



Sustainable
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HPU2

Hydrogen Powered Generator



ZERO EMISSION FUEL

GREEN POWER GENERATION

GEOPURA HPU2 TECHNICAL SPECIFICATION

GeoPura uses fuel cell technology to provide zero emission electricity when and where it's needed - the only by-product is pure water and heat. The use of green hydrogen in our Hydrogen Power Units (HPUs) does not harm the environment unlike the use of diesel and even bio replacements like HVO, which still produce harmful emissions such as CO₂, SO_x, NO_x and PM that have a devastating impact on natural habitats and health.

Building on the success of HPU1, HPU2 represents a significant step forward in power density, efficiency, and cost-effectiveness. Fuelled by green hydrogen to ensure zero emissions, the HPU2 is designed for heavy-duty industrial power applications such as EV charging, festivals, construction, film/TV, sports events, and data centres.

Key HPU2 features

- **Highest Power Density and Efficiency:** With 500kW of fuel cell power, the HPU2 offers unmatched power density and efficiency, syncing seamlessly with supplies such as mains grid, micro grid, HPU1, ICE, battery units, and other renewable energy systems
- **Scalable Power Solutions:** The HPU2 can be deployed in 1MW, 2MW, 3MW or 4MW 'power block' configurations, and each power block can be paralleled as often as required to make resilient power capabilities up to 50MW
- **Lowest Possible Costs:** From components and construction to deployment, operation, and maintenance, every aspect of the HPU2 is optimised for cost-efficiency without compromising on quality
- **Ease of Manufacture and Serviceability:** Designed with simplicity in mind, the HPU2 ensures easy manufacturing and straightforward maintenance

GeoPura's HPU2 is mass-manufactured in the UK by Siemens Energy. This ensures it is built to the highest standards, leveraging advanced manufacturing techniques for reliability and performance.

GeoPura Ltd

C A Parsons Works, Shields Road, Newcastle upon Tyne, NE6 2YL, United Kingdom

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Company Registration No. 118 55286 VAT No. GB320111775

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HPU2 SPECIFICATION

- 500kW power output (400V 3 phase AC, 50 / 60Hz, 4 wire)
- System is split in to five repeating 100kW 'power modules'
- Power delivered from industrial Proton Exchange Membrane Fuel Cells (PEMFC)
- Truly 100% zero harmful emission – the only exhaust is pure water and heat
- HPU2 synchronises with a 400V 3 phase AC supply (63A 3P minimum)
- Full flexibility in synchronous supply – mains grid, micro grid, battery unit, ICE, HPU1, other renewable generators
- Combine HPU2 with a GeoPura 'CHP (battery) system' for a fully resilient 1MW, 2MW, 3MW and 4MW system, allowing operation in off-grid (island), grid augmentation / synchronisation (mains current limitation) and back-up power modes
- Full G99 compliance when operating in mains grid synchronisation mode
- Multiple HPU2 / CHP systems can be combined to provide a fully scalable solution up to 50MW
- Quiet operation, significantly below the noise levels of an equivalently sized diesel genset
- Standard 20ft ISO high cube container form factor with C5 paint specification
- Total system weight of less than 10 tonnes
- Can be lifted with an industry standard lorry mounted crane (71Tm HIAB)
- Full CE / UKCA accreditation
- Safety control systems fully compliant with BS EN 13849
- Site set-up and layout compliant with DSEAR (2002), BCGA GN13 and BS EN 60079-10-1
- Safe & secure remote monitoring, control, and diagnostic features
- Manufactured to GeoPura design by Siemens Energy in Newcastle upon Tyne, UK

HPU2 OPTIONAL EXTRAS

- Combined heat and power: 250kW of hot water (60°C) at peak electrical power output
- EV fast charging: HPU2 can be supplied with charging posts to create temporary or permanent grid-independent EV charging facilities
- Fully integrated solar PV

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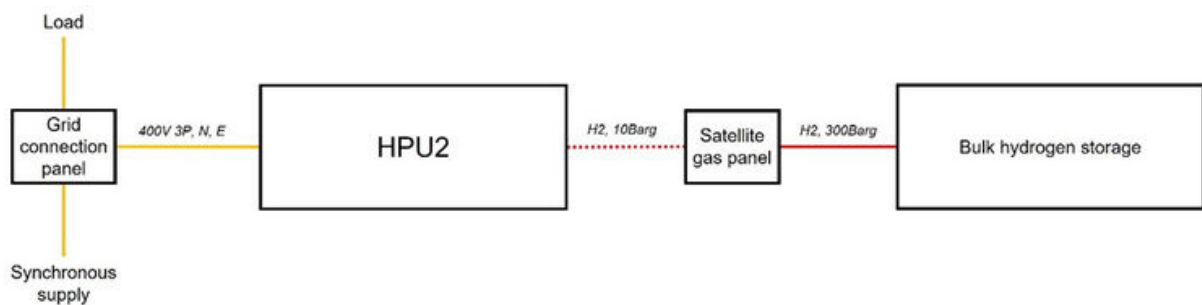
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HPU2 SYSTEM OVERVIEW

The HPU2 system operates as a 'grid' syncing device as shown below, a complete system typically includes other ancillary items as follows:

- HPU2 – GeoPura 500kW zero emission power generator
- Synchronous supply – any 400V 3 phase AC, 50 / 60Hz, 4 wire supply from mains grid, micro grid, battery unit, HPU1, ICE etc.
- Grid connection panel – electrical connection/distribution between HPU2, synchronous supply and load
- Satellite gas panel – hydrogen gas regulation, control and delivery to HPU2
- Bulk hydrogen storage – on-site storage of the hydrogen gas in MCP or tube trailer formats
- 'CHP system' – GeoPura battery and heat recovery system



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HPU2 TECHNICAL OVERVIEW

Item	Value
Length (m)	6.1
Width (m)	2.44
Height (m)	2.9
Combined weight no fluids (kg)	8,250
Combined weight with fluids (kg)	8,500
Power output (kW)	500
Power output line voltage (V)	400
Max output current per phase (A) <small>see 'HPU2 Electrical supply characteristics' for more details</small>	800
Power output frequency (Hz)	50/60
Power output lines	L1, L2, L3, N, PE
Hydrogen (max) working pressure (Barg)	10
Coolant (max) working pressure (Barg)	1 (atm)
Max noise level >1m (dB)	<65dB
Hydrogen supply quality	ISO 14687:2019, grade D
Max hydrogen usage (kg/hr)	42
Max water production (L/hr)	375

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TECHNICAL OVERVIEW

	Operation	External conditions (Storage/Transport)
Temperature max. (°C)	40	60
Temperature min. (°C)	-10	-10
Relative humidity max, (%)	100	100
Altitude (m)	1000	1000

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HPU2 ELECTRICAL SUPPLY CHARACTERISTICS

Item	Value
HPU2 power output (kW)	500
HPU2 synchronising voltage (V) 3P / N / PE	230 V / 400 V
Rated grid frequency (Hz)	50/60
Auxiliary supply* voltage (V)	230V
Auxiliary supply* max current (A)	16
HPU2 rated output current per phase (Å)	722
HPU2 max output current per phase (A)	800
HPU max. continuous output current per phase (A)	722
HPU2 main output isolator / MCCB (A) <i>2x parallel Powersafe panel mount line drain.</i>	800 <i>(rated to 1600)</i>
Main earthing conductor (mm ²)	300

GeoPura can provide a 'Grid Connection Panel' with the HPU2. The Grid Connection Panel' will monitor the Distribution Network Operator (DNO), Independent Distribution Network Operators (IDNO) or Private Network Operator (Micro Grid) service termination equipment. This monitoring provides HPU2 with the information required to set a suitable power output. Alternatively, this monitoring equipment can be integrated into the clients distribution equipment.

