Summary of Comments

Proposal 10-01-05T Electricity, Ranked # 2
Wireless Electric Vehicle Recharging System
Andrew Daga, Momentum Dynamics Corporation

PROJECT OBJECTIVE:

- Proposes to prove the feasibility of employing wireless power transmission using closely-coupled magnetic resonance induction as a means of recharging electrically-powered vehicles in a challenging commercial setting, and to assess user charging behavior in that setting.

FUNDING RECOMMENDATION:

- Recommended for funding. Eligible for funding contingent upon a satisfactory response to request for clarification for minor modifications.

PUBLIC INTEREST BENEFITS:

- The proposed technology has the potential to increase the scale and rate of California consumer adoption of electric vehicles by increasing the knowledge that recharging can be made safe, simple, and fast.

- The proposed technology has the potential to reduce the total cost of ownership of an electric vehicle. Deep discharging greatly reduces the lifetime of a Li-ion battery and the replacement cost of these batteries is in excess of $10,000. Automatic charging encourages people to charge more often and avoid deep discharging, thus reducing a cost concern for both the consumer and the automobile manufacturer.

STRENGTHS:

- Proposes to test the application with commercial airport fleet shuttles.

- Potential marketing tool for electric vehicle adoption.

WEAKNESSES:

- No significant weaknesses noted.

CLARIFICATIONS / CONDITIONS:

- Proposal needs clarification regarding transmission efficiency claims of greater than 90%.

California Energy Commission Energy Innovations Small Grant (EISG) Transportation Program **GRANT APPLICATION COVER PAGE**	**FORM A**

a. Project Title: ***Wireless Electric Vehicle Recharging System***

b. Project Subject Area: (*Indicate the one that most applies*)

☐ Vehicle Technologies ☒ Transportation Systems

c. Applicant Category:

☐ Individual ☐ Academic Institution

☒ Small Business ☐ Non-Profit

d. Grant Funding Requested: $ 95,000 ☒ Hardware $95K ☐ Modeling $50K

e. Proposed Project Duration: 12 Months *(maximum duration 12 months)*

f. Principal Investigator/Project Manager: *(serves as single point of contact for all communications)*

Name:	Andrew Daga	Address: 5 Great Valley Parkway Suite 210 Malvern, PA 19355
Phone:	610-648-3949 Fax: 610-884-6900	
Email:	adaga@momentum-dynamics.com	
Organization:	Momentum Dynamics Corporation	
Position/Title:	CEO and co-founder	

g. Proprietary/Confidential Information:

☐ NO – Proposal does not contain proprietary information, unrestricted distribution authorized.

☒ YES - Proposal contains proprietary information, restrict distribution and disclosure.

(clearly mark and label those sections that are proprietary on all copies)

h. Application Status *(include only prior submissions on same concept)*

☒ First Submission ☐ Second Submission ☐ Third Submission

Provide the proposal number(s) assigned to prior submission(s):_____

i. Indicate the Solicitation Number Listed on the Solicitation Notice: 10-01T

j. Indicate the Solicitation Number Printed on the Application Manual Used: 10-01T

(the solicitation numbers listed in items i and j must match)

k. Principal Investigator/Project Manager Certification: To the best of my knowledge, I certify that the information contained in this grant application package is true, and discloses all requested information.

Principal Investigator/Project Manager Signature:_____

Date: **3-29-2010**_____

Reserved for EISG Program Administrator Use		
Solicitation	Date Received	Proposal Number Assigned
10-01T E		

Project Summary

Wireless Electric Vehicle Recharging System

Principal Investigator – Andrew Daga

Momentum Dynamics Corporation is a clean-technology start-up company located in Malvern, PA. The company is developing proprietary technologies that will enable Battery Electric Vehicles (BEV) and Plug-In Hybrid Vehicles (PHEV) to be recharged wirelessly. This innovation will have a direct, positive impact on energy consumers in CA, the nation, and more broadly, on the ecology by accelerating the adoption of electric vehicles.

