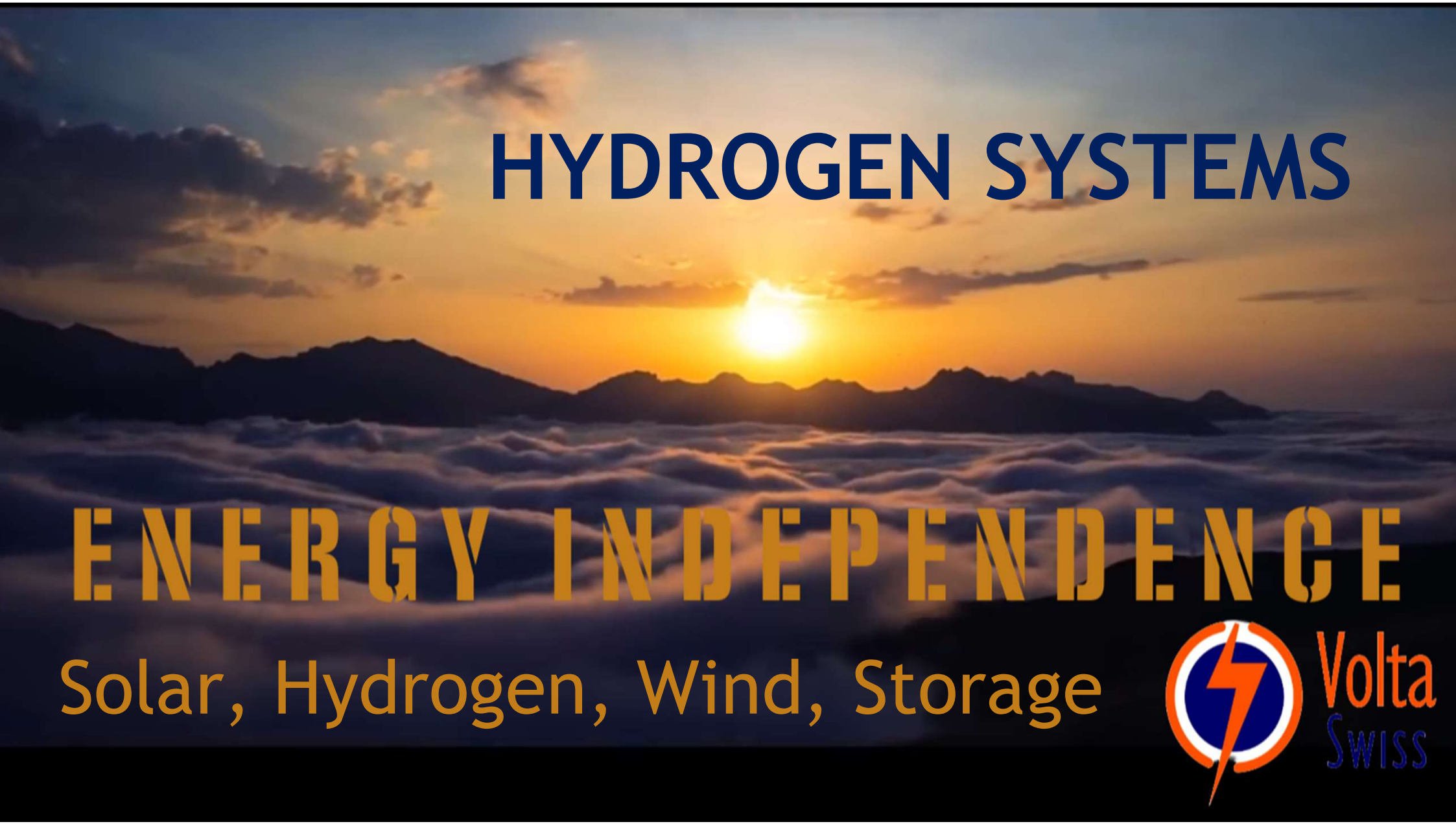

HYDROGEN SYSTEMS
ENERGY INDEPENDENCE
Solar, Hydrogen, Wind, Storage
Volta
Swiss

CONTENT

1. VOLTASWISS & Hydrogen technology introduction
2. Power to Power solutions for Hydrogen – Introduction
3. Power to Power solutions for Hydrogen - Residentials
4. VOLTASWISS & GRZ partnership and expert network
5. Containerized & certified electrolysers – ready to use
6. H2 Storage (DASH Storage) – Metalhybride – Dense and Safe Hydrogen Storage
7. H2 Power to Power (DASH Power) – Containerized peak power and back-up power
8. HyCo Hydrogen Compressors (No moving parts)
9. UPSOM Methanation Reactor (CO2 + H2 => CH4 Methane/Biogas)
10. Green Amonia Solutions – modulable 2-20 Tons/ year units
11. Swiss & EU financing supports



Who are we ?

- Our mother-company is Rottet Charpent, a 40 years old family owned company was executing construction & solar project. Volta-Swiss was born to valorize our engineering and construction experience and create an EPC (Engineer, Procurement, Commissioning) concept for affordable energy independent projects.
- From 2023 Volta-Swiss became a pioneer by representing DEYE/VTAC hydrid and storage systems on the Swiss-Market.
- From end of 2023 we have partnered with the Swiss GRZ technologies on industrial hydrogen storage solutions in CH + HU + BG
- From 2024 we expended our portfolio and representing HPS & Hybitat residential H2 storage solutions on the Swiss market.
- In 2024 we have added solutions for Swiss style solar rooftiles (beaver tail) and custom made solar panel manufacturing opportunities
- We will have our first exhibition for the public in ZuriSolar24, in Zurich from 26-29.Sep 2024. where we presented our new residential hydrogen systems







Solar, Hydrogen, Wind, Storage

OUR SERVICES

Projects from business case to site commissioning..

And more...



INHOUSE ENGINEERING & FINANCIALS => CREATE YOUR BUSINESS CASE & ENGINEER IT



INSTALLATION IN SWITZERLAND & ABROAD



PERFORMANCE SUPERVISION



BUSINESS CASE FINANCING

EU SUPPORT PREPARATION

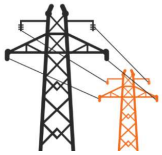
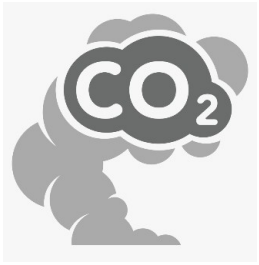
AFTER SALES AND WARRANTY MANAGEMENT



WARRANTY EXTENSION PROGRAM

Why Hydrogen ??

