INSTITUTE FOR PLASMA RESEARCH

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NOTICE FOR EXPRESSION OF INTEREST FOR DEVELOPMENT, FABRICATION AND SUPPLY OF HYDROGEN ISOTOPES SORPTION EQUIPMENT

(EOI No. EOI/IPR/001/10-11 DATED 3-1-2011)

"Expression of Interest" (EOI) is invited from reputed parties for **Development, fabrication and supply of Hydrogen Isotopes Sorption Equipment** at Institute for Plasma Research, Bhat, Gandhinagar.

The EOI document containing eligibility requirements, technical description, scope of work and commercial terms and conditions kept in the official website of IPR, i.e. **www.ipr.res.in//purchasetenders.html.** The interested parties can download the EOI document from IPR Website. Alternatively, parties can obtain the EOI document from the Purchase Officer, IPR, Bhat, Gandhinagar up to **21-1-2011.**

The parties who are satisfying the eligibility criteria as mentioned in the EOI document (Sr.No.8 - page No.8 & 9) may submit their EOI proposal to the Purchase Officer, Institute for Plasma Research at the above address latest by **15-2-2011** superscribing the envelope with **"EOI No.EOI/IPR/001/10-11 dated 3-1-2011 for Development, fabrication and supply of Hydrogen Isotopes Sorption Equipment"**.

Expression of Interest (EOI) Document

for

Development ,Fabrication and Supply of Hydrogen Isotopes Sorption Equipment

CONTENTS

Abbreviation

IPR- Institute for Plasma Research

HISE - Hydrogen Isotopes Sorption Equipment

SPTM - Sorption Prototype Test Module

CSU - Cryogenic sorbent unit

PD - Particle Divertor

CSUE - CSU Enclosure

TVC - Test Vacuum Chamber

EOI – Expression of Interest

UHV – Ultra High Vacuum

FIM- Free issue Material

R&D – Research & Development

1. Preamble

IPR is inviting Expression of Interest (EOI) from vendors for development and supply of Hydrogen Isotopes Sorption Equipment. The equipment fabrication will be in two phases. The first phase will comprise of making a test module namely Sorption prototype test module (SPTM) and the second phase will target the main Hydrogen Isotope Sorption Equipment(HISE). The equipment consists of a number of cryogenic sorbent Units coated with hydrophobic sorbents at liquid helium temperatures. The cryo sorbent units are surrounded by molecule/ particle divertors at liquid Nitrogen temperatures. The work will require knowledge in the field of fabrication of equipments at cryogenic temperatures, knowledge about adhesives binding sorbents, thermal shock testing for differential contraction of steel and adhesives, adherence of sorbents standing the tests of thermal shocks from liquid helium temperatures to room temperature. Ultimately each component must be leak tight with the requirements for ultra high vacuum.

The purpose of this document is NOT to provide detailed specification for bidding, but to provide the interested parties, an overview of the overall scope and requirement of the project.

2. Project Background

HISE is a very critical part of a nuclear fusion experimental reactor with the objective to demonstrate the scientific and technological feasibility of adsorption of Hydrogen Isotopes coming as an exhaust from nuclear fusion environment. It is highly challenging job requiring expertise with the a lot of experience in the field of sorbents , adhesives, cryogenic impact on differential contraction of materials with background of carbonaceous compounds, epoxies/adhesives with quality adhesion at cryogenic temperatures and standing the thermal cycles which will be of the order of ~ 5000 from liquid helium temperature to room temperature. The equipment is a critical part of the section comprising the reactor exhaust. It will be used for sticking the hydrogen isotopes holding the isotope molecules at cryo sorbent unit. It is technological challenge comprising various branches such as knowledge of adsorption isotherms on samples of steel plates for hydrogen isotopes and helium, cryogenics at liquid helium temperatures, adhesions under differential contraction of different materials. It is challenging task HISE and an unprecedented model for showing research capabilities of India.

3. System Overview and technical description

The project of developing HISE is divided into two phases. The first phase will comprise of developing Sorption Prototype Test Module (SPTM) and the second will comprise of fabrication of the main HISE.

