

CABLE Conductor Manufacturing Prize



U.S. DEPARTMENT OF ENERGY



1 vol% CNT addition: Potential weight savings - 50% (3500 lbs)
 2 vol% CNT addition: Potential weight savings - 66.7% (4700 lbs)

Team Name:	<i>FAST Cu-CNT Wire</i>
Primary Submitter Name:	The Pennsylvania State University
City and State:	University Park, PA
Member Names (including partners and affiliates):	J. Singh, S. Priya, Penn State University Joel Alfano,, Siemens Energy Inc., VA Dr. John Sharon, Raytheon Technologies Research Center, CT Dr. Brendan G. DeLacy, Ballydel Technologies, Newark, DE
Submission Title:	Highly Conductive-Thermal Electrical Materials (HC-TEM)

Description of Material

- Cu- <1 wt. % Zr alloy + Ag coated CNT
- Volume fraction of CNT ranging between 2-5% in matrix
- CNT aligned in the matrix along the extrusion pressure direction
- Good Cu/CNT interface
- Textured microstructure enhancing mechanical strength

Fabrication Approach

- Blend Cu+CNT powder with acoustic mixer and sinter using Field Assisted Sintering Technology (FAST).
- Sintered products will be used as feed stock.
- Feed stocks will be extruded at elevated temperatures to produce textured composite cable/wire.

Potential Impact

- Cu-CNT composite wire will be used for a wide range of applications including electric motors, electric power generators and microelectronics.
- According to Siemens, improving efficiency of electric motors as little as 0.3% will result in the reduction of emission equivalent to >820 cars
- According to aerospace industry, 4000 lbs cables weight savings by using with 1- 2 volume% CNT, implies 2500 tons of fuel savings and 78,000 tons of CO₂ emission cuts per year