

# **Feasibility of Full Solar Transportation: Using Solar to Power Bicycles and Mopeds**

## **Contact Information:**

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Total Project Cost:	\$ 47,305
Grant Funds Requested:	\$ 45,895
Match:	\$ 1,410

(no previous applications submitted)

## I Project Summary

Description: This project investigates the possibility and feasibility of using solar power exclusively to power lithium cell and lead cell power assist bicycles, tricycles and scooters for daily commuting.

Project Eligibility: This project is eligible for grant funding under the AEA Emerging Energy Technology Grant as it –

- Tests methods of conserving energy by replacing fossil fuel vehicles for electric bikes as a mode of transportation, using solar as a means of charging electric bike batteries, instead of coal produced electricity.
- Would improve on an existing energy technology by using an alternative to standard electric to re-charge.
- Deploy an existing technology that has not previously been demonstrated in the State: it is unknown if and how much solar time it would take to maintain a bike's charge, and how many hours and miles the charge would last.

Project Innovation: This project will improve Alaskan resident's health and lifespan. As the price of fuel continues to increase, and as residents continue to incorporate daily activity into a healthier lifestyle, the solar recharged electric assist bicycle is an easy to use, no carbon print way to incorporate mild to moderate exercise into their daily lives. By using a motor assist bicycle, the user can travel farther and in more difficult terrain with less fatigue, possibly using it for daily commuting needs for work, school, or errands. By using solar exclusively to charge the battery, dependence on a conventional electric supplier is eliminated, thus conserving energy. The bikes and mopeds are legal on roads, highways, bike paths and trails, and require no licensing or insurance.

Priority Considerations: The project meets 3 priority rankings:

- The owner of Arctic Solar Solutions is Mike Conley, an Alaskan resident.
- The project is supported by matching funds of \$1,410, provided by supplier discounts.
- The project has potential for widespread deployment in the State. The tests for low solar output would be useful for the coastal areas, and most of the northern locations could easily incorporate solar charges because of the clear sky conditions and length of daylight. By charging an auxiliary battery while bike is being used, daily uninterrupted use of bike can be achieved.

## II Technology Validation and Research Methodology

Objectives: The project converts 5 electric power assist bicycles and 1 electric assist moped to sole use solar charging by using the appropriate regulated power converters, 140 watt analog power inverters and controllers. This makes the bikes completely emission free. Tests are then performed to document the effectiveness and efficiency of the solar charging, and the usage range of different bikes in different riding conditions.

Methodology: The performance of both solar chargers and bikes will be monitored, documented, and analyzed as follows:

- Length of battery charge time under various sky conditions, wind conditions, and temperature ranges and size of solar charger needed for different types of bikes, using both lithium and lead.

- Data will also be collected on individual bike's range of use in hours and miles, with variables of topography (flat, rolling hills, steep hills, stop and go traffic), and percent of power assist used (full assist, 70% assist, and 30% assist).

Six combinations of bikes and solar panels will be tested. The solar panels will be 12 volt, 10.24 amp to run the regulated power converter and the 140 watt power inverter. After extensive research, Electric Wheels has the best selection, most affordable prices and most expertise in the area of rechargeable bikes.

- Bike 1: Model EW-800, 36 volt, 250 watt, 10 amp, 56 pounds, lithium battery. Lightweight bike, comfortable for long rides.
- Bike 2: Model EW-450, 36 volt, 250 watt, 10 amp, 39 pounds, lithium battery. Folding bike, super light weight, specialized for urban transportation.
- Bike 3: Model EW-88, 48 volt, 450 watt, 12 amp, 95 pounds, lead acid battery. Three wheeled bike for grocery store trips and daily tasks. Extra stable for the elderly or disabled.
- Bike 4: Pedego Step-thru Cruiser, 36 volt, 500 watt, 10 amp, 74 pounds, lithium battery. Heavier duty bike with more power assist available.
- Bike 5: Model EW-1400, 36 volt, 300 watt, 10 amp, 58 pounds, lithium battery. All terrain bike with wide tires suitable for gravel and rough road conditions.
- Bike 6: Model EW-600 Moped, 48 volt, 600 watt, 14 amp, lead acid battery.

Economic data: Economic data collected will track the initial investment cost, plus savings over using standard electric charging methods. After the initial purchase, no cost of operating and charging the bikes is incurred by the user. Electrical use savings will be calculated using power cost information for Anchorage, Fairbanks, Juneau, Bethel and Ft Yukon.

### III Project Schedule and Summary Budget

The project is expected to begin in January, 2013, with purchases of bikes and solar chargers. Testing would be performed May through September, 2013, and completed in October, 2013.

A summary budget is as follows:

6 bikes, 6 solar panels, storage trailer and shipping	\$ 18,200
Materials and supplies: power converters, auxiliary sockets, Amp meters, inverters, batteries, etc	4,575
Wages and benefits	23,830
Office supplies and expenses	<u>700</u>
Grand total project costs	<u>\$ 47,305</u>

**IV Project Team Qualifications**

Mike Conley, owner of Arctic Solar Solutions, is a 55 year resident of Alaska, with a lifelong passion for alternative energy solutions to everyday needs. He currently owns a battery assist bicycle, and has successfully modified it to charge exclusively solar. He is involved with other small solar projects, such as converting his shallow well water pumps to solar power, while removing the need for intermediate batteries.

Colleen Conley, spouse of Mike Conley, is a 46 year resident of Alaska. She received her Certified Public Accountants license in 1988 after graduating from the University of Alaska, Fairbanks, and has worked in public accounting, private industry, and local government, including grant administration and oversight.

**V Commercialization of Funded Technology**

Individual components are available locally throughout Alaskan cities, although shipping costs could be a major factor in the purchase of bikes and panels. The feasibility of putting all the parts together, once established, and the estimated costs for each unit, would be the major consideration for future commercialization. The price of gasoline and electricity production in the urban centers and rural villages continues to climb, and becomes a larger percentage of a family's budgets each year. Having no cost, yet power assisted transportation would help to buy food and necessities, while improving health.

By signature on this application, I certify that we are complying and will comply with the amount of matching funds being offered.

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Mike Conley, owner, Arctic Solar Solutions