* the auxiliary supply is for powering the HPU2 balance of plant (BoP) during storage and maintenance of HPU2 only. No power can be outputted from HPU2 using the auxiliary supply.

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HPU2 ELECTRICAL, DATA & USER INTERFACE CONNECTIONS

HPU2 MAIN POWER CONNECTIONS

800A panel mount drain Powersafe connectors - L1, L2, L3, N, PE
Two sets in parallel to provide cable connection diversity.

HPU2 AUXILIARY POWER CONNECTION

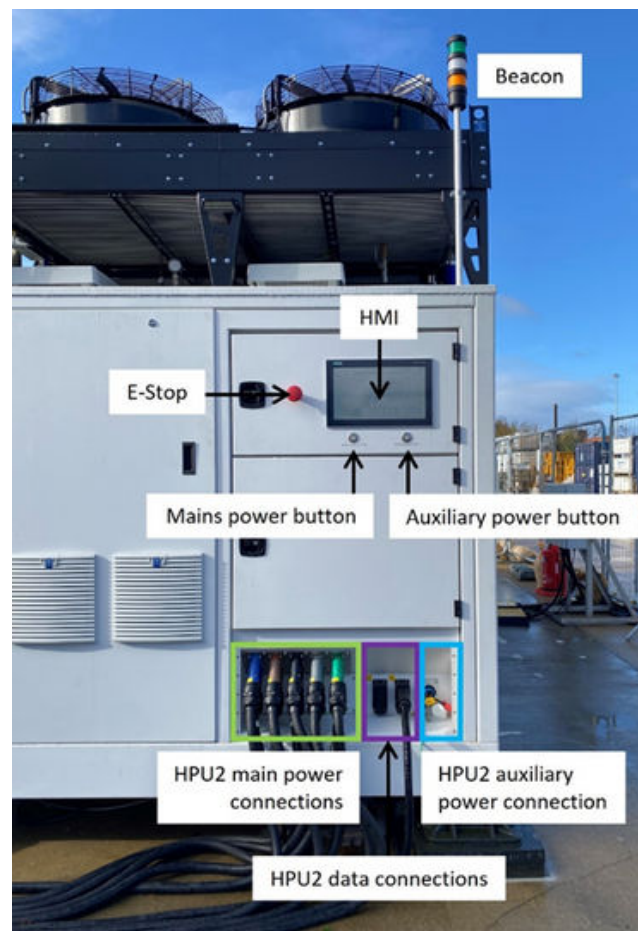
16A 1P commando socket - L1, N, PE

HPU2 DATA CONNECTIONS

Grid connection panel
Satellite gas panel
Customer – custom connection (RJ45 Ethernet / 12 pin IO)

HPU2 USER INTERFACES

HMI screen: local control of HPU2
E-Stop push button: complete and safe de-energisation of HPU2
Mains power selector button used for system start
Auxiliary power selector button used for low power system start (comms/data, GPS, heater)



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GRID CONNECTION PANEL ELECTRICAL CONNECTIONS

GRID CONNECTION PANEL POWER INPUT CONNECTION

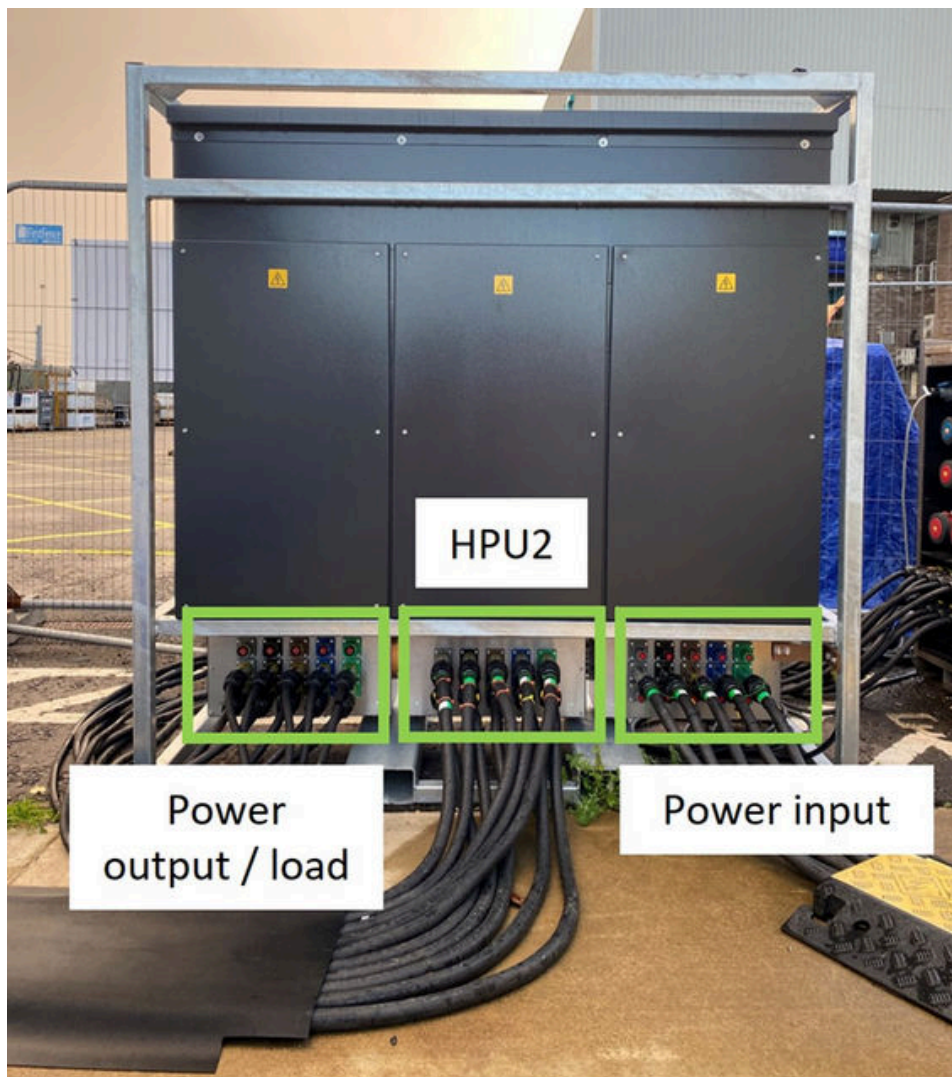
800A panel mount drain Powersafe connectors - L1, L2, L3, N, PE
Three sets in parallel to provide cable connection diversity and throughput of 1600A.

