Date 27-Aug-11

EXPRESSION OF INTEREST FOR

DESIGN AND PERFORMANCE CHECK OF CRYOGENIC SYSTEM OPERATING WITH A CLOSED CYCLE REFRIGERATION

1. Introduction

M/s Bharat Heavy Electricals Limited (BHEL) is one of the leading Navratna Public Sector Undertakings of Government of India. The company has an annual turnover of US$ 7.8 billion having outstanding order book of US$ 33 billion. We have developed low temperature superconducting generators and HTSC transformer earlier where a cryogenic system was designed and operated at 4.2K and 77K. Presently we are carrying out the development of a 200kW high temperature superconducting motor. In this expression of interest we seek to get the performance check for a 5MW HTSC motor carried out.

2. Purpose

The purpose of this Expression of Interest is to seek engineering services for carrying out the thermal design of a 5MW high temperature superconducting motor. The HTSC motor is proposed for development which will be equipped with high temperature superconducting winding in the rotor. The rotor windings will be encased in a cryogenic environment with a vacuum jacket around the enclosure. A helium gas cooling will be provided for maintaining the rotor windings at a temperature of around 20 to 30 K at an approximate pressure of 2 kg/cm^2. The cryogenic rotor will be supported on tubular shaped structures with heat exchanger fitted close to it. The cold helium gas will be circulated through the cryogenic environment and recovered through a helium transfer coupling. The amount of heat leak and losses occurring in the cryogenic system will be removed by a helium cryo-refrigerator. A high vacuum of the order of 10^{-6} mili-bar will be created in the sealed vacuum space surrounding the cryogenic coils. A set of field leads connecting the superconducting winding with the brushless exciter will be developed for optimum heat leak. A radiation shield will be provided to shield the low temperature region from the thermal radiation effect. All parts which are at cryogenic temperature will be made of special stainless steel. Special welding process will be utilized for manufacture of the cryogenic parts to avoid any cold-leaks. High quality helium leak tightness, of the order of 10^{-10} mili-bar-liter-per-second, will be maintained.

3. Scope of work

The scope of work for the vetting agency shall be as follows:

a. Study of the specification for the following above mentioned systems:
   These specifications shall be provided during execution of the contract.
b. Checking the suitability of the thermal design of the 5MW HTSC motor for meeting the performance.
c. Mapping the helium gas stream conditions at various stages through the heating and cooling cycle.
d. Checking the compatibility of the cryo-refrigerator and heat exchanger with respect to the cooling cycle.
e. Suggest modifications in the thermal design of the HTSC motor with respect to all the above factors so that the design becomes thermally suitable for the above applications.
f. Specifying the capacity of cryo-pumps to maintain the flow.
g. Preparing a detailed report covering the above details.

4. Association of BHEL engineers

The agency carrying out the design and performance check should associate BHEL engineers during the process and explain the reasons for suitability/unsuitability of the design as the case may be and then jointly work out the final design meeting the specification requirements. BHEL engineers may provide the support for explaining the in-house design details.

5. Composition of budgetary offer

The agency for design vetting should submit a proposal for above in two parts:
1) Technical proposal and
2) Commercial proposal separately indicating the overall price (including the breakup with respect to the scope of work) and time period required for each of the activities.
The total composition of offer shall include:

a) Price for the service including a breakup with respect to activities defined in Scope of Work (SOW).
b) Time schedule including breakup with respect to activities defined in SOW.
c) Date of start after receipt of order.
d) Terms and conditions of offer.
e) Credentials and/or previous experience of similar kind of motor design/vetting activities.

In case you require any further clarifications, please do contact us.

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