H2 available
H2 clean
H2 efficient
H2 tranportable
H2 storable
H2 very safe

	Hydrogen	Diesel/LPG	Battery
Storage			
Energy Density	~33 Kwh/kg	~11-17 Kwh/kg	~0.2 Kwh/kg
Transportation			
Lifetime	+25 yrs	+25 yrs	5-8 yrs
Carbon footprint			

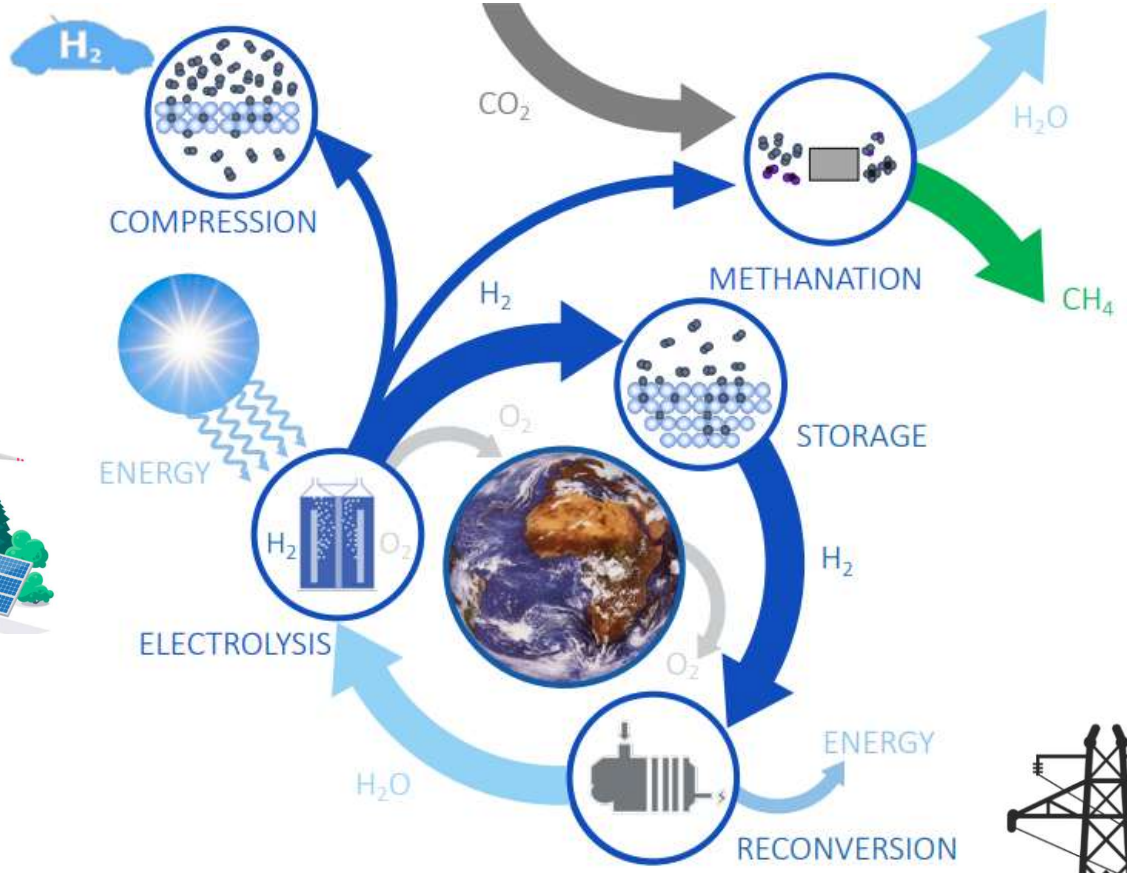
Volta Swiss
norbert.nemes@voltaswiss.ch

Carbon neutral options with Hydrogen:



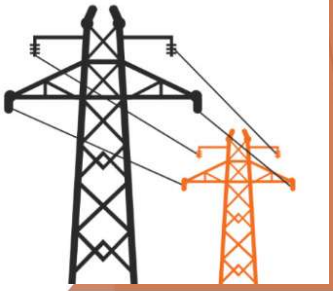






- Produce H2 from Solar
- Convert H2 to electricity
- Use H2 to enrich natural gas
- Use Hydrogen as fuel
- Use H2 to recapture Co2 to Methan