GRID CONNECTION PANEL POWER HPU2 CONNECTION

800A panel mount source Powersafe connectors - L1, L2, L3, N, PE
Three sets in parallel to provide cable connection diversity

GRID CONNECTION PANEL POWER OUTPUT / LOAD CONNECTION

750A panel mount source Powersafe connectors - L1, L2, L3, N, PE
Three sets in parallel to provide cable connection diversity and throughput of 1600A
Optional ground fault protection available



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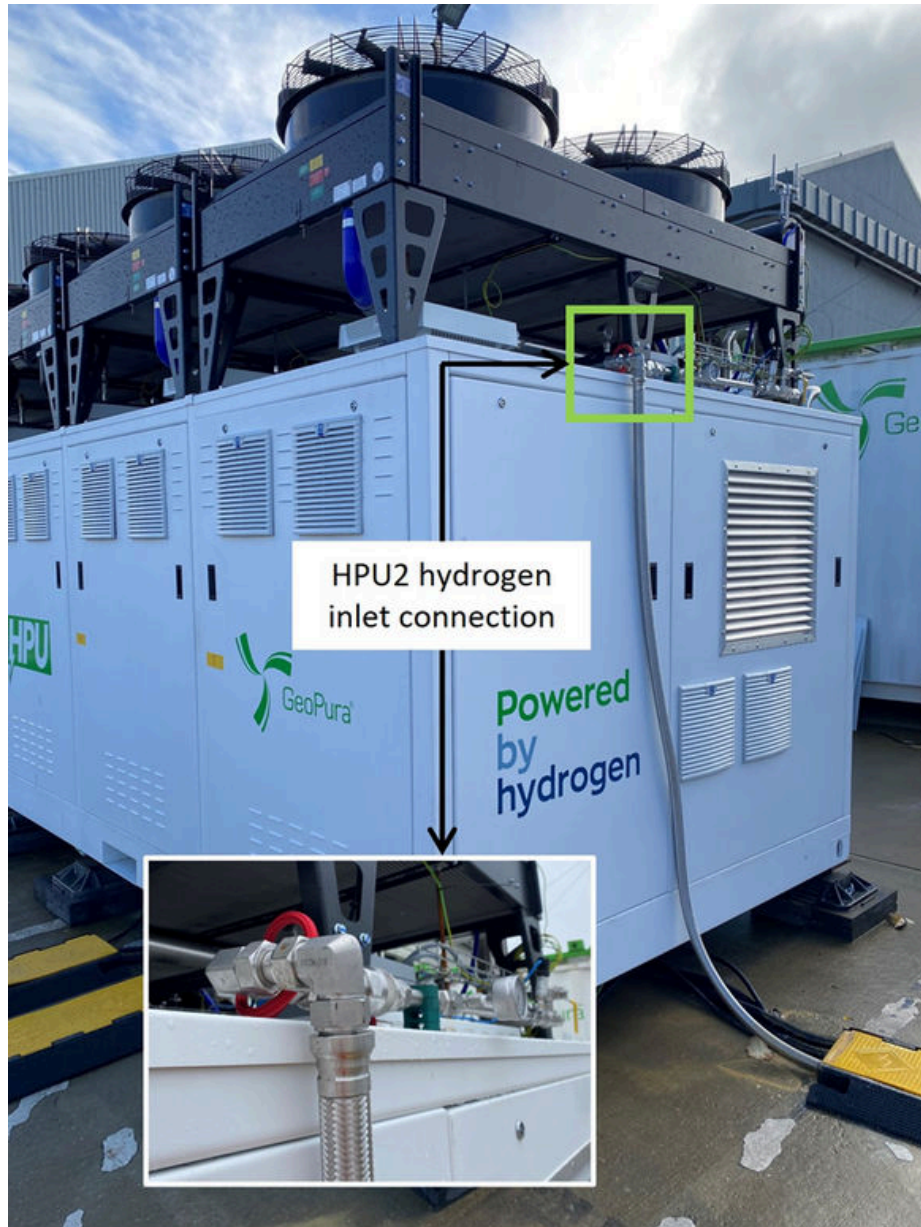
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HPU2 MECHANICAL CONNECTIONS

HPU2 HYDROGEN INLET CONNECTION

NVFCL105594 Quick release coupling, screw to connect, full flow male
Size 16, 1" BSPP, Viton seal, 316 stainless steel



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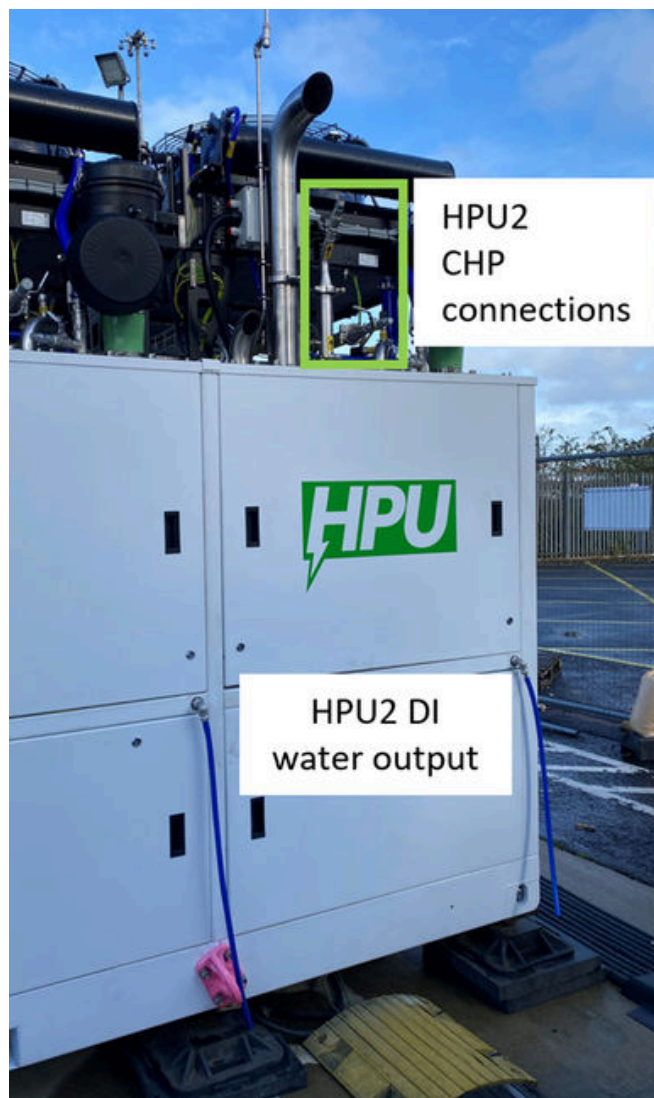
HPU2 MECHANICAL CONNECTIONS

HPU2 COMBINED HEAT AND POWER CONNECTIONS

51mm hose tail connection on CHP flow and return
Five sets of flow / return connections i.e. per 100kW 'power module'

HPU2 DI WATER OUTPUT

25mm hose tail connection
Five sets i.e. per 100kW 'power module'



All other mechanical connections (hydrogen vent line, hydrogen PRV line, process air out, water outlet) are integrated and deployed into the standard HPU2 system - no on-site connections necessary.

