



UNITED STATES ADVANCED BATTERY CONSORTIUM LLC

**DEVELOPMENT OF ADVANCED HIGH-PERFORMANCE
BATTERIES FOR 12V START STOP VEHICLE APPLICATIONS**

REQUEST FOR PROPOSAL INFORMATION (RFPI)

November 26, 2012

RESPONSE REQUESTED BY
December 15, 2012 (Preferred)

No later than:
December 31, 2012

**DEVELOPMENT OF ADVANCED HIGH-PERFORMANCE
BATTERIES FOR 12V START STOP VEHICLE APPLICATIONS**

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RFPI Agreement (to be signed and returned with each Proposal)

DEVELOPMENT OF ADVANCED HIGH-PERFORMANCE BATTERIES FOR 12V START STOP VEHICLE APPLICATIONS

REQUEST FOR PROPOSAL INFORMATION (RFPI)

1.0 Statement of Purpose/Objectives

The United States Advanced Battery Consortium LLC (USABC), an organization whose members are Chrysler Group LLC, Ford Motor Company and General Motors defines and conducts pre-competitive, vehicle-related research and development (R&D) in advanced battery technology. USABC has carried out a number of battery development programs focusing on low-cost, long-life, high-energy, and high-power technologies. With this request the USABC intends to focus on the development of advanced battery systems for 12V start stop applications.

The purpose of this RFPI is to identify developers having electrochemical energy storage technologies which have the capability of meeting or approaching the USABC criteria, as listed in the attached Appendix A. The USABC is currently working under a cooperative agreement with the United States Department of Energy (USDOE) for the development of high performance batteries. The intended R&D approach of this subcontract is to develop an advanced energy storage system based on state of the art technologies in order to meet or surpass the technical requirements in Appendix A. Although project goals can be set that approach but not meet all of the USABC goals, a credible plan toward achieving all the USABC goals must be provided.

The USABC intends to capitalize on the knowledge it has gained through the HEV, PHEV, and EV research and development activities it has been engaged in. We expect developers to bring past experiences and lessons learned from their high power and/or high-energy work to bear on developing energy storage technologies for this application.

2.0 Business Objectives

This USABC RFPI represents a unique opportunity for developers to leverage their resources in combination with those of the automotive industry and the federal government. For the auto makers, this type of pre-competitive cooperation minimizes duplication of effort and risk of failure, and maximizes the benefits to the public of the government funds.

Beyond the efficient and timely usage of resources, the auto makers recognize that successful commercialization of these technologies will only be completed when the supplier base has been established for the selected components and subsystems. It is, therefore, a major business objective of USABC to enhance a supplier base as the development progresses.

All developers submitting proposals will be required to demonstrate that they have the potential to develop a commercially viable business, which can produce sufficient volumes to meet automotive requirements, and provide engineering and testing support to meet automotive implementation requirements. Research organizations with current, direct affiliations with businesses that derive a majority of their income from related product sales, will also be

considered. At the time of submittal, all developers will be required to have demonstration hardware and test results available for USABC inspection. Testing performed in accordance with the USABC battery test procedures is preferred, however not mandatory. Inspection and test of hardware by the USABC may be included in the selection process. Developers who do not have hardware and test results available for inspection by USABC at the time of submittal need not respond.

3.0 Developmental Timing

The proposals must be accompanied by a development time chart characterizing the following:

1. Length of time the technology has been under development by the developer
2. Length of time remaining to full scale, 12V Start Stop prototype hardware availability
3. Time line for commercialization, including any preproduction phases that may be planned
4. The preferable time duration for the development proposal is 12 months.

4.0 Business Case

The submittal must be accompanied by a business case, divided into two sections. The first section shall state the cost assumptions used that will lead to the cost targets listed in Attachment A. These assumptions should be in general terms, broken down by major components, including material cost, processing cost and other costs. These costs should be presented in sufficient detail such that they can be used by the USABC to build confidence that its cost targets can be met by the technology.

The second portion of the business case is to address the anticipated capital investment required to support this initial program investment, including anticipated non-EV markets for the technology, sources of capital, etc. A copy of the USABC cost model, which is a multi-stage spreadsheet, is available on the USABC website, <http://www.uscar.org/>. **USABC will not provide funding for capital expenses.**

5.0 Technical Challenges

Proposals must be accompanied by a clear description of the remaining technical challenges that the developer still needs to meet in order to commercialize the proposed technology and meet USABC's long-term criteria. A narration of the technical challenges that have already been met to reach the present state of the demonstration hardware will also be useful. Any testing, by USABC, of pre-contract demonstration hardware will be done in accordance with the USABC battery test procedures. The procedures for a 12V S/S battery are under development and will be posted. However, similar procedures can be found on the USABC website, http://www.uscar.org/guest/article_view.php?articles_id=86.