3.1 Sorption Prototype Test Module (SPTM)

The SPTM is a prototype unit and will be a test stand for various sorbent coated units. The sorbent coated units will be at liquid helium temperatures. Permutation and combination of different cryo compatible adhesives and different sorbents has to be tried which will result in a number of cryo sorbent units. These units will be tested in the SPTM for their functional parameters. In SPTM such an arrangement will be made which will simulate the original condition in the HISE. It will have the Cryosorption unit at liquid Helium temperatures surrounded by the enclosure and particle diverters. The particle diverters are inclined plates at liquid nitrogen temperatures and protect the sorption unit from direct contact with room temperature. The whole arrangement will be kept inside a vacuum chamber to protect from outside radiations. The SPTM will be under continuous experimental state with the functional parameter tests being performed on one of the sorption unit.

3.2 Hydrogen Isotopes Sorption Equipment (HISE)

The technology established in SPTM will be used for HISE. The HISE is the main unit comprising multiple cryogenic sorbent units. It will have multiple sorbent units.

3.3 Component Description of Sorption unit:-

The brief description of each component of SPTM and HISE is given below.

All components will be with material S.S 304 / S.S. 316L.

CSU: The Cryogenic sorbent unit (CSU) is meant for sorption of Hydrogen Isotopes coming from high temperature regime. This unit will be consisting a suitable sorbent on a composite plate of dimensions 1.0 m by 0.2 m by 0.003 m, which is cooled at liquid helium temperatures.

Particle Divertor: Particle Divertors (PD) are conical shaped geometry meant for diverting Hydrogen isotopes towards CSU. The shapes are like conical frustum and a number of such plates arranged in a stack. The inner surface of PD has to have high emissivity and the Outer surface should have high absorptivity like black body surface. The composite plate of PD is about 0.24m (min) and 0.27 m (max) diameter of a frustum with 0.003 m thickness of plates with height of cone 0.04 m arranged in a stack in a length of about 1 meter.

CSUE: The enclosure surrounds the whole arrangement of CSU and PD to protect from environment radiation. It is cylindrical enclosure with top and bottom plates. The PD and CSU are inside the CSUE. The approximate dimensions for SPTM are diameter of about 0.42m - 0.5 m (max) with 0.003 m thickness and height about 1.4 m for HISE it will be about Diameter = 0.62- 0-65 m for HISE.

TVC:- Test vacuum chamber (TVC) is cylindrical vacuum enclosure housing all the above mentioned units with dimensions of about with diameter of about 1 m for SPTM and 1.5 m for HISE and length of about 3 m.

Note:1- The stack of PD and CSUE will be cooled by Helium gas at 80 K at pressure of 15 bar.

Note-2:- The dimensions mentioned above are tentative and will be revised in the actual tender document.

Note-3: Fabricator has to design suitable assembly stand for STPM and HISE as per instructions and details that will be given in the Tender Document.

4. Scope of Work under Expression of Interest

The scope of work under the said EOI will be fabrication, testing, assembly and erection of the complete systems SPTM and HISE. Fabrication of all the components under SPTM and HISE as listed in section 3 will under the scope of the vendor. The SPTM will have about 20 combinations of sorbents and adhesives, and each combination will be tested for sorbents characteristics on samples, thermal cycling, emissivity and UHV compatibility. The various headers connecting the liquid Helium Components and liquid nitrogen carrying components are also under vendor's scope. IPR will furnish a list of tests to be carried out at component level before agreeing to next step of assembly stage in the tender document in detail. Each component and the assembly as a whole will again be tested for the list of test provided by IPR in the tender document.

The scope of this EOI is to identify potential original suppliers for the above mentioned system, able to execute required R&D for adsorption of Hydrogen Isotopes. The vendors must qualify as per the eligibility criteria mentioned in section-8 of this document.

5. Technologies Involved

The CSU, PD & CSUE represents composite plates that are fabricated in order to have elliptical flow ducts which will increase the turbulence of the flow due to their special shaped course and thus leading to excellent heat transfer conditions. The composite plates can be derived from a variety of processes like press forming, welding, machining, electroforming, hydro forming etc.

The sorbent development represents the attachment of special micro porous material like charcoal granules on the surface of CSU for sorption of Hydrogen Isotopes. Kindly noted that the Micro Porous Material will be FIM to vendor to carry out the required.