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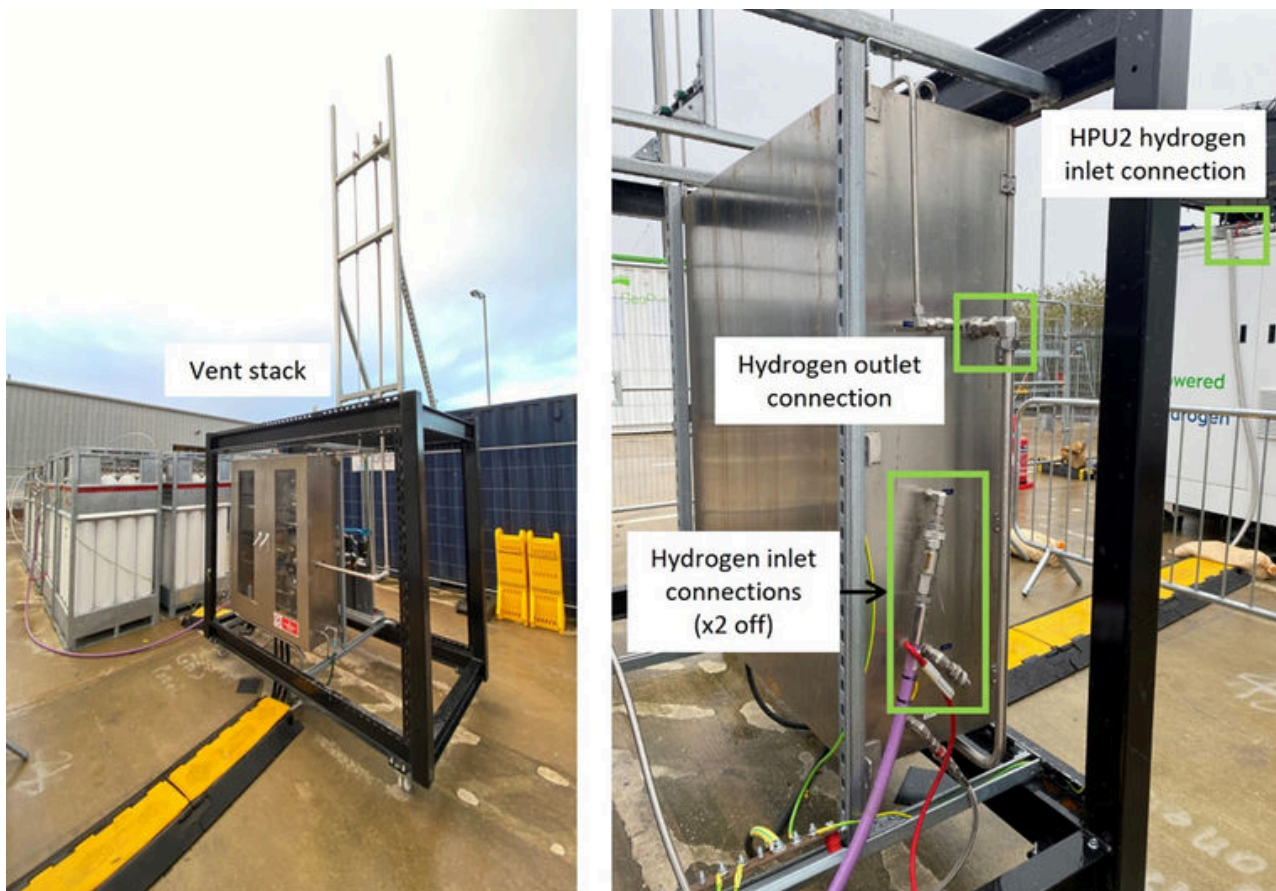
SATELLITE GAS PANEL MECHANICAL CONNECTIONS

SATELLITE GAS PANEL HYDROGEN INLET CONNECTION

NVFCL096730 Quick Release Coupling, Screw to Connect Male
Size 12, 1/2 BSP Male, Viton Seal, 316 Stainless Steel

SATELLITE GAS PANEL HYDROGEN OUTPUT CONNECTION

NVFCL105594 Quick release coupling, screw to connect, full flow male
Size 16, 1" BSPP, Viton seal, 316 stainless steel