BIOGAS



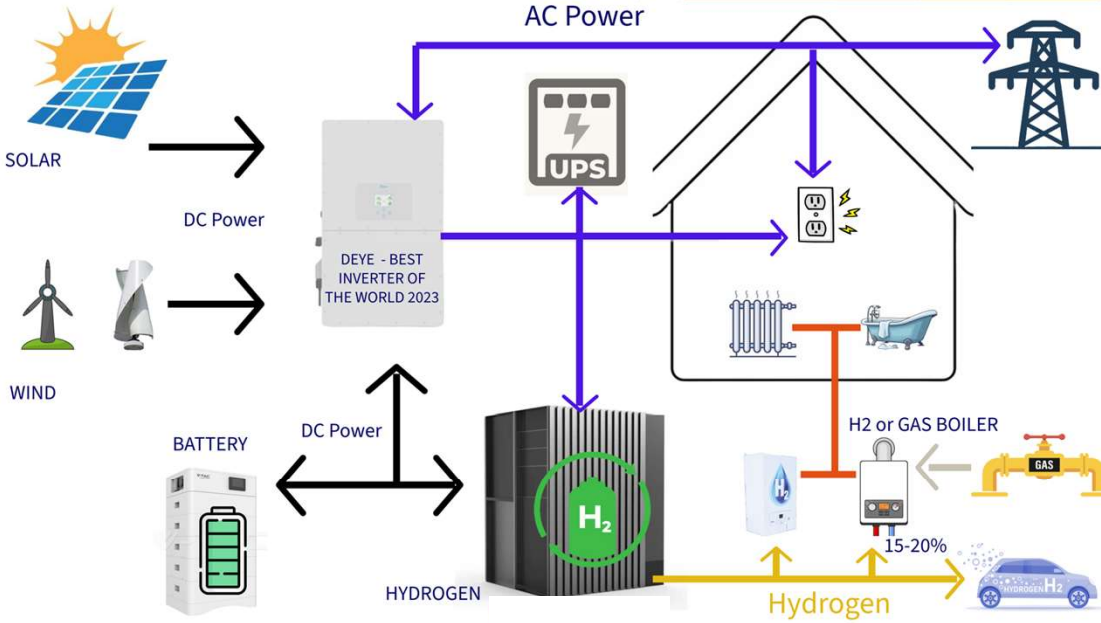
grz TECHNOLOGIES
OFFICIAL PARTNER

Volta Swiss

norbert.nemes@voltaswiss.ch

Energy Flow for residentials

- We engineer and execute customized solutions for our clients to reach high energy independence
- We use high quality components
- Cost effective
- Long lasting
- Future ready, extendable and adaptable systems for future needs
- Customizable to clients wishes
- Reduce carbon footprint by using European products where possible



- **50-95% ENERGY INDEPENDENCE**
- **CUSTOMIZED FOR CLIENTS NEEDS**
- **SAFE H2 STORAGE - DEVELOPMENT**

2. Power to Power solutions for Hydrogen

Introduction

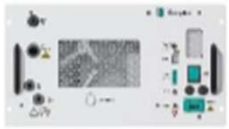
Hydrogen Power to Power Systems Components

Residential & Small Business

Hydrogen Generation

Electrolysers

Small needs – Single core (2-175 Kw)



Hydrogen Storage

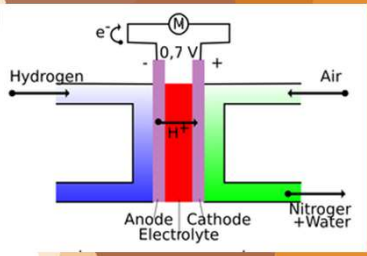
Compressed H2 Systems
(Cheaper, but high maintenance & ATEX risk)



Power Generation – H2 to Power

Fuel Cell for small users





Business & Large scale

Large users – Multi-core - (< 175kw)



Metal Hybrid H2 Systems
(Safe and dense storage, no exposition risk, low footprint, low maintenance)



High Energy needs =>
Power containers (VoltaSwiss solutions is power by Hyundai



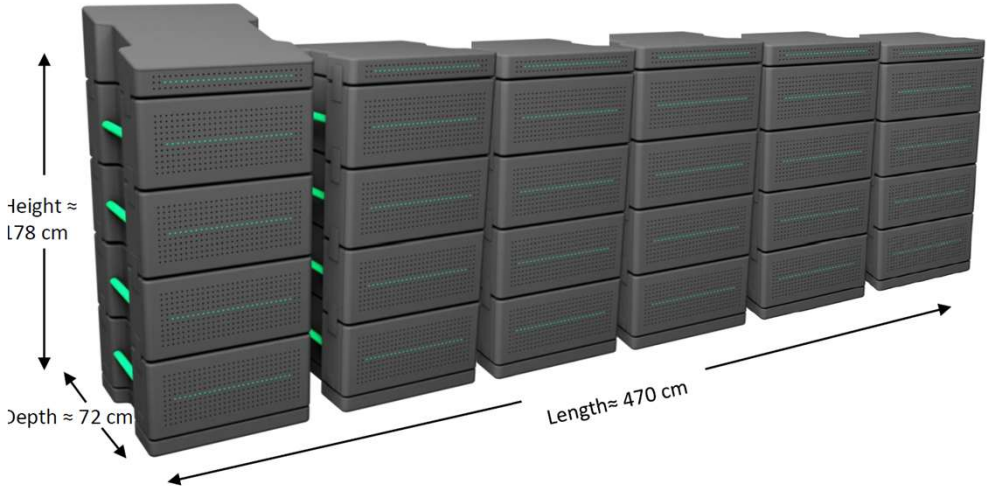


VoltaSwiss Hydrogen Systems
Short & Long term Energy Storage & Power



Residentials & Small Business

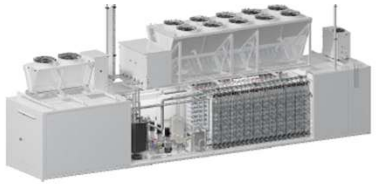
Power: 3 Phase / 5 Kw /
Storage 30 till unlimited
Electrolyser modulary expansible



Business

Power -175kw->several MW
Storage: Max 4500 Kw/20 feet container

Electrolyser packs:



AEM Nexus 1000™
~ 450 kg/24h



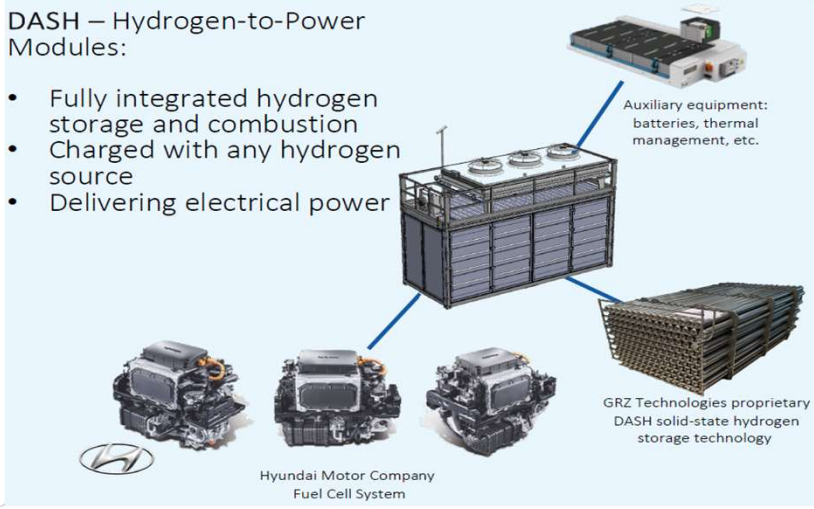
AEM Nexus 500 (kW)
~ 226 kg/24h



AEM Flex 120 (kW)
~ 54 kg/24h

DASH – Hydrogen-to-Power Modules:

- Fully integrated hydrogen storage and combustion
- Charged with any hydrogen source
- Delivering electrical power

