

# ARGONNE NATIONAL LAB

## EXCHANGE-SPRING MAGNETS

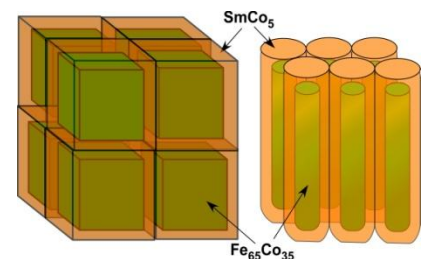
<b>PROJECT TITLE:</b>	Nanocomposite Exchange-Spring Magnets for Motor and Generator Applications		
<b>ORGANIZATION:</b>	Argonne National Laboratory (ANL)	<b>LOCATION:</b>	Argonne, IL
<b>PROGRAM:</b>	REACT	<b>ARPA-E AWARD:</b>	\$1,698,093
<b>TECH TOPIC:</b>	Vehicle Technologies & Renewable Energy	<b>PROJECT TERM:</b>	1/1/12 – 9/30/13
<b>WEBSITE:</b>	www.anl.gov		

### CRITICAL NEED

Rare earths are naturally occurring minerals with unique magnetic properties that are used in electric vehicle (EV) motors and wind generators. Because these minerals are expensive and in limited supply, alternative technologies must be developed to replace rare-earth-based magnets in motors and generators. Alternatives to rare earths will contribute to the cost-effectiveness of EVs and wind generators, facilitating their widespread use and drastically reducing the amount of greenhouse gases released into the atmosphere.

### PROJECT INNOVATION + ADVANTAGES

ANL will develop a cost-effective exchange-spring magnet to use in the electric motors of wind generators and EVs that uses no rare earth materials. This ANL exchange-spring magnet combines a hard magnetic outer shell with a soft magnetic inner core—coupling these together increases the performance (energy density and operating temperature). The hard and soft magnet composite particles would be created at the molecular level, followed by consolidation in a magnetic field. This process allows the particles to be oriented to maximize the magnetic properties of low-cost and abundant metals, eliminating the need for expensive imported rare earths. The ultimate goal of this project is to demonstrate this new type of magnet in a prototype electric motor.



### IMPACT

If successful, ANL’s exchange-spring magnets would be used to power an electric motor for use in wind generators and EVs using low-cost and abundant materials.

- **SECURITY:** The U.S. produces a small fraction globally of industrial rare earths. Developing alternatives to the use of rare earths has potential to reduce our dependence on these materials and will have a positive impact on our national economic and energy security.
- **ENVIRONMENT:** The transportation and electric power sectors account for nearly 75% of U.S. greenhouse gas emissions each year. Better magnets would support the widespread use of EVs and wind power, significantly reducing these emissions.
- **ECONOMY:** The U.S. spends nearly \$1 billion per day on imported petroleum. Improvements in magnet technology would enable a broader use of EVs, which would help insulate our economy from unexpected spikes in the price of oil.
- **JOBS:** Construction and manufacturing of renewable power facilities and EVs could create tens of thousands of jobs by 2030.

### CONTACTS

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