

# Detailed Project Report (DPR)

## Centre of Excellence for the Hydrogen Energy

(Under the Green Energy Mission of Government of India)

(Design → Manufacturing → Testing → Innovation Ecosystem)

### 1. Vision:

To establish India's **most practical, industry-integrated Hydrogen energy Centre of Excellence** enabling **design, manufacturing, testing and commercialization** of hydrogen energy technologies.

#### Mission Points:

- Develop **industry-ready hydrogen technology engineers** (not just researchers)
- Build **India's first integrated Fuel Cell Manufacturing + Testing Lab**
- Build **India's first integrated Electrolyser Manufacturing + Testing Lab**
- Enabling startup creation through access to hydrogen technology infrastructure, hands-on development platforms, and expert mentorship.”
- Enable **hands-on learning: “Build → Test → Validate”**
- Support **startups, MSMEs & OEMs** in hydrogen product development
- Reduce dependency on imported hydrogen systems (**Atmanirbhar Bharat**)
- Create **job-ready skilled workforce for Green Hydrogen Mission**
- Strengthening PhD research and academic publications through direct collaboration with industry experts and real-world problem statements.”

### 2. Unique Value Proposition

#### Why This COE is Different:

<b>Traditional Labs</b>	<b>Your COE</b>
Only Testing	Manufacturing + Testing
Theoretical	Hands-on build experience
Imported systems	Indigenous + customizable
Limited industry connect	Industry-integrated ecosystem

#### India's First Practical Hydrogen Learning & Development Ecosystem

### 3. Fuel Cell Manufacturing & Testing Facility

#### Objective:

To provide hands-on manufacturing & testing exposure of fuel cells & stacks.

Proposed Manufacturing Setup Includes:

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### 3.1 Cell Level Assembly Setup

- MEA (Membrane Electrode Assembly) handling station
- Gasket cutting & alignment fixtures
- Bipolar plate alignment jig
- Torque controlled assembly of the single cell
- Multi cell stack assembly techniques

### 3.2 Stack Assembly Line

- Manual/Semi-automatic stack assembly fixture
- Torque-controlled tightening system
- Compression control fixture
- Leak testing setup

### 3.3 Balance of Plant (BoP) Integration Setup

- Tubing & gas flow integration
- Sensors & instrumentation setup
- Humidifier integration

### 3.4 Testing Integration

Manufacturing → Direct testing in:

- Fuel Cell Test Station
- Electrolyser Test Station

### Learning Outcomes:

- Students will assemble real fuel cell stacks
- Understand design vs performance relation
- Industry-ready practical exposure

## 4. Academic Value Proposition

### Why Universities Will Invest

- NAAC / NBA accreditation support
- Industry-oriented curriculum
- Live projects & research publications
- New Placement opportunities in Hydrogen domain (domestic and abroad)
- Attract government grants (DST, AICTE, CSR)

### Programs to Offer

- Hydrogen Certification Courses
- Final Year Engineering Projects

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- Faculty Development Programs (FDP)
- Industry Internship Programs
- Short term skill development program

### 5. Industry & Revenue Model

#### Revenue Streams:

- Lab setup for universities
- Testing services for industries
- Training programs (students + corporates)
- Startup incubation
- Consultancy projects

### 6. Enhanced Technical Scope

#### Design → Manufacturing → Assembly → Testing → Data Analysis

- ✓ Fuel Cell Stack Design Software (basic level)
- ✓ Digital Twin / Simulation (optional but powerful)
- ✓ Hydrogen Storage Demonstration Module
- ✓ Mini Hydrogen Power System (Demo Kit)

### 7. Enhanced Technical Scope

- ✓ Hydrogen zoning classification
- ✓ Explosion-proof electrical fittings
- ✓ Safety training module
- ✓ Emergency SOP simulation

### 8. Skill Development Module

- ✓ **Level 1:** Hydrogen Basics
- ✓ **Level 2:** Fuel Cell Assembly
- ✓ **Level 3:** Testing & Analysis
- ✓ **Level 4:** Industry Application

### 9. Benchmarking

- ✓ CSIR-NCL technology
- ✓ Indigenous advantage

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- ✓ 60–70% cost benefit

India's most cost-effective Hydrogen COE solution

### 10. Expected Outcome

- ✓ 500+ trained students per year
- ✓ 05+ industry projects annually
- ✓ Startup incubation (Expected 3–5 per year)
- ✓ Patent & research output

This is not just a laboratory — it is a Hydrogen Innovation & Skill Ecosystem. This COE will not just create lab — it will create Hydrogen Technology Engineers.

### 11. Space Requirement

Facility	Area
Hydrogen Test Lab	1200 sq ft
Control Room	300 sq ft
Gas Storage Area	300 sq ft
Researcher's Area	200 sq ft
Manufacturing Area	500 sq.ft

### 12. Utility Requirement

- 3 Phase electrical supply
- Industrial ventilation system
- Hydrogen gas cylinders / supply system
- Nitrogen cylinders and purging system
- Oxygen gas cylinder/ supply system
- Air compressor with dryer system
- Cooling water system
- Fire and gas safety system
- UPS system

### 13. Project Timeline

Phase	Duration
Design	2 weeks

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Manufacturing	10–12 weeks
Installation	4 Days
Commissioning	3 Days
Training	4 days