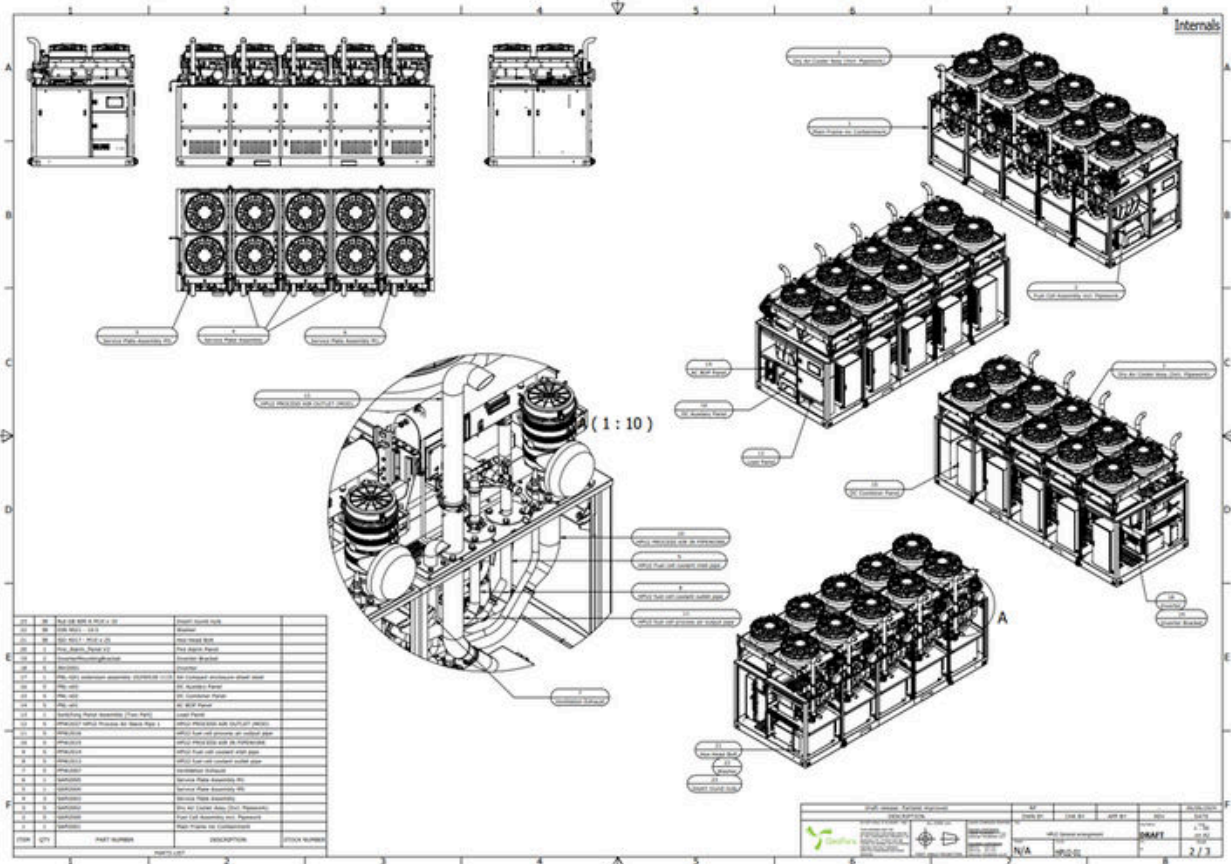
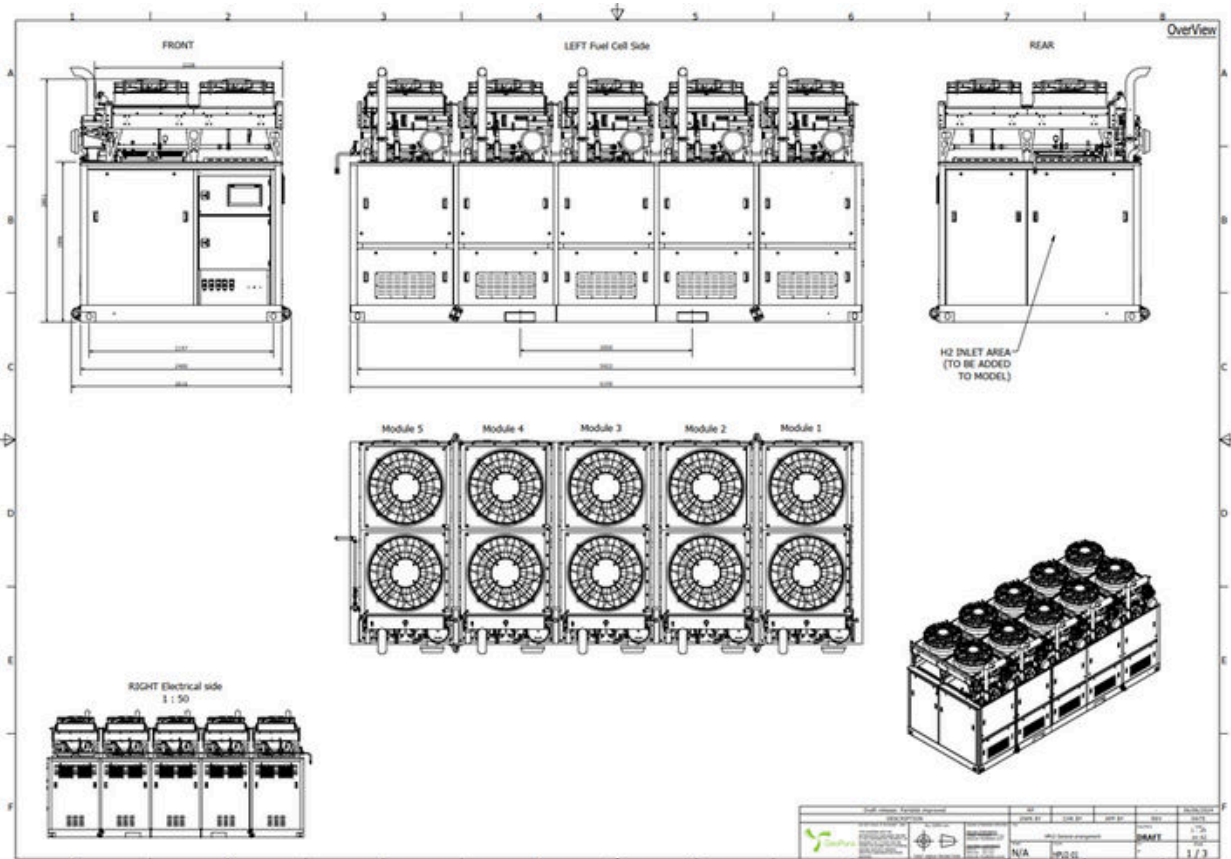
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HPU2 GENERAL ARRANGEMENT DRAWINGS



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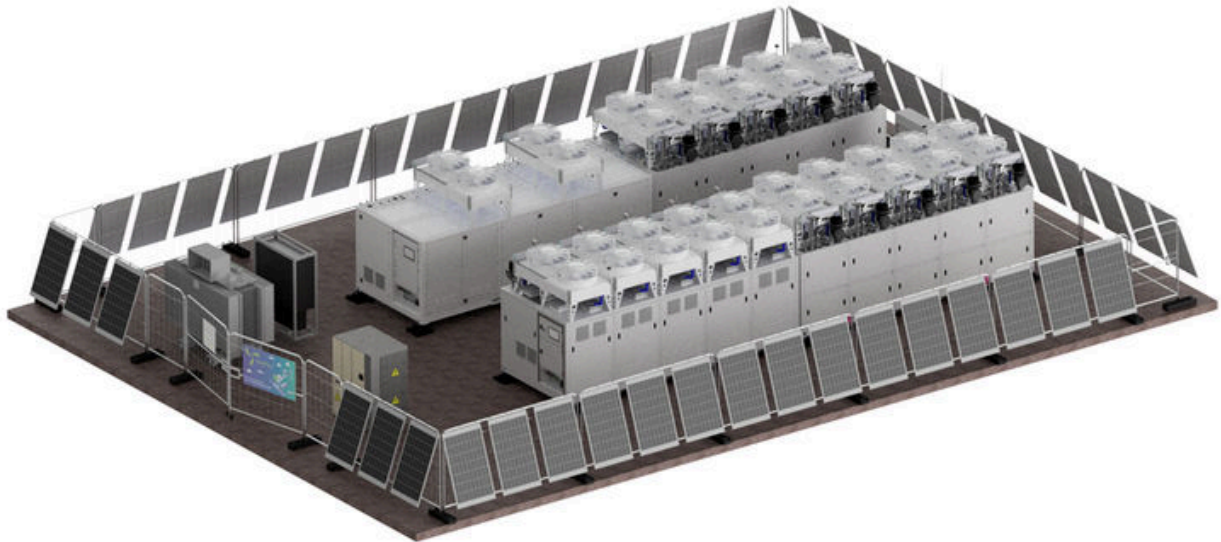
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HPU2 SITE LAYOUT DRAWINGS

Siting of all HPU2s comply with DSEAR (2002), BCGA GN13 and BS EN 60079-10-1:2021

Example 1.5/3MW PowerBlock (constant / peak power) - 11kV grid input illustrated, 33kV and 400V or off-grid options available

- x3 off 500kW HPU2 systems
- x1 off 3MW CHP system (3MW / 500kWh battery system)
- 8 Barg hard piped hydrogen supply
- 33kV grid connection
- Hydrogen distribution panel
- 33kV RMU, 400V to 33kV transformer, Low Voltage distribution board



