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### MTSU Clean Energy Initiative Project Funding Request

There are five (5) sections of the request to complete before submitting. See <http://www.mtsu.edu/sga/cleanenergy.shtml> for funding guidelines. Save completed form and email to [cee@mtsu.edu](mailto:cee@mtsu.edu) or mail to MTSU Box 57.

1. General Information	
Name of Person Submitting Request: <b>John Rozell</b>	
Department/Office: <b>Engineering Technology</b>	Phone # (Office) <b>615-904-8568</b>
MTSU Box # <b>19</b>	Phone # (Cell)
E-mail: <b>john.rozell@mtsu.edu</b>	Submission Date: <b>2/17/16</b>

2. Project Categories (Select One)			
Select the category that best describes the project.			
<input type="checkbox"/>	Energy Conservation/Efficiency	<input type="checkbox"/>	Sustainable Design
<input checked="" type="checkbox"/>	Alternative Fuels	<input type="checkbox"/>	Other
<input checked="" type="checkbox"/>	Renewable Energy		

3. Project Information
<p>a. Please provide a brief descriptive title for the project.</p> <p>b. The project cost estimate is the expected cost of the project to be considered by the committee for approval, which may differ from the total project cost in the case of matching funding opportunities. <b>Any funding request is a 'not-to-exceed' amount. Any proposed expenditure above the requested amount will require a resubmission.</b></p> <p>c. List the source of project cost estimates.</p> <p>d. Provide a brief explanation in response to question regarding previous funding.</p>
3a. Project Title: <b>GEM (Global Electric Motors) electric vehicle for Engineering Technology Department</b>
3b. Project Cost Estimate: <b>\$12,000 (\$10,500 for vehicle and \$1,500 for solar cell conversion). Currently, new model GEM cars can cost 16,000 or more based on options. A used late model vehicle will be lower priced and still have sufficient reliability to serve the needs of the department for several years.</b>
3c. Source of Estimate: <b>Dealer information, internet ads, comparison of NEV vehicles, discussions with current NEV operators.</b>

3d. If previous funding from this source was awarded, explain how this request differs? **NA**

#### 4. Project Description

(Completed in as much detail as possible.)

- a. The scope of the work to be accomplished is a detailed description of project activities.
- b. The benefit statement describes the advantages of the project as relates to the selected project category.
- c. The location of the project includes the name of the building, department, and/or specific location of where the project will be conducted on campus.
- d. List any departments you anticipate to be involved. Were any departments consulted in preparation of this request? Who? A listing may be attached to this form when submitted.
- e. Provide specific information on anticipated student involvement or benefit.
- f. Provide information for anticipated future operating and/or maintenance requirements occurring as a result of the proposed project.
- g. Provide any additional comments or information that may be pertinent to approval of the project funding request.

##### 4a. Scope: Work to be accomplished

Purchase a late model (2012-2013) 2 or 4 (preferred) passenger GEM electric vehicle and equip it with a top mounted solar cell charger to provide a low carbon footprint/alternative energy vehicle to serve the on-campus needs of the Engineering Technology Department.

This vehicle could also serve as a testbed for research in electric vehicles, battery storage and solar cell technologies.

This vehicle would replace an aging solar powered electric golf cart that has been used by the department for several years.

#### 4b. Scope: Benefit Statement

Application of electric vehicles for short range transportation needs, such as on campus, is a smart investment. Already the MTSU printing, post office, resource and operations management departments have already recognized the utility of the GEM electric vehicle.

A vehicle such as this would provide additional applied technology opportunities for our Engineering Technology Students, as well as a means to demonstrate clean energy technology to prospective students who may be interested in our department as well as visitor to our campus.

Our modified electric/solar powered golf cart has been as asset over the years, but as both electric vehicle and solar cell technology has developed, we seek to opportunity to upgrade our capability, reliability, and to utilize it as an environmentally friendly technology demonstrator.

Additionally, the GEM electric vehicles are equipped to be street legal (headlights, brake lights, automotive windshield, wipers, etc.) and as such they are much safer on campus roads than golf carts.

**4. Project Description (continued)**

4c. Location of Project (Building, etc.) Voorhies Engineering Technology Building.