Knowledge of fabrication technologies with the components operating at cryogenic temperatures of liquid helium and liquid nitrogen is required. Also the knowledge of fabrication criticalities with components operating with high pressure cryogenic helium gas at 80 K will be required, experience with adhesives compatibility for UHV and cryogenic conditions is envisaged.

Knowledge about criticalities associated with fixing of sorbents to the plates and the effect of it on adsorption isotherms of the combination selected is required.

6. Required Test facilities

All individual components have to qualify various tests before going for assembly. Each component and the assembly as a whole will again be tested for the list of tests provided by IPR in the main tender document.

The main tests to be performed are thermal cycling (from room temperature to 80 K) for thermal shocks, pressure drop measurement with various fluids like water and cryogen at 80 K example liquid nitrogen, helium gas at 80 K , leak testing of components before and after thermal shock to 10^{-9} mbar lit/sec, emissivity measurement using emissometer for coated black surfaces and shining surfaces .

7. Schedule and Duration of Work: –

The Scope of Work explained in this EOI, will be supplied in more details in the tender document. The expected project period is about 10 months for delivering the Scope of Work as mentioned. The duration mentioned is required to be followed by the supplier in a strict manner. Any delay in the process will be highly penalized on the supplier as the project is the one of the higher priority and prestigious project of IPR.

8. Eligibility Criteria:

Technical Requirement:

- The vendor shall have in-house / access to adequate inspection and testing facilities required for the equipment and should be able to arrange for site visits to the projects which have been successfully completed in the past.
- The vendor shall have in-house/access to manufacturing facilities in India with proven technologies that are explained in various sections of this EOI, and should have been carried out in their in house R&D. The foresaid technologies include cryogenic sorbent unit development, characterization of the sorbents with its attachment to the unit.

- The vendor should have proven R&D capabilities and testing facilities in manufacturing of the described equipment components for HISE with sufficient valid R&D proofs for establishing the mentioned technologies.
- Vendor should have experience of developing cryogenic sorbent unit with sufficient R&D for establishing the technology.
- Vendor should have in house/access to facility of thermal cycling of components from room temperature to 80 K.
- Vendor should have in house/access to facility of measuring pressure drop using liquid & gaseous cryogen at 80 K.
- The vendor should have proven records of similar technology developed for Indian Govt. agencies within the past three years.
- Vendor should have ability and access to emissivity measurement facility.
- Vendor should have experience of high absorptivity coating with low outgassing properties.

Financial Requirement:

- The Fabricator/vendor should have financial stability and status to meet the financial obligations for the intended work –
    - The vendor should have executed a single job of relevant technologies to minimum of ` 80 lacs in the past 3 years.
    - The vendor should have a turnover of ` 60 Crores for the past three financial years (2007-08, 2008-09, and 2009-10).
    - In case of vendor being a subsidiary and brings in financial support from its parental company, then the financial condition of the eligibility for latter will be of minimum turnover of ` 100 Crore for the last three financial years (2007-08, 2008-09 and 2009-10). In such case, you will have to submit an **UNDERTAKING** as per the format attached under Annexure-4 of this document.
    - In case of government research organizations the points under **"Financial Requirement"** shall not be applicable.

Annexure-1

Vendor Details and Compliance Sheet

1. Vendor's Information

TABLE-1

Name of Vendor		
Address Vendor	Line1	
	Line2	
	Line3	
Ref. Vendor Registration		
Key Personals to be Contacted		
Senior Management	Name	
	Contact No.	
	Address	
R&D Co-ordinator	Name	
	Contact No.	
	Address	
Others (Production, Planning etc)	Name	
	Contact No.	
	Address	

2. **List of Proof of documents to be submitted to IPR**

The following required list of documents specified in TABLE-2 filled in complete details is required to fulfill the eligibility criteria as specified in the EOI document. Vendor is requested to submit all supporting documents as listed below to prove eligibility against the EOI for design, manufacturing, assembly, testing and inspection for Development, Fabrication and Supply of Hydrogen Isotopes Sorption Equipment. Please note that the evaluation will be based on the document proof and hence photo copies of the requested document should be

attached. Proposals received without the proof of required documents will not be considered by IPR. The proof attached must be in accordance with the requirements specified in various specifications of this EOI.

