POWER GENERATION USING SOLAR-HEATED GROUND AIR

Georgia Tech Research Corporation

Power Generation Using Anchored, Buoyancy-Induced Columnar Vortices: The Solar Vortex (SoV)

Program:
OPEN 2012
ARPA-E Award:
$3,699,976
Location:
Atlanta, GA
Project Term:
05/03/2013 to 05/02/2016
Project Status:
ACTIVE
Website:
sov.gatech.edu(link is external)
Technical Categories:
Stationary Generation

Critical Need:

Renewable energy is critical to our environmental, economic, and national security. Demand for energy is on the rise, as is our national reliance on fossil fuel-based power plants for the bulk of our electricity generation. There is a critical need for safe, clean, and cost-effective alternatives to coal, such as wind, solar, hydroelectric, and geothermal power. These technologies would reduce carbon dioxide emissions and help position the U.S. as a leader in the global renewable energy industry.

Project Innovation + Advantages:

Georgia Tech is developing a method to capture energy from wind vortices that form from a thin layer of solar-heated air along the ground. "Dust devils" are a random and intermittent example of this phenomenon in nature. Naturally, the sun heats the ground creating a thin air layer near the surface that is warmer than the air above. Since hot air rises, this layer of air will naturally want to rise. The Georgia Tech team will use a set of vanes to force the air to rotate as it rises, forming an anchored columnar vortex that draws in additional hot air to sustain itself. Georgia Tech's technology uses a rotor and generator to produce electrical power from this rising, rotating air similar to a conventional wind turbine. This solar-heated air, a renewable energy resource, is broadly available, especially in the southern U.S. Sunbelt, yet has not been utilized to date. This technology could offer more continuous power generation than conventional solar PV or wind. Georgia Tech's technology is a, low-cost, scalable approach to electrical power generation that could create a new class of renewable energy ideally suited for arid low-wind regions.

Impact Summary:

If successful, Georgia Tech's technology would reduce the cost of energy by 20% over wind power and 65% over solar photovoltaic energy.

Security:
Cost-effective solar energy would increase U.S. renewable energy use and help reduce our dependence on fossil fuels.

Environment:
Replacing energy systems powered by fossil fuels would provide an immediate decrease in greenhouse gas emissions, of which electricity generation accounts for over 40%.

Economy:
Cost-effective renewable energy alternatives would reduce fuel prices and stabilize electricity rates for consumers. Integrating these renewable technologies directly into buildings will reduce stress on the electric grid.

Contacts

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