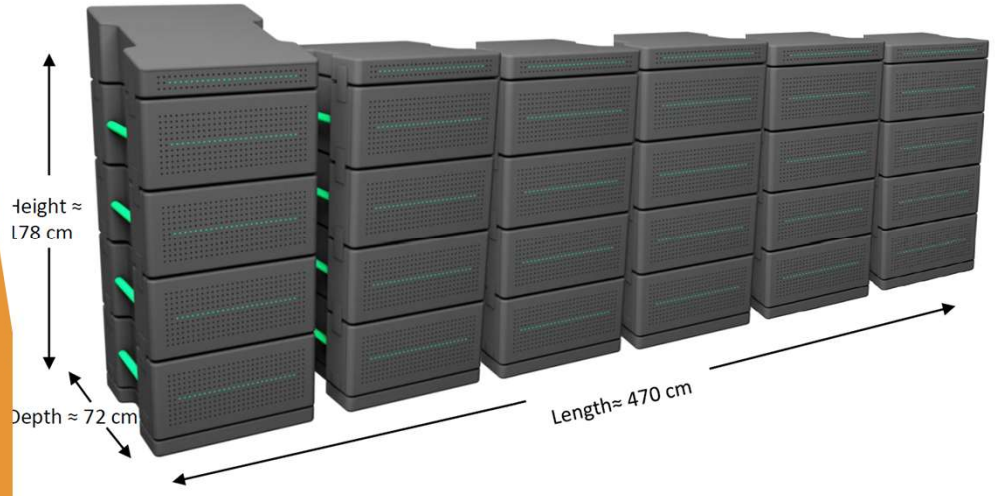


3. Power to Power solutions for Hydrogen

Residential certified technologies

Small Residentials - Hyviva





Specification	Value	Unit	Comment
Tower Size	75.2 L x 75.3 W x min: 52.2 H max: 181.4 H	cm	Size is per tower. The total height is determined by the number of modules stacked on the base. The base of the tower has a height of 20 cm. Each module is 32.3 cm high. A tower can have up to 5 stacked modules, providing a maximum height of 181.5 cm. Additional towers can be extended to the right of the first tower.
Space Between Towers	20	cm	Towers connect with the HyvivaGrid Tower Connect.
Weight	80 - 750	kg	Per tower and depends on type of stacked modules
Production Rate	up to 1.0785	kg/24 h	With one Electrolyzer Module See Electrolyzer Module datasheet for details
Hydrogen Storage	1 - 100	kg	Each Storage Module can contain up to 1 kg hydrogen. See Hydrogen Storage Module datasheet
Power Output	up to 4	kW	With one Fuel Cell Module See Fuel Cell Module datasheet for details
Buffer Battery	5.1	kW/h	Located in the Top Controller Module See Top Controller Module datasheet for details
Peak Power Consumption	3	kW	With one Electrolyzer Module
Operative Power Consumption	2.4	kW	With one Electrolyzer Module
Standby Power Consumption	0.6	kW	All modules idle with HyvivaGrid software monitoring
Connectors	1x battery connector	each	Provided via HyvivaGrid Power Supply
Control and Monitoring	via HyvivaGrid EMS		OPC UA, MQTT, Modbus, REST, Web Sockets
Water Consumption	~420	ml/h	At 25° C when electrolyzer is running
Water Input Pressure	1 - 4	Barg	

4. VOLTASWISS & GRZ partnership and expert network

VOLTASWISS PARTNERSHIP WITH GRZ

- GRZ Technologies (https://grz-technologies.com/) is developed from Lausanne technical university (EPFL) and still maintains strong cooperation in R&D. Founder is an active scientist (Prof. Andreas Züttel), who is a reference in the swiss hydrogen community => Volta-Swiss has access to Swiss Hydrogen research community
- Volta-Swiss is official partner of GRZ since 2023 and representing GRZ solution in CH & HU & BG.
- Volta-Swiss represents a network of ~40 hydrogen specialized partner companies globally
- Each project we bring highly a competent team in client needs

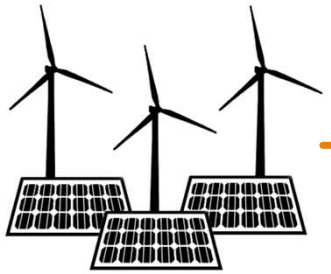
Client advantages:

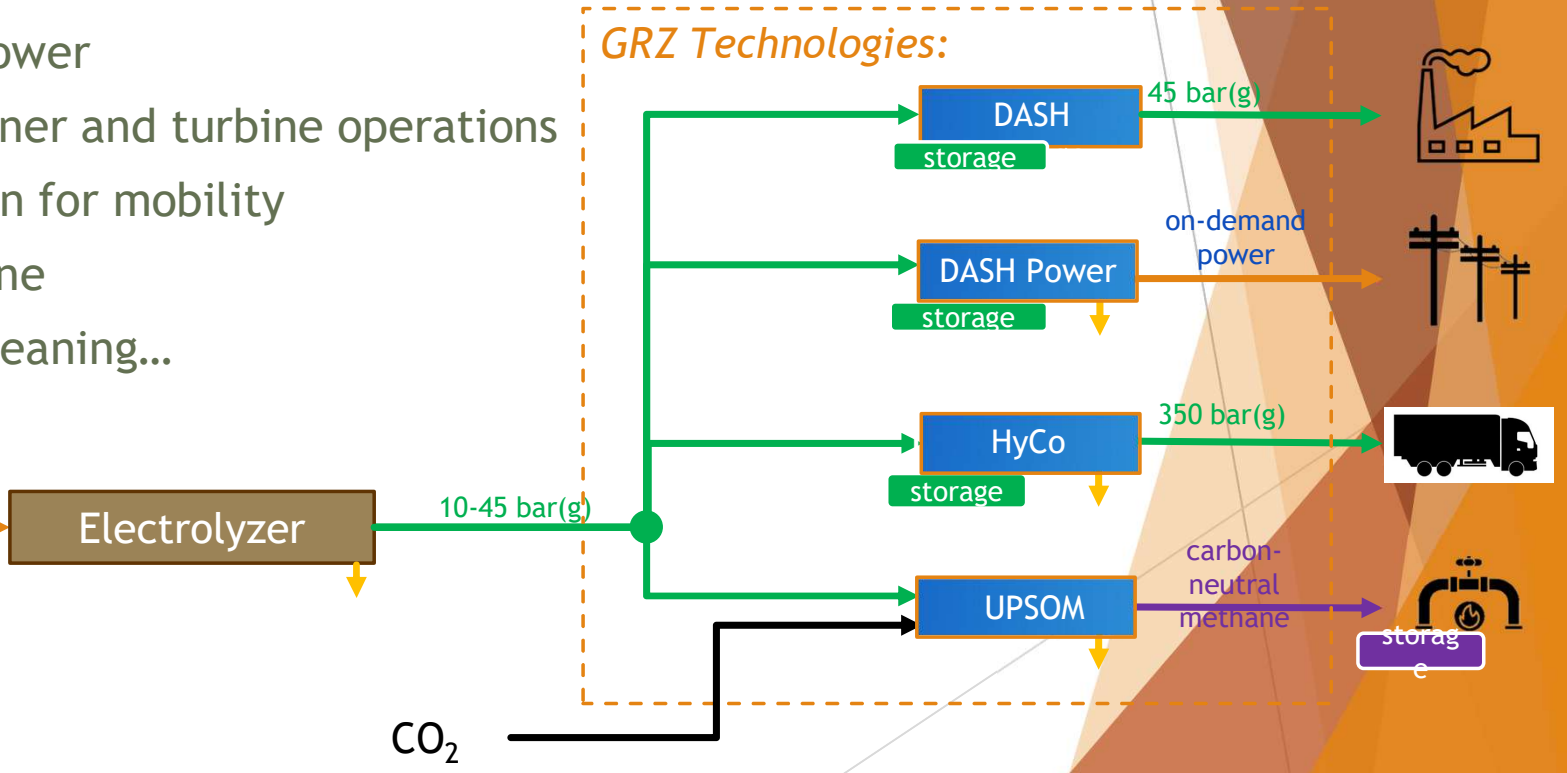
- Experienced engineering and research team
- Priority access to materials to delivery projects on time
- Own manufacturing site, we test and FAT all equipment on site with the client before delivery
- Performance follow-up and maintenance service
- Globally mobile team

Investers

H2 solution for industry

- Our vision is a world fueled by renewable energy – day and night, summer and winter.
- Our products transform low-pressure hydrogen into lasting value:
  - On-demand electric power
  - Gas mixing for gas burner and turbine operations
  - High-pressure hydrogen for mobility
  - Carbon-neutral methane
  - …Soon to come – H2 cleaning…





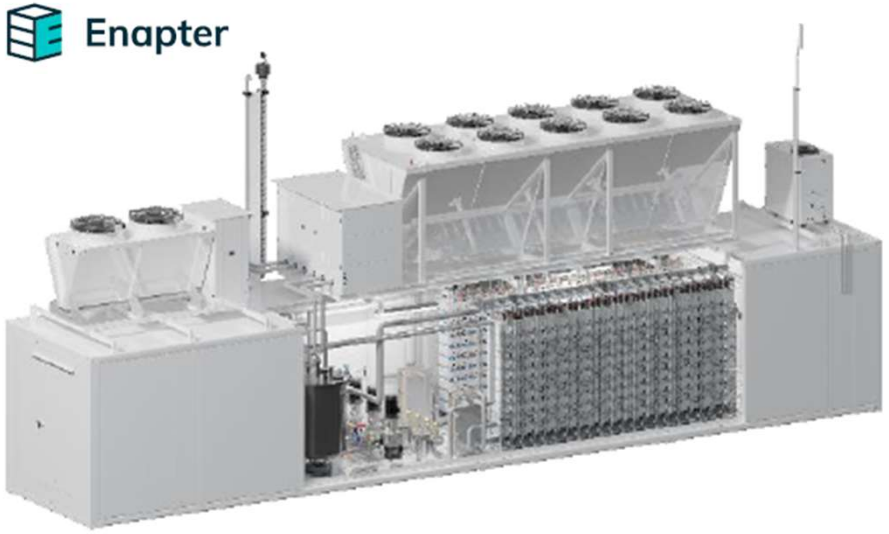
Solution are containerized pluy & play design and CE certified

5. Containerized & certified electrolysers

Ready to use

Containerized Electolyser – Tested technology, high reliability

- Standardized solution for Hydrogen production
- Plug and play containers with continuous supervision
- 53-453 kg/day/ container (1,5 MW-13,5MW/day in Hydrogen)
- Production regulation from 3-100%
- Cold start-up 30 min / hot start-up 2 min
- Head recovering possible up to 300 kw
- EU manufacturing and EU electrolyser technology (Enapter)
- Leadtime: 12 month



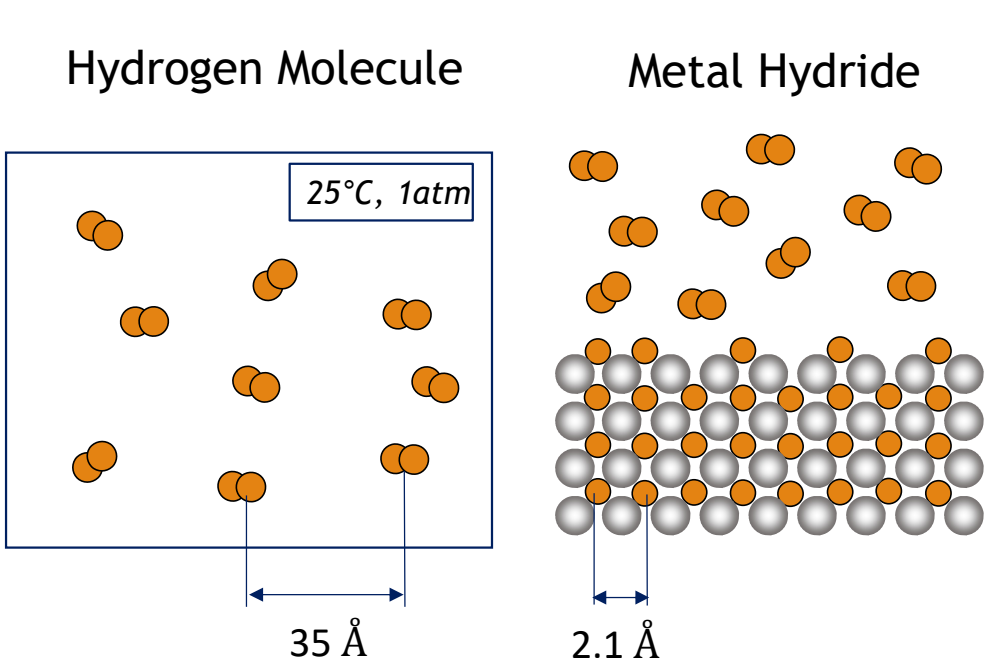
Certification and norms:

	EN ISO 12100
	ISO 22734
≡ Pressure Equipment Directive (PED)	ISO/TR 15916
≡ Machine Directive	IEC 61508-6
≡ Electro-Magnetic Compatibility (EMC)	IEC 61511-1
≡ ROHS Directive	
≡ Radio Equipment Directive (RED)	IEC 60079-10-1 Annex K, DGUV, TRGS

6. H2 Storage (DASH Storage) – Metalhybride

Dense and Safe Hydrogen Storage

Solid-State Hydrogen Storages (Metal Hydrides)



Factor 16.6 in Distance = Factor 2300 in Volume



Ph. Mauron, M. Bielmann, A. Züttel EMPA, Switzerland

Hydrogen molecules are dissociated in hydrogen atoms, which are absorbed into a specific metallic material under favorable conditions. The hydrogen atoms occupy the interstitial sites of the metallic lattice, which enables a high volumetric density.

Metal Hydrides for Hydrogen Storage
1000 bar equivalent storage @ maximum 35 bar – Safe & Dense









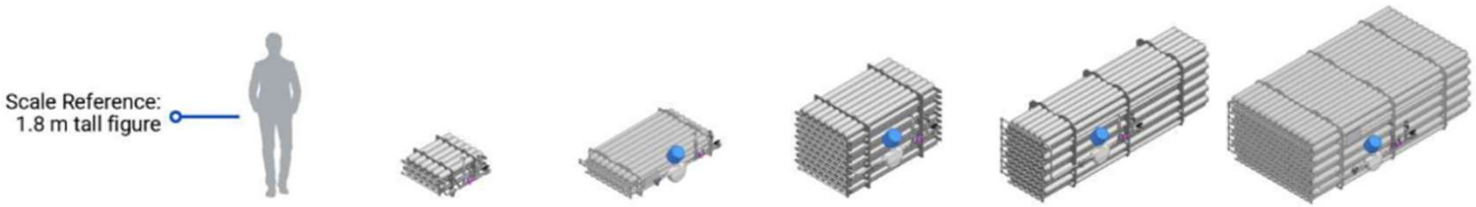
Hydrogen (=Energy) Storage

- Very high volumetric density
- Excellent safety properties
- Long lifetime, no degradation
- Density correspond to compressed hydrogen at 1000 bar(g)

FEATURE	BATTERY SOLUTIONS	DASH M-SERIES H_2 STORAGE
Lifespan	5-10 Years	20+ Years
Storage Density	100 kWh_e/m^3	600 kWh_e/m^3
Safety Concerns	Fire Hazard	Extremely Safe (Low Pressure, Solid-State)
Environmental Impact	High Grey Energy, Challenging to Recycle	Low Grey Energy, Fully Recyclable

DASH M-series Solid State Hydrogen Storage Modules

- Metal hydrides in optimized stainless steel pressure vessels



DASH M-SERIES	UNIT	M1	M3	M10	M20	M45
Hydrogen Storage Capacity	kg H_2	1	3	10	20	45
Weight	kg	111	315	1035	1910	4180
Dimensions (L x W x H)	m	0.55 x 0.44 x 0.22	1.05 x 0.65 x 0.22	1.07 x 0.65 x 0.70	2.00 x 0.60 x 0.70	2.00 x 1.10 x 0.70
ATEX Zones		None				
Recommended Hydrogen Supply Purity	%	99.995				
Hydrogen Charging Pressure	bar(g)	30 to 45 [1]				
Hydrogen Discharging Pressure	bar(g)	1 to 45 [1]				
Expected Service Life	years	> 20				

[1] *Depending on Thermal Management System (TMS)*





DASH C-series Solid State Hydrogen Storage Containerized Up to 675 kg (22 MWh per a 20ft container)

- Metal hydrides in optimized stainless steel pressure vessels integrated in a container, that can be stacked
- Plug & play modules with thermal management for rapid charge / discharge
- From 45 kg. to several tons.
- Up to 675 kg –h2 per 20ft-ISO container with use of heat exchanger

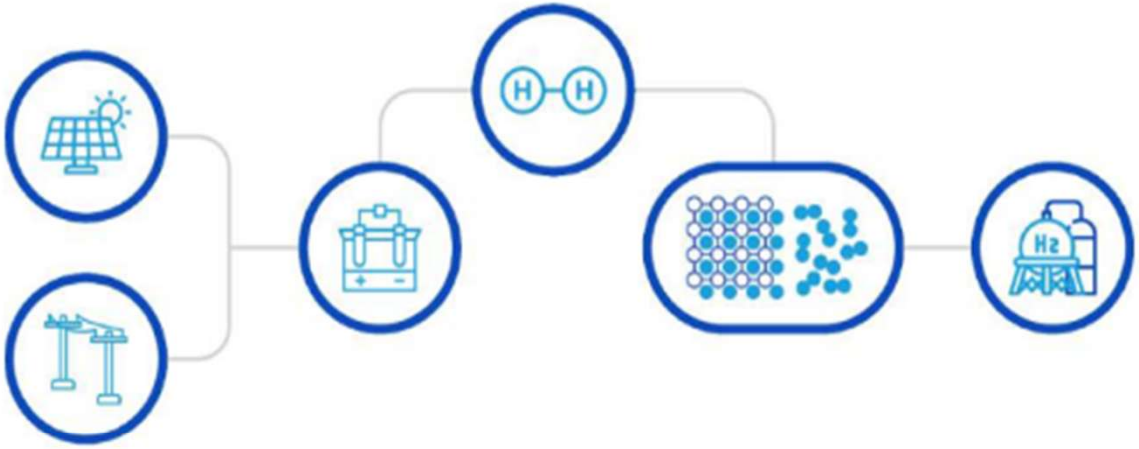


DASH C STORAGE	UNIT	C45	C90	C135	C180	C270	C405	C540	C675
Hydrogen Storage Capacity	kg H_2	45	90	135	180	270	405	540	675
Nominal Outflow Rate [1]	kg H_2/h	2	4	8	8	8	8	8	8
Nominal Inflow Rate [1]	kg H_2/h	2	4	8	8	8	8	8	8
Weight	tons	10.4	14.9	19.4	23.9	32.9	46.4	59.9	73.4
Dimensions Container	feet	20	20	20	20	20	20	20	20
Electrical Interface	V AC	1-phase 230	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400
ATEX zones	Only at exhaust of vent lines								
Admissible Ambient Temperature	°C	-5 to +38							
Hydrogen Supply Purity	%	99.995							
Hydrogen Charging Pressure	bar(g)	30 to 45							
Hydrogen Discharging Pressure	bar(g)	1 to 45 [2]							
Expected Service Life	years	> 20							