If IPR does not receive all the required list of documents for eligibility, the response from the vendor will not be considered.

To be Noted:-

1. Please specify clearly the reasons for agreement and disagreement.
2. In case of being not sure/ unknown for any of the required list of documents for eligibility points specify as “not able to specify to agreement”
3. Any response with “blank” or “no reply” to required list of documents for eligibility points will be considered as “not able to specify to agreement”

Please furnish the following table listed **below duly sealed and signed** which can be forwarded to the Purchase Officer with all copies of document proof.

TABLE-2

	List of documents to be furnished for proving the eligibility of Vendor	Vendor’s Response	Proof of Documents to be attached
1	The vendor should have proven R&D capabilities and testing facilities in manufacturing of the described equipment components for HISE with sufficient R&D for establishing the technology.	Agreed/Not Agreed	Willingness: Yes/NO
2	Vendor should have experience of developing CSU with sufficient R&D for establishing the technology. (Attach proof)	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 01
3	Vendor should have facility or access to the facility for thermal cycling of components from room temperature to 80 K. (Attach proof)	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 02
4	Vendor should have facility or access to the facility of measuring pressure drop using liquid & gaseous cryogen at 80 K. (Attach proof).	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 03

5	The vendor should have proven records of such technology developed for Indian Govt. agencies within the past three years. (Attach proof)	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 04
6	Proven R&D capabilities in developing sorbent and sorption unit. (Attach Proof) past experience proof	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 05
7	R&D capabilities for Hydrogen Isotopes Sorption. (Attach Proof)	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 06
8	Ability of Design, manufacturing, assembly, testing and inspection of HISE in 10 months from Date of Purchase Order.	Agreed/Not Agreed	Willingness: Yes/NO
9	The vendor should have executed a single tender of relevant technology to minimum Rs. 80 lakhs in the past 3 years	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 07
10	The vendor should have financial stability and status to meet the financial obligations for the intended work as mentioned in the eligibility criteria.	Available/Not Available	Doc. Attached: Yes/NO Doc. Ref No.: 08

NOTE: Vendor should provide sufficient proof of certificates for all above said requirements. Vendors will not qualify if sufficient proofs of certificates are not included in the submission list. Mere statements/self declaration of the vendor on capabilities will not be considered.

Remarks

Signature

Name

Place: Designation

Date: (Official Seal)

Annexure-2

STANDARD CONDITIONS

NOTE:

1. Annexure-1 should be filled, duly signed and submitted along with all the valid supporting documents while submitting the EOI. If the EOI is submitted without valid documents or received without proof of eligibility criteria, the party will summarily be rejected.

2. The EOI shall be submitted along with a covering letter of Expression of Interest, Vendor Information Form as contained in Annexure-1 duly filled with the requested information/responses as per this EOI with all accompanying documents duly signed by personnel authorized by the interested Parties. The designation and authority of the signatory shall be stated.

3. Proof of attachment will be considered only if the documents are found valid with respect to the requirements specified in various sections of this EOI.

4. Those who do not meet with the eligibility criteria need not submit EOI.

5. The Director, IPR reserves the right to accept or reject any response in full or part thereof without assigning any reason thereof.

6. Request for the extension of due date will not be considered.

7. Late/Delayed proposals will not be accepted.

8. The System overview and brief technical description to HISE is given in Section - 3. Further details and technical specification will be included in tender document which will be supplied to the shortlisted parties of this EOI. Hence, queries regarding further technical details will not be entertained during this process of EOI.

Roadmap to finalize the Vendor for Supply of HISE

Following is indicative roadmap that will be followed from obtaining proposals for EOI to finalize the vendor for supply of HISE.

(a) This Notice is for invitation of EOI proposal for contract for Supply, assembly, erection of HISE at IPR and this is not the tender.
(b) The Scope of work & technologies involved are mentioned in - Section – 4& 5 respectively.
(c) Essential Eligibility Criteria are in section-8. (EOI proposals received from the vendors satisfying these Essential Eligibility Criteria will only be considered for further evaluation).
(d) Vendor will submit EOI proposal with all necessary supporting documents as mentioned in Annexure-1.

