19th February 2021
Updated on 22nd February 2021

To Whom It May Concern

Domestic Tender for a Hydrogen Generation system

This is an RFQ (Request for Quote) for supply, installation, commissioning and testing of **Hydrogen Generation system** as part of a limited tender for the Centre for Nano Science and Engineering (CeNSE.) at Indian Institute of science (IISc.) Bengaluru.
CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. CeNSE also runs a nationwide program which has allowed 4200 participants from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any utility/facility at CeNSE receives significant exposure to the scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure into their quotes. Details of existing facilities and INUP program is available at:
http://nnfc.cense.iisc.ac.in/
http://www.mncf.cense.iisc.ac.in/

Update on 22nd Feb 2021

1. Modified clause 11 below to clarify that quotes must be in INR and must include shipping. This is a domestic tender.

Procedure

1. Vendors will be required to submit their technical proposal and their commercial bid in **two separate sealed envelopes**. Any violation of this will lead to cancellation of the bid.
2. **The deadline for submission of proposals is the 5th March 2021, 5:30 pm Indian Standard Time.** Bids should arrive at the Main office, GF-20, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the above deadline.
3. The decision of the purchase committee will be final.
4. The technical proposal must contain a compliance table.
    a. The first column must list the technical requirements in the order given in the "Technical Requirements".
    b. The second column should describe your compliance in a "Yes" or "No" response.
    c. The third column should provide the actual specifications of the system.
    d. The fourth column should describe the extent and explanation for any deviation (please be quantitative).
    e. The fifth column can highlight the advantages of the system. Any additional capabilities or relevant technical details can be listed here.
5. If multiple systems can fulfil the requirements, vendors can submit multiple bids.
6. Only vendors who are compliant with the technical requirements will be considered for commercial comparison. The bid is awarded to the lowest cost vendors (referred as L1)
7. The commercial comparison is made as per Government of India rules, specifically GFR 2017. Note that GFR has recently been amended. As per recent edits to the GFR, there are three classes of vendors distinguished by their "local content". In the cover letter, vendors must mention which applies to them:
    a. Class 1 supplier: Goods and services have a local content of equal to or more than 50%
    b. Class 2 supplier: Goods and services have a local content more than 20% but less than 50%
    c. Non-local supplier: Goods and services have a local content of equal to or less than 20%

8. **This tender will only apply entertain Class 1 or Class 2 suppliers. Vendors must provide a self-declaration of what Class they belong to.**
9. In the commercial bid, please provide an itemized cost of the system and *required* accessories, such as detector, cabling, panel, software, piping etc.,
10. As an option, please provide itemized cost for any *suggested* accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the system. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.
11. Quote should come only from Indian Original Equipment Manufacturer (OEM) or their Indian authorized distributor. The quotations should be on FOR-IISc Bangalore basis in INR only.
12. Mention GST separately. IISc will be taxed at 5%. IISc will provide the GST exemption certificate against invoice.
13. Please indicate the warranty provided with the tool. Warrant of 3 years or more is required.
14. As an option, provide itemized cost for required spares and consumables for 2 years of operation from the time of installation.
15. Clarify if periodic (preventive) maintenance be done by a trained on-site engineer or requires a specialist from the OEM.
16. If maintenance requires OEM, as an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post-warranty. The AMC must cover 1 scheduled and 1 emergency visit per year. It must also indicate who will service the AMC, an Indian agent or the OEM. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.
17. The technical proposal must include references from 5 previous installations in India. Please provide the names and contact addresses of the referees so that the committee can contact them independently.
18. Dr. Savitha P, COO, NNfC (savithap@iisc.ac.in) can answer questions over email. She is also available at GF-20, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India.

Technical Requirements

1.	Application	On-site hydrogen Gas Generator for a semiconductor foundry. Scope of the order includes: 1. H2 generator 2. H2 buffer tank
2.	Industry type	Semiconductor cleanroom class 100 and class 1000
3.	Generator type	1. A non-caustic and maintenance-free proton exchange membrane (PEM). No KOH/NaOH or asbestos. 2. The system must be integrated, automated, site-ready, with a compact enclosure. 3. The system must not require nitrogen or other inert gas for purging or inerting during routine operation after installation. 4. Oxygen gas produced as a byproduct shall be exhausted to ambient without any special ducting or handling.
4.	Production rate	20 standard litres per minute (SLPM) (±10%). The operational range must be 0-100 %. No external mechanical compression should be needed.
5.	Delivery pressure	Tunable between 5 to 15 barg/200 psi (±10%).
6.	Tubing and fittings	Electropolished SS316 RA < 0.4um. Only metal face-seal fittings (VCR's) as per the P&ID refer fig 1. All tubing and fitting should pass the following tests. 1) Pressure hold test at 1.5 times of operating pressure for 24 hours with