6.0 Information Requested

The information USABC is requesting from interested parties is specified in the following subsections. It includes: (1) a brief description of your company(s) background; (2) the

advanced battery technology being proposed; (3) the development plan for the technology; (4) the proposed program deliverables, timing, and cost-share; and (5) any formal or informal teaming arrangements planned.

USABC does not expect to award contracts on the sole basis of responses to this RFPI. All responses will be considered by representatives of the USABC and other participants and will be ranked in order of merit. The submitters of the most promising proposals will be contacted by USABC to enter into negotiations which may lead to firm contractual arrangements. If the government and other funding become available, as now expected, USABC intends to award one or more development contracts. However, nothing herein should be interpreted as a commitment to award a contract.

Information requested below should be answered as thoroughly as possible within a maximum of twenty five pages, in total, for the response to the RFPI. Your submission package should be sent via electronic mail and shall contain a cover letter, a complete copy of your proposal and, a signed copy of the RFPI Agreement. If you have any questions concerning the RFPI, please contact Harshad Tataria @ (248) 836-7894 or Eric Heim @ (415) 472-1157.

NOTWITHSTANDING PROPOSER'S MARKINGS TO THE CONTRARY, ALL INFORMATION SUBMITTED IN RESPONSE TO THIS USABC RFPI SHALL BE TREATED ON A NON-CONFIDENTIAL BASIS.

ALL PROPOSALS ARE TO BE SUBMITTED TO THE CONSORTIUM IN ACCORDANCE WITH THE ATTACHED RFPI AGREEMENT WHICH MUST BE EXECUTED WITHOUT MODIFICATION AND ACCOMPANY THE PROPOSAL. NO PROPOSAL SHALL BE EVALUATED BY THE CONSORTIUM WITHOUT PRIOR EXECUTION OF SUCH RFPI AGREEMENT.

SEND, VIA ELECTRONIC MAIL, YOUR PROPOSAL (including signed RFPI Agreement) TO:

**Eric Heim
Business Manager
United States Advanced Battery Consortium
E-mail: eric@eheimconsulting.com**

6.1 Company Background

In order to become fully familiar with your company(s), the USABC needs information about your business. If your proposal is for a team, furnish the requested information for each company that makes up your team. Please answer/furnish the following information:

- Describe your company's structure, ownership, product lines, and customer base.
- If publicly owned, include the last 3 years of Annual, 10k, and 10Q Reports. If privately held, include the last 3 years of Balance Sheets, Income Statements, and a Sources & Uses of Funds Statement.

- Enclose a copy of your company's Business Plan for areas related to electrochemical energy storage technology.
- Describe the resources (headcount, expenses, and facilities) devoted to electrochemical energy storage technology development for the previous three years, currently, and forecasted through 2013.
- Do you currently hold any licenses and/or patents or pending patent applications for advanced electrochemical energy storage technology and manufacturing processes? If so, please describe. Are there any restrictions on licensing this technology to the Consortium?
- Provide any projections on potential production for the proposed technology. Also, describe key technical innovations that could lead to high performance and cost effective electrochemical energy storage subsystems.
- Provide a brief resume on key personnel to be dedicated to the project.

6.2 Proposed Electrochemical Energy Storage Technology

In preparing a reply to the RFPI please provide a response to each of the following points. A thorough technical review of each proposed technology is required prior to the award of any contract for development.

Provide a brief technical description of the proposed technology that will meet the 12V Start Stop Vehicle criteria listed in Attachment A.

Summarize the present status of the proposed technology, including:

- Physical, performance, and life characteristics of all relevant hardware built and tested at your facilities, or at independent test facilities
- Packaging constraints or limitations applicable to your technology, such as vertical-only orientation, minimum foot-print, etc.
- Any environmental and safety issues relating to manufacturing, recycling, use and disposal of the proposed technology
- Dominant failure mechanisms that limit operating life, and use restrictions desired/required to maximize the life of the subsystem
- Summarize the characteristics of the current technology by using the table provided in Attachment A and adding an additional column that describes your technology on a pack level. This gap analysis should indicate the number of cells or modules used to calculate your technology's performance against the requirements.
- Provide any relevant quality-related metrics.

6.3 Proposed Technology Development Plan

Propose how the component/subsystem technology would be developed to meet the USABC technical criteria including:

- Barriers that must be overcome (should be closely based on the provided gap chart)
- Task objectives needed to overcome the barriers, approaches, success criteria, and demonstration tests
- Feasibility and scale-up issues that must be resolved
- Transition from feasibility demonstration to prototype hardware

Separately propose how the technology could be produced in high volume. Define the raw materials, processes, capital equipment, and labor required at the desired production levels. Discuss the overall timing required to achieve initial production, including prove-out. Define any intermediate steps required to reach initial rated production including pilot plants, technical challenges regarding the manufacturing process, and their time frame.