[1] *Depending on Thermal Management System (TMS)*
[2] *With our TMS; can be customized for high flow rates*



Applications of DASH Hydrogen storage
Example 1 – on demand H2 supply, replacing H2 delivery with on site production



A small-scale electrolyzer (e.g., 5 kW) is connected to the grid or to a local renewable production plant (e.g. a photovoltaic plant). The hydrogen produced is safely stored in the DASH M-Series module and delivered to the application on demand.

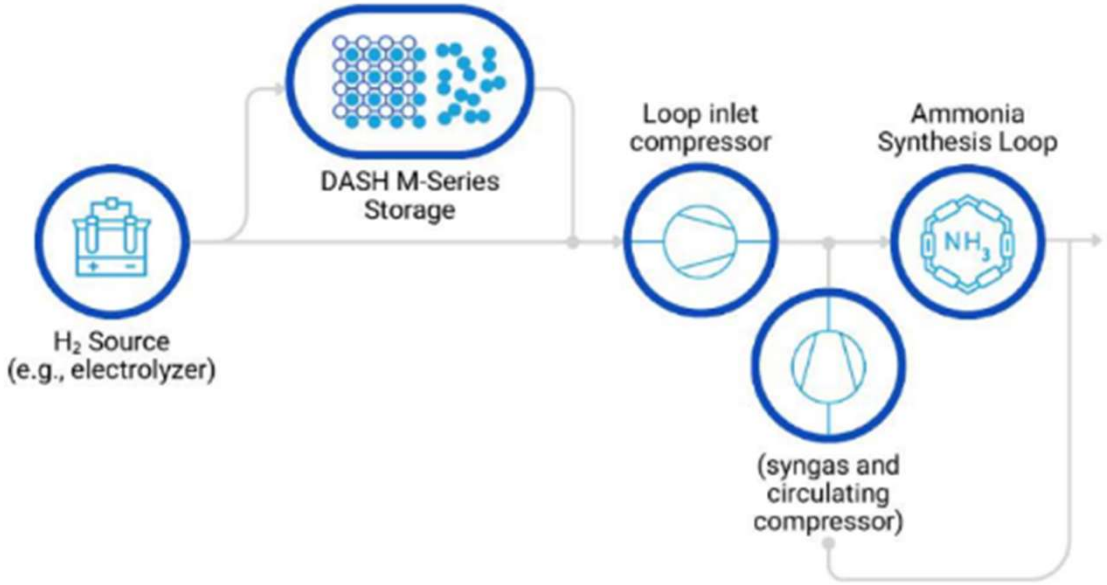
PARAMETER	BASIC SOLUTION: COMPRESSED H_2 CYLINDER BUNDLES (12 X 50L AT 300 BAR)	GRZ SOLUTION: DASH COMBINED WITH A SMALL-SCALE LOCAL ELECTROLYZER
Pressure	300 bar	< 45 bar
Hydrogen Storage Form	Gaseous	Solid-State
Explosivity	High	None
Safety Concept Required	ATEX, Ventilation and Sensors Required	None
Capacity	10.8 kg H_2 [1]	10 kg H_2 [2]
Footprint	1 m²	1 m²
Levelized Costs of Hydrogen Storage [3]	130€/kg H_2	40€/kg H_2

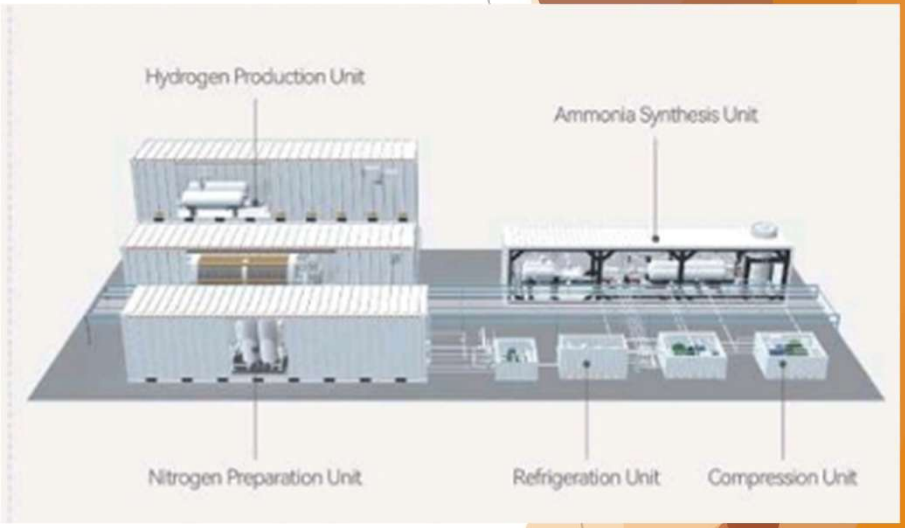
[1] *Considering the DASH M10 unit; higher capacities are possible, even keeping the same footprint*
[2] *A capacity of 0.90 kg H_2 per cylinder (50L) is considered*
[3] *Considering a period of 10 years, cost of capital 4%/y, consumption of 2 kg H_2/d for 250 d/y, cost of hydrogen (4.5) cylinder bundle at 300 bar 1570€ per unit, electricity cost 0.20€/kWh.*

- Energy production with CHP
- Metal processing
- Heat treatment applications
- Thin layer Deposition and Chemical vapor deposition process
- Fuel cell stack testing
- Hydrogen reactions in organic chemistry



