dr. Daryoosh Vashaee, a researcher at OSU-Tulsa's Helmerich Advanced Technology Research Center, is developing thermoelectric nanomaterials that use waste heat to generate power. His work could create numerous new clean energy processes that reduce the use of fossil fuels. ***(Photo provided by OSU-Tulsa)***

"The harvesting of energy from waste heat and temperature differential could supplement the internal power supply for aircraft, much like a hybrid car." Vashaee said. "It creates a more efficient and inexpensive energy source and the thermoelectric materials are very robust. They almost last forever."

Dr. Kenneth Ede, assistant dean of OSU's College of Engineering, Architecture and Technology, says it's the material's toughness and relatively low-cost that makes it a very attractive alternative to solar energy technology.

"Thermoelectric materials are so much less expensive than the current solar materials. At one-fifth of the cost, thermoelectric materials are one of science's best kept secrets," Ede said. "We're very excited about Dr. Vashaee's research and its potential for future environmentally friendly household and everyday applications."

Vashaee said thermoelectric materials can be developed for a variety of uses from utilizing body heat to power a pacemaker to providing soldiers with lightweight, climate-controlled fatigues and night-vision enhanced helmets. He also illustrated the concept by explaining how harvesting the excess heat in a home's attic could be converted to power that would efficiently and economically heat and cool the entire house.

Vashaee believes all of these solutions could be made possible by using nanostructured thermoelectric materials to convert already existing solar or body heat into electrical energy.

He will use the NSF grant to combine theory and experiments in developing a capability to predict the relevant properties of thermoelectric nanocomposite materials, essentially providing the theoretical groundwork used by future researchers.

Trish McBeath