Define any additional technical issues, and their possible resolution, concerning the proposed technology relevant to a 12V Start Stop Vehicle application. Propose a warranty structure for the subsystem corresponding to the initial commercial production level.

Provide a projected cost breakdown of the proposed technology, including costs projected for the desired production volumes. Costs related to warranty and/or replacement, and recycling should be clearly indicated. The manner in which the projected costs, volumes and time schedules are expected to be achieved should also be provided.

The proposals must be accompanied by a development time chart characterizing the following:

1. Length of time the technology has been under development by the developer
2. Length of time remaining to full scale, 12V Start Stop prototype hardware availability
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4. The preferable time duration for the development proposal is 12 months.
- 5.

6.4 Proposed Program Schedule, Deliverables, Cost, and Cost Sharing

Developers must clearly identify their milestone objectives. The setting of major milestones and timing will be reviewed and agreed upon between each USABC Work Group and the corresponding subsystem developer/supplier team. It is anticipated that there will be intensive interaction between both parties in setting program milestones. The involvement of all team member organizations in the setting of program milestones is strongly encouraged.

The delivery of prototype hardware for test and evaluation will be scheduled, on a continuing basis, as developments warrant. Details of scheduling would be agreed upon with the developer and the USABC Work Group. The evaluation of deliverable hardware will be undertaken at several testing facilities, such as the National Laboratories and those of the USABC partners. The battery test schedule will be agreed upon by the USABC Work Group, subsystem developer, and the test facilities.

Developers are expected to contribute or cost share in the developmental costs. The developer should submit proposals indicating cost sharing as a percentage of the total proposed program development amount. The extent of cost sharing may be negotiated between USABC and the development team, taking into consideration whether the company is domestic, foreign, or foreign controlled, rights to license background and foreground technology, benefits to US economy, and other factors. However, a minimum of 50 percent developer cost share is contractually required.

Contractors will provide quarterly reports to USABC, including test data and development progress. A final report will be submitted to USABC at the end of the contract period.

6.5 Cooperative Relationships

The proposal should indicate any additional resources that may be required beyond those of the contractor to achieve program goals. This would include the development of cooperative relationships between component developers, component manufacturers, and subsystem integrators. Other cooperative relationships could involve National Laboratories or Universities for materials research, test facility development, test and analytical procedures, or other techniques available only at specialized locations.

RFPI AGREEMENT

NOTWITHSTANDING PROPOSER'S MARKINGS TO THE CONTRARY, ALL INFORMATION SUBMITTED IN RESPONSE TO A UNITED STATES ADVANCED BATTERY CONSORTIUM (USABC) REQUEST FOR PROPOSAL INFORMATION (RFPI) SHALL BE TREATED ON A NON-CONFIDENTIAL BASIS.

AGREED:

BY _____

TITLE _____

PROPOSER _____

DATE _____



APPENDIX A - USABC Goals for Advanced Batteries for 12V Start Stop Vehicle Applications

End of Life Characteristics	Units	Target	
		Under hood	Not under hood
Discharge Pulse, 1s	kW	6	
Max current, 0.5s	A	900	
Engine-off accessory load	W	750	
Cold cranking power at -30 °C (three 4.5-s pulses, 10s rests between pulses at lower SOC)	kW	6 kW for 0.5s followed by 4 kW for 4s	
Extended Stand Test (30 days at 30°C followed by cold crank test)	kW	6 kW for 0.5s followed by 4 kW for 4s	
Min voltage under cold crank	Vdc	8.0	
Available energy (750W)	Wh	360	
Peak Recharge Rate, 10s	kW	2.2	
Sustained Recharge Rate	W	750	
Cycle life, every 10% life RPT with cold crank at min SOC	Engine starts/miles	450k/150k	
Calendar Life at 30°C, 45°C if under hood	Years	15 at 45°C	15 at 30°C
Minimum round trip energy efficiency	%	95	
Maximum allowable self-discharge rate	Wh/day	10	
Peak Operating Voltage, 10s	Vdc	15.0	
Sustained Max. Operating Voltage	Vdc	14.6	
Minimum Operating Voltage under load	Vdc	10.5	
Operating Temperature Range (available energy to allow 6 kW (1s) pulse)	°C	-30 to + 75	-30 to +52
30 °C – 52 °C	%	100 (to 75°C)	100
0 °C	%	50	
-10 °C	%	30	
-20 °C	%	15	
-30 °C	%	10	
Survival Temperature Range (24 hours)	°C	-46 to +100	-46 to +66
Maximum System Weight	kg	10	
Maximum System Volume	L	7	
Maximum System Selling Price (@100k units/year)	\$	\$220	\$180