		0 psi pressure drop. 2) He leak check with limit of 10^{-9} mbar.l/sec 3) Trace moisture test < 10 micron 4) Trace oxygen test < 10 micron 5) Trace particle test < 10 micron
7.	Purity	99.9995 % (H_2O < 5 ppm; -65°C (-85°F) dew point or lower; N2 < 2 ppm; O2 < 1 ppm; all other gasses must be undetectable). Should not need additional downstream drying.
8.	Operation	Automatic operation. Specifically: 1. The system should match load automatically with no pressure spikes of more than 10 psi that last longer than 1 second 2. The system should have inbuilt diagnostics. At the very least, the system should: a) Continuously monitor the purity of gas produced. The data from the last 48 hours should be available for download. b) Continuously monitor dew point. The data from the last 48 hours should be available for download. c) Continuously check for H2 leak. Raise the alarm if the leak is found and shut down the system d) Raise warning if maintenance is pending.
9.	Documentation	1. Complete P & ID diagram of the system 2. Complete user manual including product description, operation principle, user information, and troubleshooting. 3. SOP for regular preventive maintenance that can be done by in-house engineer. 4. SOP for monitoring during operation. 5. SOP for troubleshooting
10.	Location	Generator to be stored indoor or ventilated sheds.
11.	Noise level	<70 dB at 1 meter
12.	Generator: Installation, Footprint & weight	1. The system will be stored within 10 ft of an electrical duct and panel in a building actively populated by humans. The system must be intrinsically safe for such an installation in an unclassified area. Vendor must specify set-back distance or hazard classification. The set-back cannot be more than 1 metre. 2. Please specify the total footprint in cm x cm. System must have a combined footprint of less than 4 m^2 3. Please specify the weight.
13.	Storage/Buffer tank	1. Capacity: 500 liter ± 10% 4. The storage tank will be stored inside the same area as the generator. Vendor must specify set-back distance or hazard classification. The set-back cannot be more than 1 metre. 2. SS 316. ASME Section VIII Div.1 3. Working Pressure: 15 Kg/cm^2 4. Design Pressure: 30 Kg/cm^2 5. Purging, venting and drain ports for tank cleaning 6. High-pressure relief valve and pressure monitoring
14.	Conformity	ISO 22734-1, NFPA 69 and EN 1127-1. Copy of test certificates must be