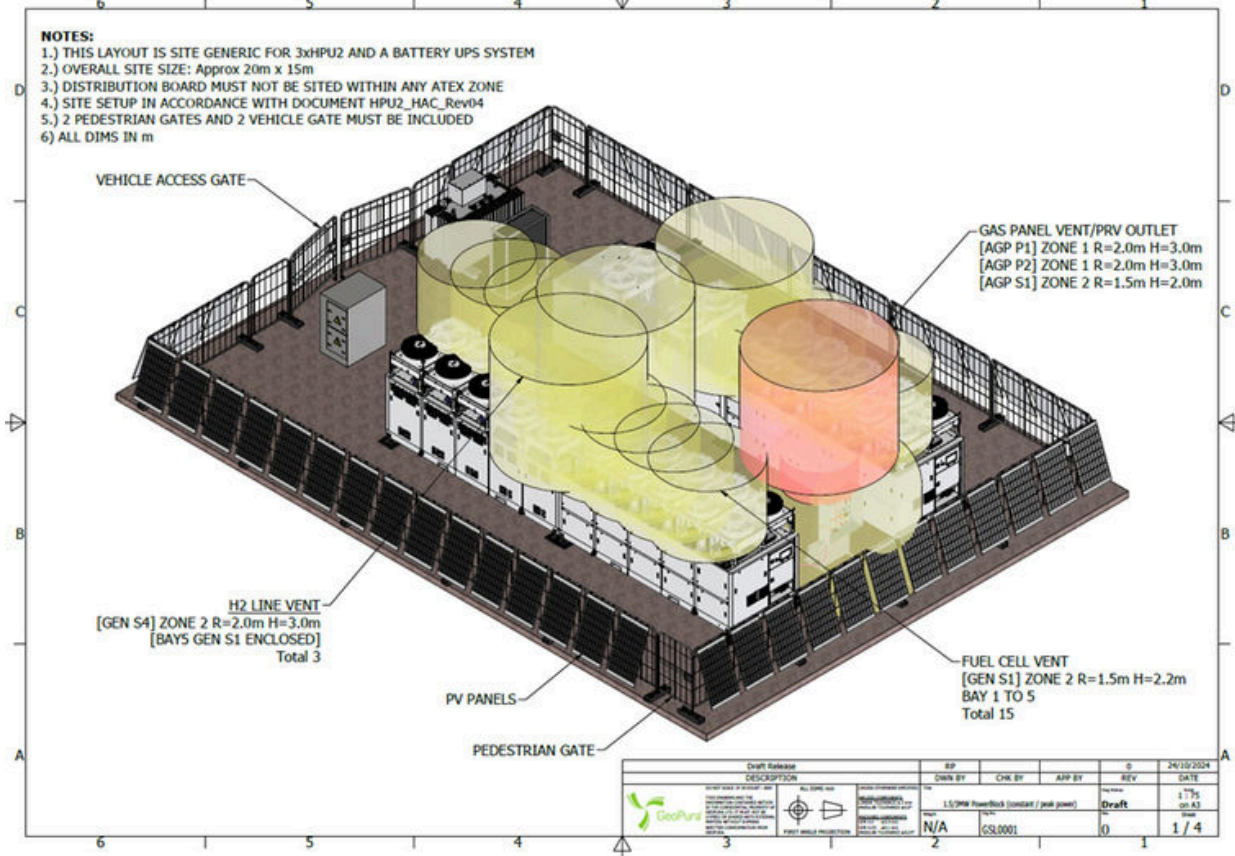
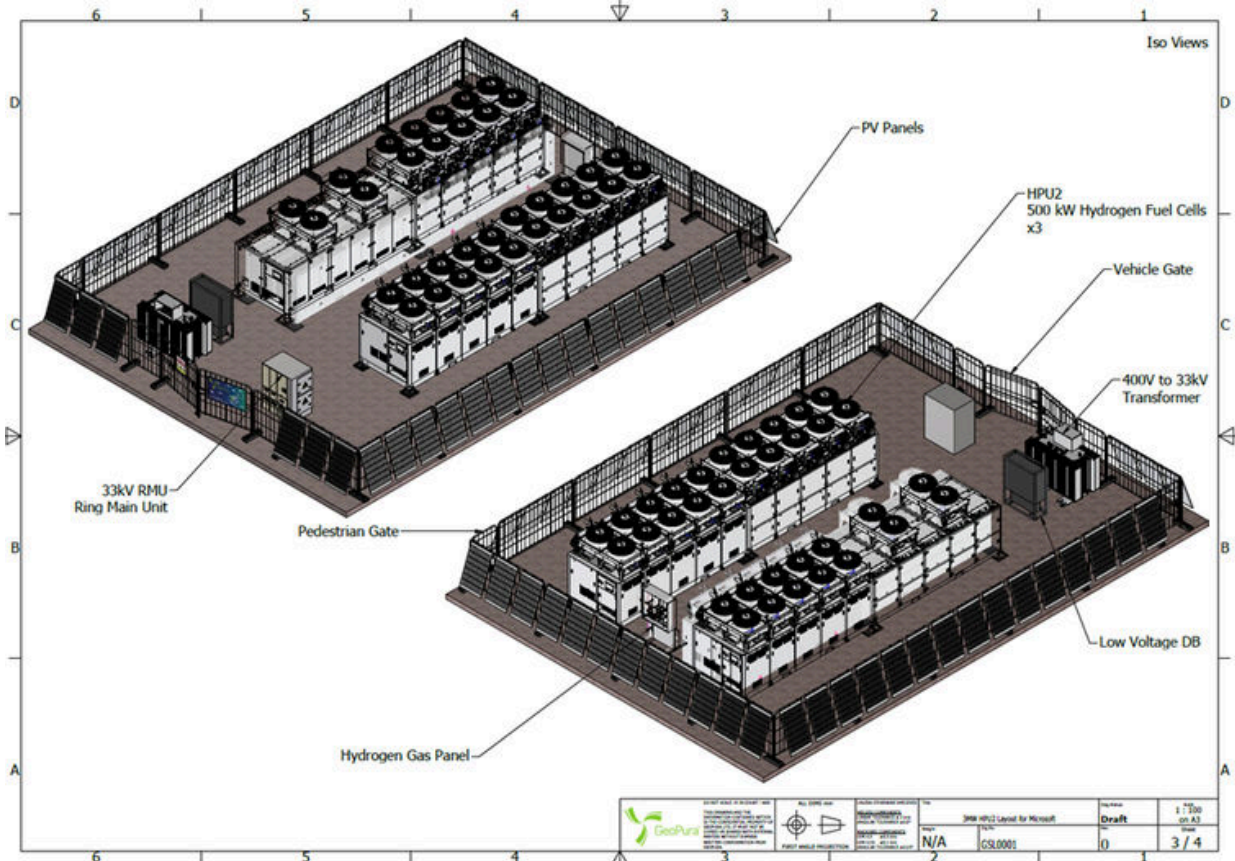
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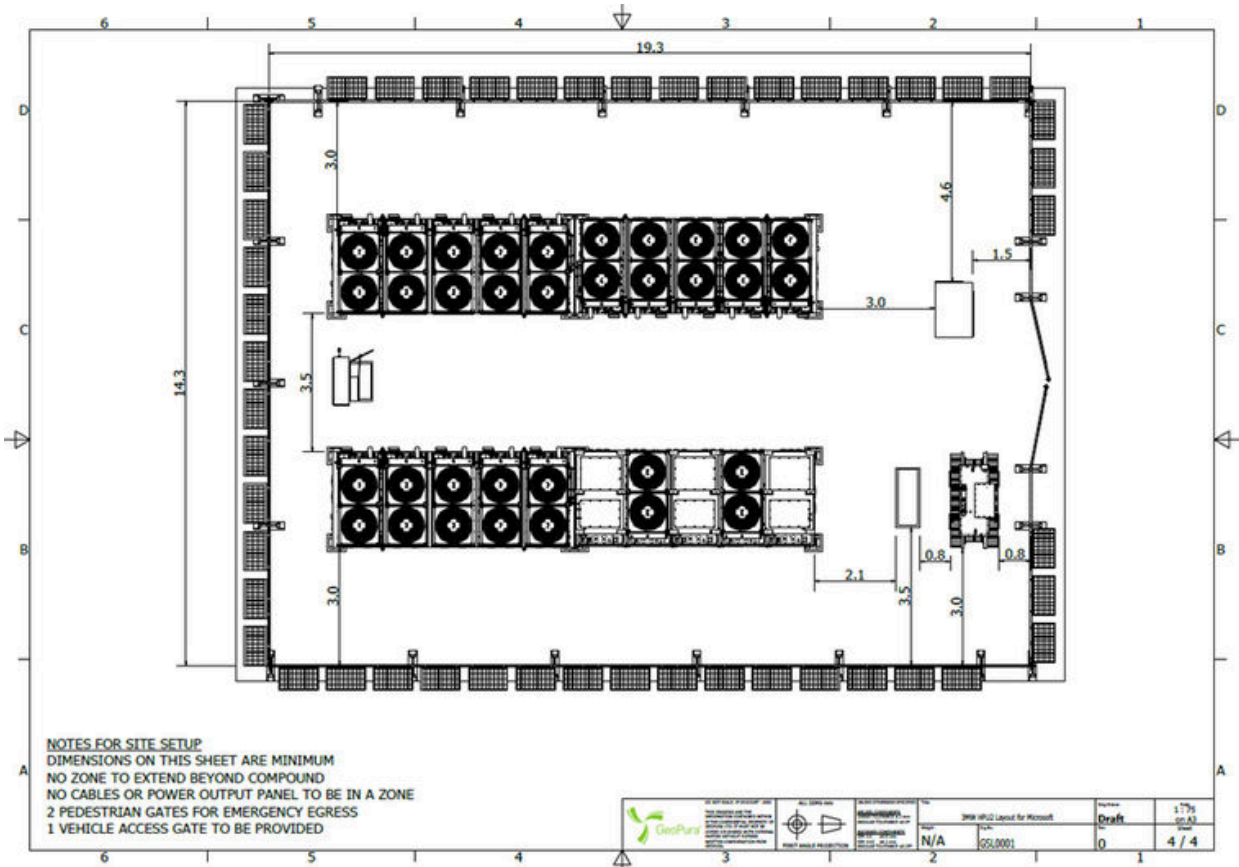
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HPU2 SITE LAYOUT DRAWINGS