### 14A. Project Cost estimate for fuel cell COE ( Capacity : 1KW)

Component	Estimated Cost
Fuel Cell Test Station	₹45 – 70 Lakhs
Gas & Power Utility system	₹07 Lakhs
Cell assembly and raw material	₹10 Lakhs
Recurring expenses / year	₹10 Lakhs
Fuel Cell BoP	₹25 Lakhs
Academic material	₹05 Lakhs
Trainers cost	₹10 Lakhs
Quality assurance & material testing	₹15 Lakhs

### 14B. Project Cost estimate for Electrolyser COE ( Capacity : 1KW)

Component	Estimated Cost
Electrolyser Test Station - PEM	₹40 – 60 Lakhs
Gas & Power Utility system	₹05 Lakhs
Cell assembly and raw material	₹10 Lakhs
Recurring expenses / year	₹10 Lakhs
Electrolyser BoP	₹25 Lakhs
Academic material	₹05 Lakhs
Trainers cost	₹10 Lakhs
Quality assurance & material testing	₹15 Lakhs

**Note :** There are 3 dominant technologies in Electrolyzers namely alkaline , AEM , PEM and SOEC. The PEM technology is most clean and safe and hence we are suggesting PEM electrolyser to begin with. Other variants can be added in future to the COE.

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### About Our company

**Indian manufacturer of advanced hydrogen test infrastructure: Hydrozenfuture tech**

**Specialization:** Electrolyser Test Stations, Fuel Cell Test Stations, Balance of Plant (BoP) systems, Cell Voltage Monitoring System, Standalone Back Pressure Controller, Standalone Gas Humidifier Unit, Integration of Electrochemical Impedance Spectroscopy(EIS), IoT and analytics & Hydrogen Power Generator.

**End-to-end capability :** Design → Manufacturing → Installation → Commissioning → AMC

**Position :** Government-backed, lab-integrated, customization-first Indian OEM, CSIR-NCL licensed technology + customization agility + India-first policy alignment, Price competitive Indian alternative & ISO Certified unit.

**Aligned to :** National Green Hydrogen Mission , Aatmanirbhar Bharat , Make in India & Import substitution.

**Value Proposition:** Certified Indian Technology at Global Cost Advantage.

<u>Parameter</u>	<u>Indigenous System (India-Based)</u>	<u>Imported Systems</u>
Technology	CSIR-NCL Certified	Proprietary
Cost	30–40% Lower	Very High
Customization	100%	Limited
Lead Time	12–15 Weeks	6–9 Months
Service	India-Based	Overseas
Govt Alignment	Make in India	No

**Execution & Support Model :** Beyond Supply – We Partner

- ✓ System design & customization
- ✓ Installation & commissioning
- ✓ Training & SOPs
- ✓ AMC & lifecycle support
- ✓ Data analytics & performance optimization

**Product Details : Electrolyser Test Station**

- ✓ Certified Technology by CSIR-NCL (Govt of India)
- ✓ The Electrolyser Test Stations are offered for AEM, PEM and Alkaline type electrolyzers
- ✓ Programmable test protocols as per international standard
- ✓ A compact integrated system with plug and play operation
- ✓ The test station variants available from 500 W to 5000 W power capacities
- ✓ Programmable power supply with CC, CV and CP modes

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- ✓ User friendly menu driven software
- ✓ Display of all test parameters and visualization of user selectable test parameters
- ✓ Flow metering for H<sub>2</sub> and O<sub>2</sub> outlet gases, Data logging of test parameters
- ✓ Safety Interlocks for all important parameters
- ✓ N<sub>2</sub> purging for both anode and cathode streams
- ✓ H<sub>2</sub> leak detection with audio-visual alarm
- ✓ Media compatible gear pumps with programmable flow control
- ✓ Designed for Indian harsh climatic conditions

### Product Name : Fuel Cell Test Station

- ✓ Certified Technology by CSIR-NCL (Govt of India)
- ✓ PEM Fuel Cell Test Stations available from 500 W to 5000 W load power capacities
- ✓ Programmable test protocols as per international standards
- ✓ The standalone integrated system with plug and play operation
- ✓ User friendly menu driven software
- ✓ Testing with all standard test protocols
- ✓ Auto/manual N<sub>2</sub> purging for safety
- ✓ H<sub>2</sub> leak detection with audio-visual alarm
- ✓ Display and visualization of test parameters, Data logging of test parameters
- ✓ Inbuilt robust bubbler units
- ✓ All important safety interlocks
- ✓ Programmable load bank with CC, CV and CP modes
- ✓ Designed for Indian harsh climatic conditions

### Software : Key Features:

- ✓ LabVIEW-Based Control & Automation
- ✓ User-Friendly Graphical User Interface
- ✓ User Login & Access Control
- ✓ Stack Conditioning & Pre-Test Setup
- ✓ Electrochemical Test Modes
- ✓ Polarization Test Module
- ✓ Auto Flow Stoichiometry Control
- ✓ Data Logging & Analysis
- ✓ Customization & Integration driven
- ✓ Safety & Interlocks

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### Key Highlights:

- ✧ **Present Esteemed Clients:** DRDO, CSIR-NCL, Venture Centre, MKCI, New Delhi (Japan)
- ✧ State of the art manufacturing and testing facility at Pune
- ✧ Team Strength: Strong team of engineers and technologists for System Hardware
- ✧ Design and Development, Software Development, Manufacturing, Quality Assurance, Testing and Validation
- ✧ ISO 9001 Certification
- ✧ Clean Energy Startup award from Madhya Pradesh

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