(e) Vendors, whose EOI proposals are found suitable, shall be called at IPR and asked to make presentation to explain their EOI proposals. The presentation should cover the following points -

(i) Vendor's overall profile.

(ii) Vendor's manpower and machinery/equipment availability and mobilization at IPR site for executing the work.

(iii) Vendor's work experience in similar nature jobs. List of projects executed, few of which can be discussed in detail.

(iv) If any special tasks carried out where it made specific contributions in manufacturing, fabrication and assembly areas mentioned under EOI, using non-conventional, innovative techniques and approach for achieving the tasks in hand.

(v) Overall experience, infrastructure to meet job specific requirements, like (a) vacuum, cryogenic compatible requirements and welding of SS316 L made components, attachment of sorbent (b) handling of cryogenic (upto liquid He temp.) items (c) design and manufacture of necessary assembly fixtures etc.

(vi) Understanding of overall scope of work & technologies involved covered herein and their approach towards successful execution of projects of this nature. Identification of major activities involved in this job and their view about their capability to undertake these activities.

(vii) Critical areas identified in the scope, if any and proposed solutions.

(viii) Capability and financial abilities to undertake this type and magnitude of work contract.

(ix) Codes and standards regularly followed in manufacturing, assembly, welding and erection works.

(x) Details of Quality Policy and Program, testing and inspection facilities and outsourcing places. Discussion on QA/QC strategy envisaged for the job covered under this EOI.

(xi) Project planning and Execution strategy, with specific emphasis on schedule and cost control.

(xii) Details of consortium if any planned to cover all the activities mentioned in this EOI and deliver them efficiently in terms of quality, cost and time schedule.

(xiii) Records for last three years in terms of projected and actual delivery schedule, cost overruns etc for projects / contracts costing INR 80 lakhs and above.

(xiv) Present commitments and order book position in terms of time schedules for projects/contracts costing INR 80 lakhs and above up to March 2011.

(xv) Commitment from highest authority in the organization for full involvement in the work till completion of the project.

(f) IPR reserves the right to incorporate the suggestions made by the vendor in their proposal, during the presentations and meeting at its sole discretion in final tender document.

(g) Final selection of EOI proposals for award of tender documents shall be made based on submitted documents, presentations and discussions. This assessment shall be done considering (a) Available manpower and infrastructure, (b) Understanding of scope of work presented during presentations and discussions, (c) financial stability to undertake such high cost projects (d) earlier experience of doing such jobs and in successful execution of similar nature projects, assignments in terms of costs, quality and schedule.

(h) The vendors, whose EOI proposals are accepted by IPR, will be given an opportunity for pre-bid discussion of the scope of work and a final tender document will be prepared by taking into account the feedback of vendors.

(i) Final tender document shall be in two parts - **Part-A** - containing detailed scope of work, deliverables, assembly and inspection stages for deliverables, project execution plan, commercial terms and conditions and **Part-B** - containing price bid format.

(j) Those who receive tender documents shall submit the responses in two parts. Detail procedure for submission of technical proposal including commercial terms and conditions (Part-A) and price bid (Part-B) shall be mentioned in our tender document.

(k) Initially technical proposals including commercial terms and conditions (Part – A) shall be opened.

(l) IPR will evaluate technical proposals received and shortlist them after scrutinizing their contents for the suitability of contract specified in tender document.

(m) Those, whose proposals (Technical proposals – Part A) are short listed based on the scrutiny, shall be called for further discussion for technical content of the proposals in more details and to clarify commercial terms of IPR.

(n) IPR shall shortlist these proposals further based on the outcome of the technical discussions held during meeting. This short listing shall be based on vendor's presentations informing about their past experience, their understanding of the technical contents, their approach to the work and their suitability to undertake such high cost and multi skilled activity at IPR as per drawings, technical specifications and delivery schedule given in our tender document. If needed technical bid can be revised based on the outcome of these meetings along-with their price bids.

(o) Price Bid (Part-B) of only short listed vendors will be opened.

(p) Based on the price bid, IPR shall award a contract for the execution covering the details mentioned in tender documents and finally agreed during techno-commercial meeting and finalized.