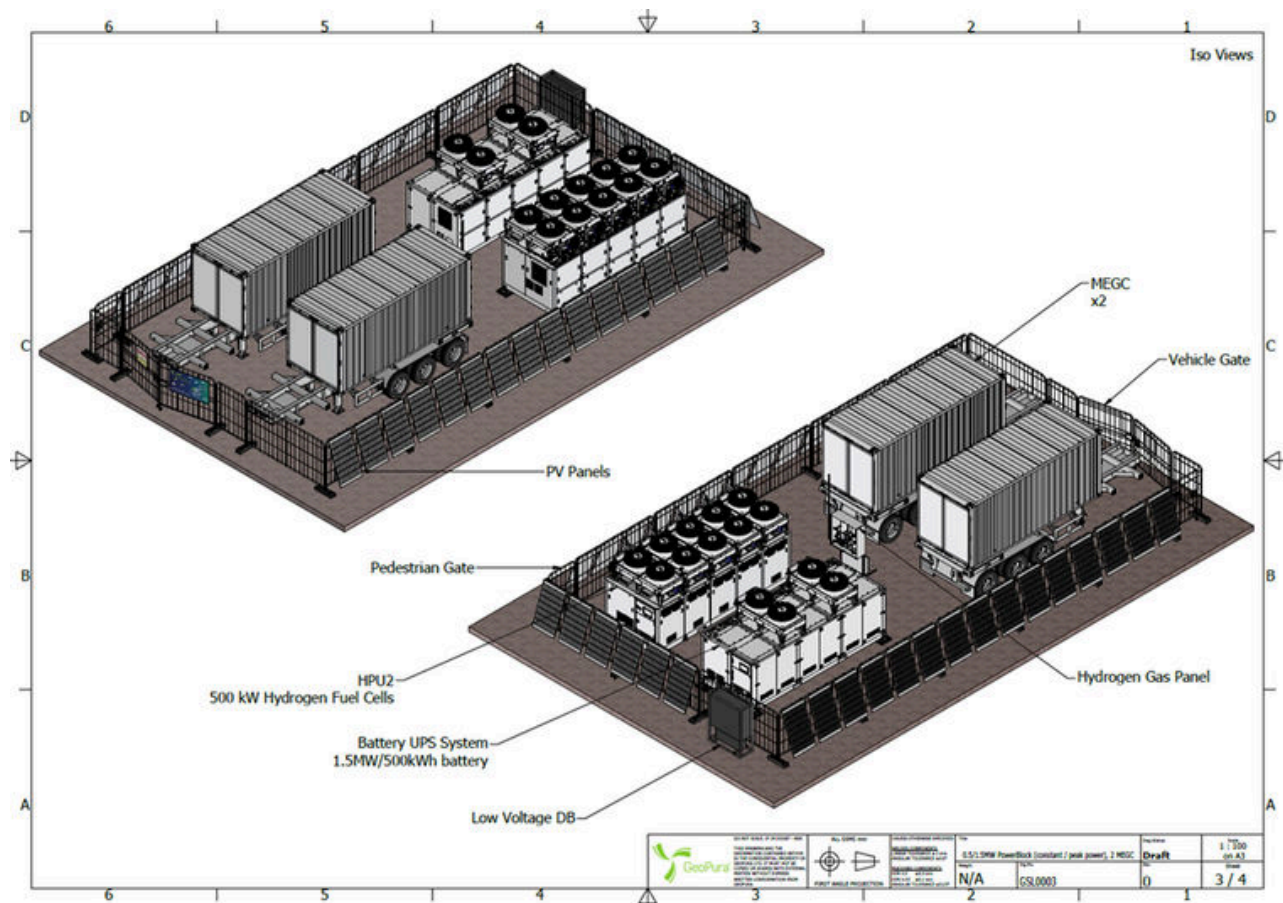


HPU2 SITE LAYOUT DRAWINGS

Siting of all HPU2s comply with DSEAR (2002), BCGA GN13 and BS EN 60079-10-1:2021

Example 0.5/1.5MW PowerBlock (constant / peak power) off-grid illustrated, 400V, 11kV and 33kV grid input options available

- x1 off 500kW HPU2 system
- x1 off 1.5MW CHP system (1.5MW / 500kWh battery system)
- x1 off Grid connection panel
- x1 off Satellite gas panel
- x2 off hydrogen MEGCs (each 300kg hydrogen storage)



