

Invitation for Proposals

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CUSTOMER ENERGY SOLUTIONS INTEREST GROUP (CESIG)

CEATI PROJECT No. CESIG-10-03

**EFFICIENCY TESTING OF SWITCHED RELUCTANCE AND
AC PERMANENT MAGNET MOTORS**

CEATI International Inc. (CEATI) invites the submission of proposals to perform research work on the following topic:

TITLE

Efficiency Testing of Switched Reluctance and AC Permanent Magnet Motors

INTRODUCTION

Manufacturers claim that the energy efficiency of switched reluctance (SR) and AC permanent magnet (PM) motors is at least as good as the best AC machines operating at their sweet spot. Motor efficiency measurements point out that the energy efficiency of AC motors drops dramatically when they operate at less than 50% load. In contrast, complete SR and PM systems (including all motor and inverter losses) can have efficiencies well over those of their equivalent squirrel cage motors under a wide span of load conditions.

SR and PM drives have efficiency advantages compared to variable speed or variable frequency drives. CESIG has completed a project where VFD efficiencies were measured at different load points and speeds. CESIG will also have a complete set of data to provide good advice to its participants.

SR and PM torque density can easily exceed that of AC squirrel cage motors. However, there are trade-offs because efficiency falls off faster at light loads for PM motors than for SR motors. And there is a loss of efficiency with PM motors at speeds high enough to necessitate the use of field weakening to prevent the back EMF from exceeding the power supply voltage.

CESIG participants believe that the results of the proposed tests and this investigation will bring a solid information base that can influence their actions in promoting high efficiency and best choices in customer technologies.

PROJECT OBJECTIVES

To test the energy performance over the entire speed and torque range of emerging motor types that have recently become commercially available. The test procedure shall comply with international standards in power: C390, IEEE112, IEC60034, EN600 34-2-1, EN 600 34-30, IEC 61972.

SCOPE OF THE STUDY

Evaluate (measure) the energy performance of 10, 50 and 100 hp permanent magnet motors and switched reluctance motor drives using 20 efficiency tests each, as shown in Table 1.

Table 1: Proposed Range of the Load points

Points	1	2	3	4	5
Speed (%)	100	100	100	100	100
Torque (%)	100	75	50	25	10

Points	6	7	8	9	10
Speed (%)	75	75	75	75	75
Torque (%)	100	75	50	25	10

Points	11	12	13	14	15
Speed (%)	50	50	50	50	50
Torque (%)	100	75	50	25	10

Points	16	17	18	19	20
Speed (%)	25	25	25	25	25
Torque (%)	100	75	50	25	10

If bidders wish to include additional motor brands or sizes, they should include them as “extra” items and provide reasoning for including them.

POTENTIAL BENEFITS

Validate manufacturers’ efficiency claims and identify suitable applications.

DELIVERABLES

The successful proponent is expected to prepare a ready-to-publish report on the results of the investigation and present the results to funding consortium members. The completed report must be submitted for CEATI approval in editable, electronic format (Microsoft Word). In addition, the platform and version should be specified for any software or programs to be developed.

Progress reports will also be required on either a quarterly or milestone basis - normally these are scheduled to coincide with the completion of the identified tasks.

The successful proponent is also expected to provide the following:

- A ten to fifteen (10-15) slide Power Point Presentation. This should be composed of three main sections:
 1. The factors motivating the initiation of the work;
 2. A description of the main findings;
 3. Summary of the conclusions and recommendations for future research.
- Contents for the Project’s Technical Brief. This is a summary of the report (between 1,000 and 1,500 words), which is published separately by CEATI. Proponents are not responsible for the preparation of a ready-to-print Technical Brief, but solely to provide the contents for the following 4 sections: Background, Summary, Conclusions and Recommendations.
 1. The Report Background section should be short (approximately 200 words) and should detail the reasons the work was conducted.
 2. The Summary section should be approximately 700 words. It must provide a general description of the work program.

3. The Conclusions section should be about 150 words and should provide a general outline of the key results (do not include specifics).
4. The Recommendations section should be about 200 words and should include a description of the potential applications of the results.
5. Please note that all reporting must be submitted in English. If written English is not the author's strong suit, it is recommended that a technical writer be hired to review the document prior to submission.

BUDGET AND SCHEDULE

The proposal must contain a schedule and a quote of required remuneration for the work in US or Canadian dollars. All prices shall be presumed to be in Canadian dollars (CAD) unless explicitly specified otherwise in the proposal. Proponents' responses to this section must include a full breakdown of the budget and schedule, including an indication of rates and hours and the task allocation for the key personnel by task and must correspond to any phases or milestones outlined above. (Please refer to the Proposal Template for more information).

It is expected that this project can be completed (draft final report submitted for review and approval) within 12 months of initiation.

The proposal must include the names and qualifications of the key individuals who will be involved, as well as the name of the accountable manager.

CEATI is not bound to accept any proposal but any selection will take into account technical merit, qualifications, price and schedule. A proposal may be accepted in whole or in part. A commitment to proceed with the first phase of a multi-phase project does not automatically imply that the work of the subsequent phases will be undertaken.

ALTERNATIVE WORKS

Proponents shall generally follow the above description of work, but are encouraged to offer alternative works if these alternatives will meet the objectives and provide a better end product to the utilities sponsoring this work. Alternatives shall be fully described including logistics explaining why the alternate works are being offered and the benefits to be realized by the funding utilities. Where alternatives are proposed, separate budgets shall be calculated for each alternative.

SUBMISSION OF PROPOSALS

The consideration of proposals received will be limited to those who indicate their intent to employ a suitable experienced project team and who possess proper facilities to perform the work. Receipt of this "IFP" does not necessarily constitute a prior determination by CEATI that your organization has the requisite experience and facilities.

The proposal must be properly completed and executed in accordance with the CEATI guidelines available at <http://www.ceati.com/guidelines.php>, and shall be submitted to CEATI as an attachment in Microsoft Word at the following website: www.ceati.com/private/submissions.

Be sure to indicate project number “**CESIG-10-03**” on the submission form. For assistance, please contact us at 514-866-5377 x 236.

CLOSING DATE FOR RECEIPT OF PROPOSALS

Thursday, April 8, 2010, 4:00 pm EDT