(q) IPR reserves the right to place the entire work order for with either one or more than one vendors.

(r) IPR reserves the right to place the entire work order for with either one or more than one vendors.

Annexure-3: Conceptual Drawings of System

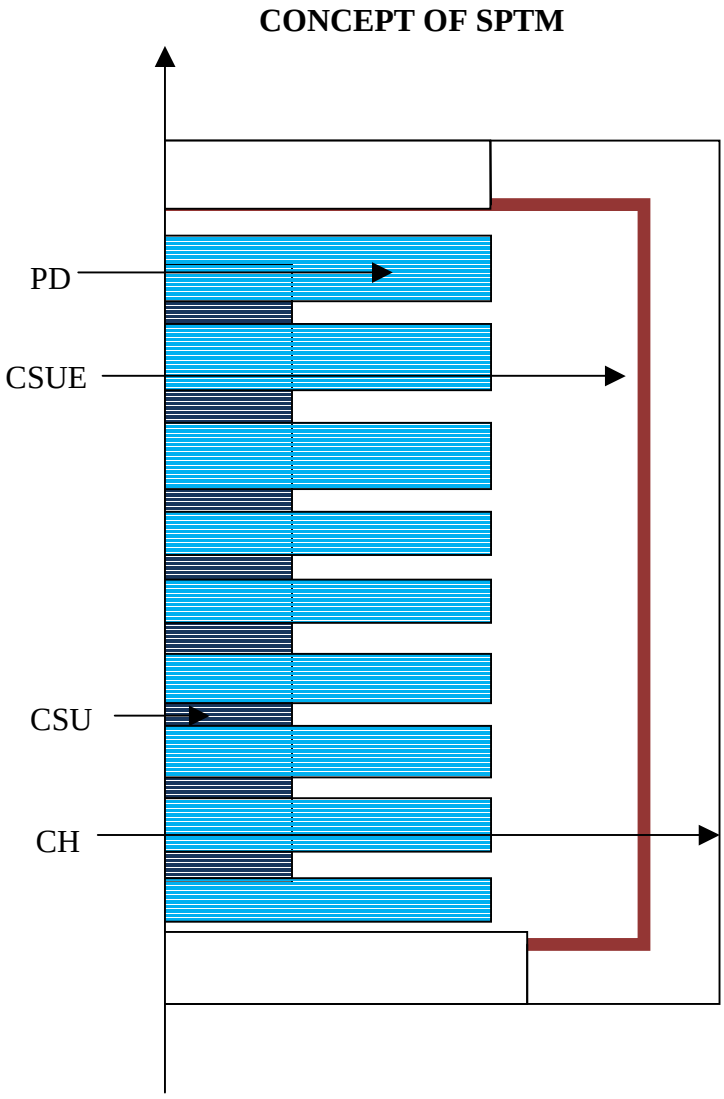
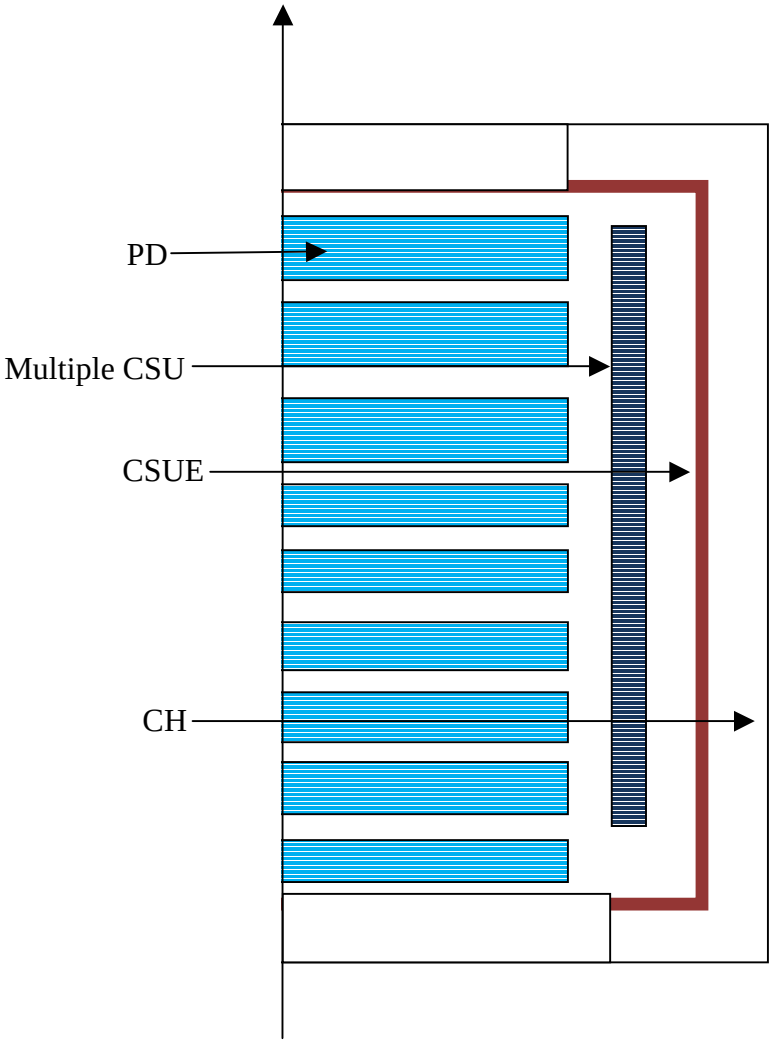