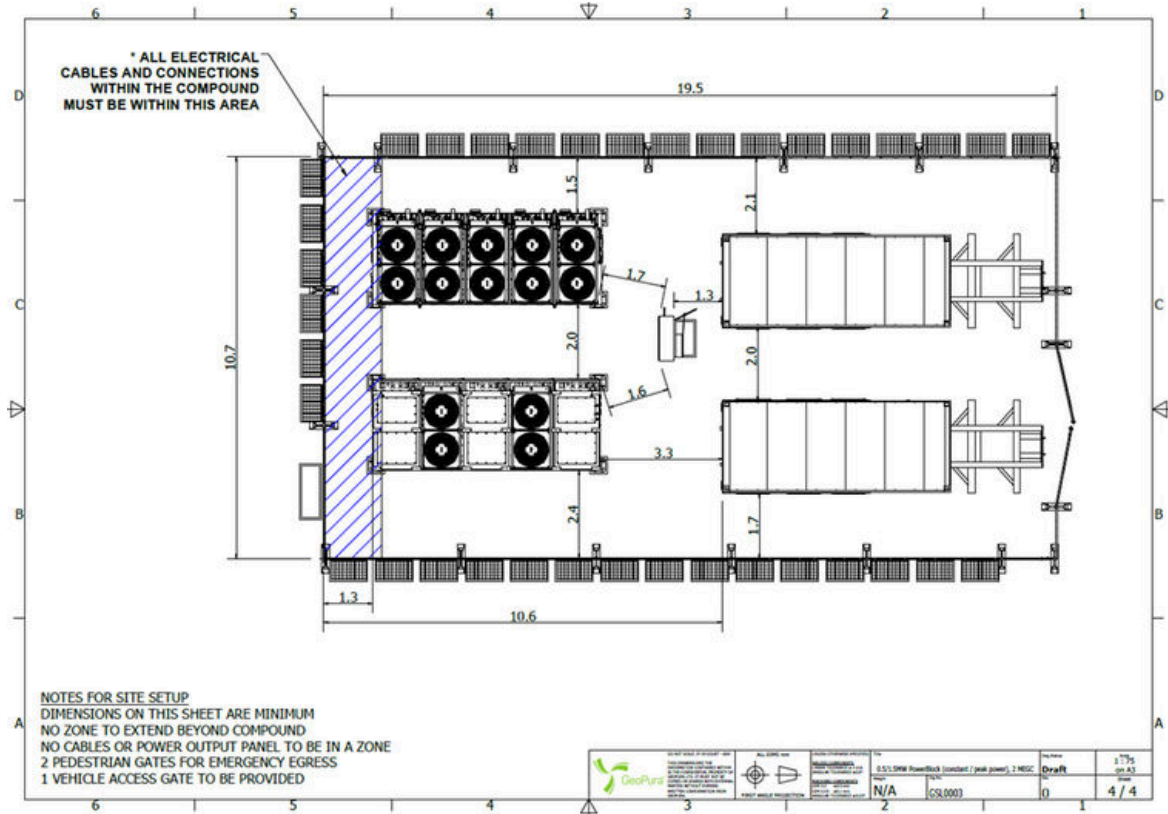
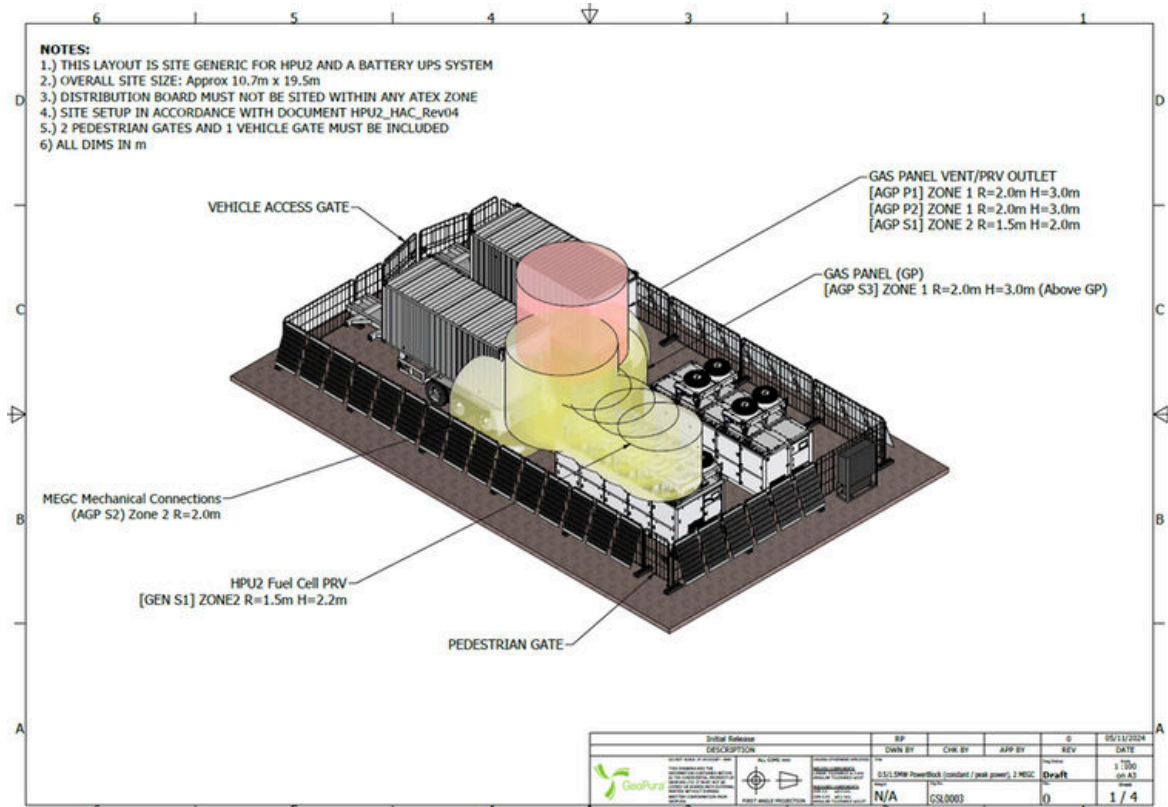
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HPU2 SITE LAYOUT DRAWINGS



HPU2 PHOTOGRAPHS



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HPU2 CE ACCREDITATION

GeoPura Ltd. declares that:

Equipment: HPU2 three phase generator

Model: HPU2

Electrical power: 500kW

Complies with the essential requirements of the following EU Directives:

- Pressure Equipment Directive (PED) 2014/68/EU
- Machinery Directive 2006/42/EC
- Low Voltage (LV) Directive 2014/35/EU
- Electro-magnetic Compatibility (EMC) Directive 2014/30/EU
- Equipment For Potentially Explosive Atmospheres (ATEX) Directive 2014/34/EU

And has been designed and manufactured to the following Harmonised Standards:

- EN IEC 62282-3-100:2020 Fuel cell technologies - Stationary fuel cell power systems. Safety
- EN 60204-1:2018 Safety of machinery. Electrical equipment of machines. General requirements
- EN ISO 13849-1:2023 Safety of machinery. Safety-related parts of control systems –General principles for design
- EN IEC 60079-10-1:2021 Explosive atmospheres - Classification of areas. Explosive gas atmospheres
- EN IEC 60079-14:2014 Explosive atmospheres - Electrical installations design, selection and erection
- BS 7671:2018+A2:2022 – SET Requirements for Electrical Installations. IET Wiring Regulations
- EN IEC 61000-6-2:2019 Electromagnetic compatibility (EMC) - Generic standards. Immunity standard for industrial environments
- EN IEC 61000-6-4:2019 Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments

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