**4d. Participants and Roles**

The following departments were contacted who are current GEM vehicle users on campus:

**Jack Ross, Senior Director, Resource and Operations**

**Management:** Met with Jack who operates both a 2 seat and a 4 seat GEM vehicle for his department, to take a test drive, discuss both the benefits and downside to operation and maintenance, and to inspect the vehicles up-close.

**Carrie Waxman, Printing Services:** Met with Carrie who uses a 2 seat GEM vehicle for deliveries across campus. Discussed operation and handling of the vehicle to determine if it met expectations.

**Note:** Although not contacted in preparation for this funding request, the Post Office also utilizes a GEM vehicle on campus.

**4e. Student participation and/or student benefit**

Engineering Technology students can participate in the integration and installation of the solar charging system. Students can use vehicle to study electric vehicle technologies in association with student projects, measure efficiency of the electrical vehicle system, and investigate the benefits of electric vehicle technology. Advanced projects in motor efficiency, electronics, and solar energy can also be developed.

**4f. Future Operating and/or Maintenance Requirements**

The only periodic maintenance requirements identified are replacement of the batteries. GEM electric vehicles use a 12V-6 deep cycle battery pack for power. Prices can range from \$1000 to \$1400 for a complete replacement set of 6 batteries. There are several factors that can affect the life of a battery pack, but on

average battery replacement can be required anywhere from 4 to 7 years.

One benefit of a solar cell charger is that they help keep the batteries always at full charge, which tends to extend the life of lead acid batteries.

4g. Additional Comments or Information Pertinent to the Proposed Project

Utilizing an alternative energy vehicle, identified with vinyl graphics, on campus helps to promote the sustainability fund in support green technologies, as well as the Engineering Technology Department.

Commented [JR1]:

Many universities and college campuses are increasing their utilization of NEV vehicles in their daily transportation needs.

Local colleges such as Lipscomb and Belmont are have already purchased and are currently using several GEM vehicles as a part of their transportation fleet.

### 5. Project Performance Information

Provide information if applicable.

- Provide information on estimated annual energy savings stated in units such as kW, kWh, Btu, gallons, etc.
- Provide information on estimated annual energy cost savings in monetary terms.
- Provide information on any annual operating or other cost savings in monetary terms. Be specific.
- Provide information about any matching or supplementary funding opportunities that are available. Identify all sources and explain.

#### 5a. Estimated Annual Energy Savings (Estimated in kW, kWh, Btu, etc.)

The electrical energy used to fully charge a GEM vehicle for a 30 mile range is \$.80 (based on 8Kwh and the MTEMC rate of \$.10 per Kwh.)

A comparable golf cart will get approximately 10-12 miles per gallon, so for a 30 mile range the cost would be on average \$4.63 (using current AAA national retail fuel average (\$1.699 per gallon.)

GEM vehicle fuel cost: **\$.026 per mile** (no exhaust, quiet, low carbon footprint)

Golf Cart: **\$.154 per mile** (fossil fuel)

#### 5b. Annual Energy COST Savings (\$)

Based on the estimated usage of our current solar cart (7 miles/week x 45 weeks/year):

Gas Golf cart: 315 miles X \$.154 fuels costs= **\$48.15**

GEM car: = 315 miles x \$.026 per mile = **\$8.19**

Summary: The GEM car provides transportation at about 1/6<sup>th</sup> the cost of a traditional gasoline fueled golf cart.

#### 5c. Annual Operating or Other Cost Savings. Specify. (\$)

Adapting the GEM vehicle with a solar cell charger would eliminate the electrical grid costs. However, if you simply look at the cost to implement a solar cell, the cost/benefit equation favors plugging it in to the grid to take advantage of the relatively cheap TVA rates. In

discussion I have had with electric golf cart dealers, this analysis is generally accepted. Few if any local golf courses that utilize electric carts use any type of solar charging system.

However, from a sustainability/green energy perspective, the use of a solar cell charging system provides the opportunity to demonstrate clean energy technologies that may eventually become more economically viable if electrical rates rise and solar cell manufacturing costs fall.

5d. Matching or Supplementary Funding (Identify and Explain)

None at this time.