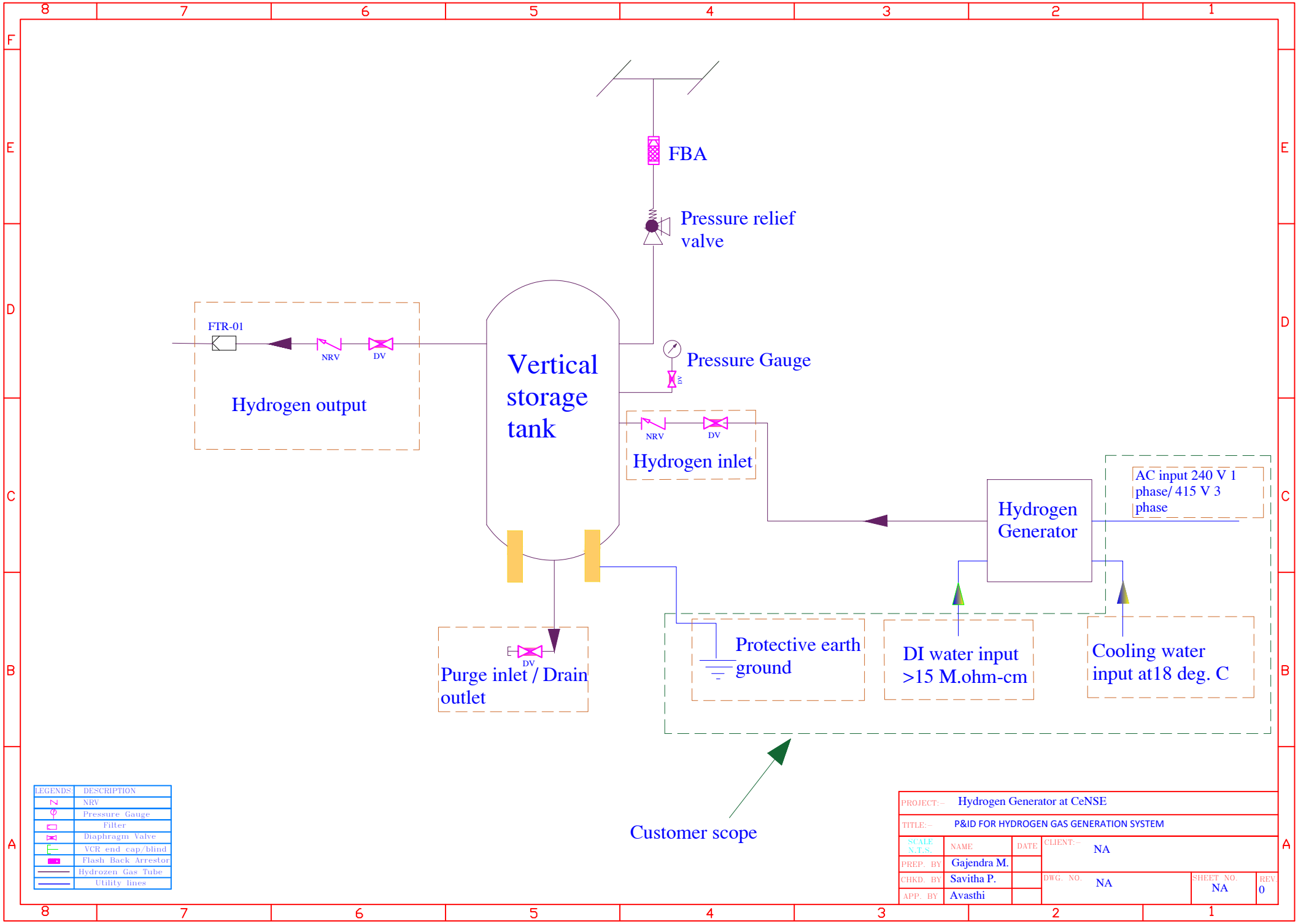
		attached.
15.	System software	1. Vendor must provide a front panel displaying equipment status. 2. The software must allow varying levels of instrument access. Restricted access for an operator and full access to an engineer. 3. The software should interface with the online monitoring facility. 4. Complete logs of all the process and system parameters to be available and stored for future troubleshooting 5. Graphical representation of system and process parameters 6. Please specify the date the system was launched and the date till when the software will be supported 7. Must have the capability for remote monitoring with software graphical user interface via TCP/IP Ethernet or MODBUS for individual signals via TCP/IP.
16.	Periodic Maintenance	1. The system should require minimal maintenance. 2. Mention the recommended preventive maintenance schedule for the system. Any accessories needed for periodic preventative maintenance for 3 years. 3. Can the preventive maintenance be done by a trained on-site engineer or requires a specialist from the OEM? If the latter, please provide cost of a 3-year AMC with required kit/consumables. 4. The system should be supported by a trained local representative and should have a 12-hour window of response.
17.	Installation and Training	1. Installation and training at the site, by the experts from principals, should be part of the package. 2. During the installation, all the specifications of the processes should be verified for acceptance by the customer.
18.	Power & utilities	1. The instrument should work with Indian standards and power sockets. 2. Mention the power requirement. 3. Vendors must mention any utility requirement (water, air, exhaust, etc.). The list of utility at site is given below. The system must not need anything beyond this.
19.	Safety	1. Mention the safety standards to which the system is designed. 2. The system must come with a complement of interlocks to prevent common user errors. 3. Mention any special safety requirements that the facility must have to support the installation. 4. The system must shut down safely without a need for UPS. Any residual H2 generated during a shutdown must be safely vented. 5. List all the sensors available. Must have onboard H2 sensor.
20.	Recommendation	1. The vendor must submit references from at least 3 previous installations 2. The names and contact addresses of the references must be submitted with the proposal, so the purchase committee can contact them independently.
21.	Standards	cTUVus (UL and CSA equivalent), CE (PED, Mach. Dir., EMC), ISO 22734-1, NFPA 69 and EN 1127-1
22.	Operating conditions	1. Temperature range: 5-40°C 2. RH: 10-90%

		3. Altitude: 1000 m

Thanking you,
Savitha P,
COO, NNfC

Appendix

1. Utility available on the site:
    a. Single phase (240 V) and three phase (415 V) at 50 Hz. Load of upto 10 kVA is acceptable
    b. DI water with resistivity > 15 MOhm-cm. Temperature 10-30 °C.
    c. Closed loop cooling water upto 4 bar pressure and 18 °C.
    d. Indoor location or covered shed for both generator and storage tank.
2. P&ID of a model H2 generator system is given in the next page. The dashed lines in green is under IISc scope. The rest is under vendor scope.


FBA
Pressure relief valve
FTR-01
NRV
DV
Hydrogen output
Vertical storage tank
Pressure Gauge
DV
NRV
DV
Hydrogen inlet
Hydrogen Generator
AC input 240 V 1 phase/ 415 V 3 phase
DV
Purge inlet / Drain outlet
Protective earth ground
DI water input >15 M.ohm-cm
Cooling water input at18 deg. C
Customer scope
LEGENDS:
DESCRIPTION
NRV
Pressure Gauge
Filter
Diaphragm Valve
VCR end cap/blind
Flash Back Arrestor
Hydrozen Gas Tube
Utility lines
PROJECT:- Hydrogen Generator at CeNSE
TITLE:- P&ID FOR HYDROGEN GAS GENERATION SYSTEM
SCALE N.T.S.
NAME
DATE
CLIENT:- NA
PREP. BY Gajendra M.
CHKD. BY Savitha P.
APP. BY Avasthi
DWG. NO. NA
SHEET NO. NA
REV. 0