Fig:1 Assembly of SPTM

Fig:2 Typical CSU

CONCEPT OF Hydrogen Isotopes Sorption Equipment (HISE)



Annexure-4

Joint Venture / Consortium / Partnership (group)

In case the interested industry which is a subsidiary company of a large company and it wishes to bring in support of its parent company then it should state the same in its letter and obtain a clear authorization letter from not less then the Managing Director of the parent company stating parent companies willingness to support the project of the subsidiary company technically/ financially.

If the industry intends to enter into a Joint Venture / Consortium / Partnership (group) for bidding on the enquiry for Development of Hydrogen isotope Sorption Equipment, please give the following information suitable, otherwise state *"not applicable"* so that it clearly establishes the responsibility and role of various parties.

1. Names and addresses of Joint Venture / Consortium / Partnership (group) industries

2. Name of industry leading the Joint Venture / Consortium / Partnership (group)

3. Name and address of bankers to the Joint Venture / Consortium / Partnership (group)

4. Attach the power of attorney of the signatory(ies) on behalf of the Joint Venture / Consortium / Partnership (group)

5. Attach the legal agreement among all partners of the Joint Venture / Consortium / Partnership (group) (which is legal binding on all partners). The agreement must show that:

    (i) All partner industries shall be jointly and severally liable for the execution of the works in accordance with the contract terms.

    (ii) One of the industries will be nominated as being in-charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all partner industries of the joint venture.

    (iii) The questionnaire shall be signed by all partners so as to be legally binding on all partner industries.

6. Provide details regarding financial responsibility and participation (percentage share in the total) of each firm in the joint venture (group). Attach a Memorandum of understanding for the proposed Agreement of joint venture

which should lay down responsibility regarding work and financial arrangements in respect of each of the firms in the joint venture.

7. Details of participation in the Joint Venture / Consortium / Partnership (group)

(Indicate role and extent of participation in respect of finance, planning, project management, construction equipment, key personnel and execution of the work of the partner in-charge of the joint venture and of the each of the Joint Venture partners)

Participation details	**Industry-A [Partner Industry-in-charge]**	**Industry-B**	**Industry-C**
Financial			
Planning			
Project Management			
Construction Equipments to be shared			
Key Personnel			
Execution of Work (Give details on contribution of each)			
1. Details			
2. Analysis			
3. Manufacturing			
4. Factory acceptance test			
5. Packing and shipment			
6. Assembly and Installation at site			
7. Cold Acceptance test at site			
8. Finance			

Note:

1. **Please add columns if there are more than 3 Industries in the Construction/ Joint Venture / Partnership (Group)**

2. **Industries forming the Construction/ Joint Venture / Partnership (Group) for the pre-qualification process of** "Development of Hydrogen isotope Sorption Equipment" **individually and submit along with the Construction/ Joint Venture / Partnership / Group legal agreement.**

Authorized signatory from Industry **Industry stamp**