The company's technology consists of an integrated suite of hardware and software that can be operated with any type of vehicle. The system is unique in that it does not require any conductor or cable interface with the power grid. As a result, it is far more convenient and safer than competing plug-in chargers, and can be operated in any weather and without supervision. This capability means that wireless charging can be operated automatically.

It is our assertion that wireless charging holds the key to wide scale consumer adoption of EVs. By enabling more frequent charging as a means of increasing battery capacity, frequent intermittent charging will increase driving range while reducing the number of battery deep discharge cycles. **Deep discharging remarkably increases the cost of EV ownership.**

Momentum Dynamic's Wireless Electric Vehicle Recharging System involves two hardware components that are linked and operated by proprietary software. One hardware component, the power transmitter, is installed on floors and pavement as a mat; for more robust outdoor applications, the transmitter can be embedded in pavement. A receiver is mounted to the vehicle underside. All electrical connections are protected so that safety is assured and vandalism and misuse are not possible. The transmitter is automatically electrified only when a properly equipped receiving vehicle is positioned above it.

Our proposal seeks to demonstrate the effectiveness of this system. We propose to equip a commercial-duty BEV with our technology and allow it to be thoroughly tested under actual conditions. The preferred recommendation of this proposal is that this test be conducted by equipping an airport rental car shuttle van with our wireless system. We propose to work with an existing electric vehicle manufacturer, Smith Electric Vehicles, in a joint effort with a shuttle van operator, such as a major rental car agency.

Momentum Dynamics is prepared to form a three-party team with the vehicle manufacturer and vehicle operator on terms that will provide all parties with strong cost saving, marketing, and public relations incentives. This test may be conducted at a major CA airport. Doing so will expose the technology to near-constant 24/7/365 use and enable the technology to be quantitatively measured while user charging behavior is evaluated concurrently.

An additional opportunity exists in this setting to broadly promote EV technology while educating consumers.

Statement of Work

Wireless Electric Vehicle Recharging System

Principal Investigator – Andrew Daga

Project Goal: The goal of this project is to determine the feasibility of employing wireless power transmission using closely-coupled magnetic resonance induction as a means of recharging electrically-powered vehicles in a challenging commercial setting, and to assess user charging behavior in that setting.

Project Tasks	**Performance/Cost Objectives**
1. Finalize contractual arrangements with vehicle OEM and vehicle operator. 2. Finalize test plan (incl. questionnaire) 3. System Eng – coordinate w/ OEM	1.1 Negotiate and execute contract allowing for vehicle provision to operator and for vehicle to be temporarily equipped with MD technology 3.1 Confirm technical requirements
4. Finalize system design 5. Fabricate (1) full-scale prototype 6. Fabricate CAD drawings 7. Design data recording equipment	5.1 Prototype to demonstrate 3 kWh capacity at 12” at min 80% efficiency w/ no adverse inductive heating
8. Fabricate test articles 9. Engineer software 10. Fabricate/assemble data rec. equipment	8.1 Demonstrate test articles meet specification for function and fit 10.1 Validate data recording equipment
11. Integrated HW testing 12. Integrated HW/SW testing	11.1 Validate HW function in field test 12.1 Validate full suite in field test
13. Vehicle integration 14. Deliver vehicle to operator site	13.1 Validate vehicle integration for interference and functionality 14.1 Pre-test and then deliver vehicle to site
15. Install software at field site 16. Instruct operator personnel 17. Conduct initial personnel interviews 18. Conduct baseline function test 19. Conduct field test (long term) 20. Conduct continuing and final personnel interviews	15.1 Validate function of SW 16.1 Confirm field personnel competency 18.1 Measure system function and record data 19.1 Initiate full dynamic trials 19.2 Assimilate technical and performance data 19.3 Analyze data 19.4 Confirm the technology functioned effectively and reliably 19.5 Measure and analyze battery charge state over full period, noting # of deep discharges 20.1 Assess user behavior based on questionnaire; compare final/initial responses

Reporting Requirements: Submit Progress Reports and Final Report in accordance with proposed Project Schedule/Deliverables Chart.