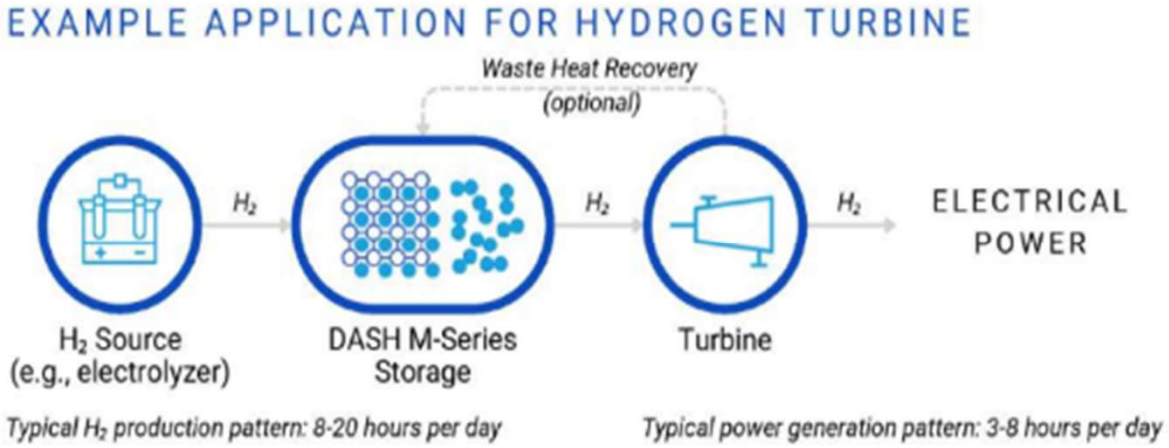
Applications of DASH Hydrogen storage
Example 2 – Green ammonia production





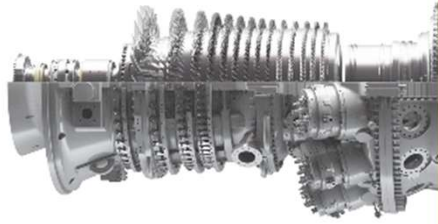
Amonia Syntesis - Hydrogen is a key precursor, andbuffer storage is crucial for operational flexibility, especially when the hydrogen is sourced from fluctuating renewable energy

Applications of DASH Hydrogen storage
Example 3 – Hydrogen Turbine & CHP plant



PARAMETER	BASIC SOLUTION: COMPRESSED H_2 (200 BAR)	GRZ SOLUTION: DASH M-SERIES
Pressure	200 bar	< 45 bar
Hydrogen Storage Form	Gaseous	Solid-State
Explosivity	High	None
Capacity	50 tons H_2	50 tons H_2
Levelized Costs of Hydrogen Storage [1]	0.48€/kg H_2	0.24€/kg H_2

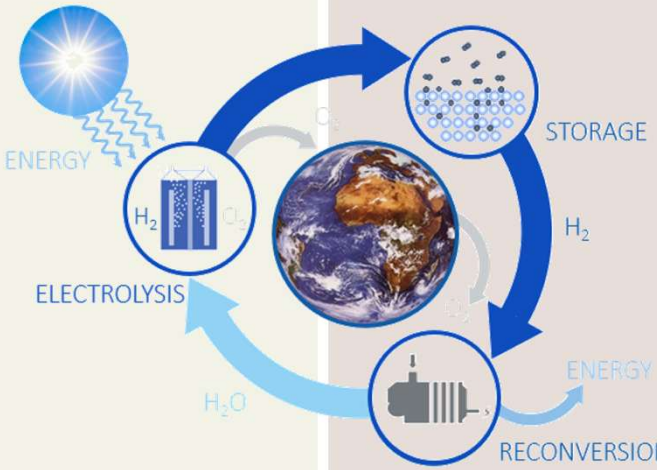
With top-tier safety standards, a minimal footprint, and cost-efficient storage, the DASH M is a robust choice for industrial-scale hydrogen needs. For example, a 50-ton H2 storage capacity (1650 MWh) requires only 560 m2, simplifying site preparation and satisfy high safety requirements.



7. H2 Power to Power (DASH Power)

Containerized peak power and back-up power

DASH Power (I)





Standardized Electrolysis Units or delivered hydrogen via truck or pipeline – all depending on application

DASH Power

- Fully integrated hydrogen storage and combustion
- Charged with any hydrogen source
- Delivering electrical power



DASH Power (II)

DASH Power Systems:

- **On-demand power where you need it:** integrated automotive-grade fuel cell system (up to 500 kW_{el} per module)
- **Think MWh not kWh:** up to 4.5 MWh_{el} of electrical energy on a very small footprint.
- **Forget cycle limitations and capacity degradation:** fully reversible process without cycle limitations or degradation.
- **Safety without compromises:** our proven and patented solid-state hydrogen storage technology leads to excellent safety properties allowing for the installation in almost any environment, even indoors.
- **Environmentally friendly energy storage:** greatly reduced environmental footprint and long lifetime
- **Easy integration:** compact design in 20ft ISO - containers



DASH POWER STORAGE	UNIT	175-900	260-1800	400-2700	500-3500	500-4500
Electrical Power (Peak)	kW_e	175	260	400	500	500
Electrical Power (Avg.)	kW_e	75	160	240	320	320
Hydrogen Storage Capacity	kg H_2	45	90	135	175	225
Total Storage Capacity	MWh_e	0.9	1.8	2.7	3.5	4.5
Time to Discharge at 100% Load	h	12.0	11.3	11.3	10.9	14.0
Weight	t	17.7	21.9	26.1	30.8	35.0
Electrical Interface Output	V AC	3-phase 400 V 50/60 Hz				
Communication Interface	TCP/IP	OPC UA and hardwired				
Ambient Temperature	°C	-5 to +38				
Hydrogen Supply Purity	%	> 4.5 (> 99.995%)				
Hydrogen Charging Pressure	bar(g)	30 to 45				
Max. Efficiency (Incl. Waste Heat)	%	84				
Expected Service Life	years	> 20				
External Cooling Requirements		None				

PHOTO - DASH POWER from inside - installation on site = 1 day

DASH POWER IN A PUBLIC PARKLING IN BERN – NO ATEX ZONE REQUIRED





DASH POWER READY TO GO TO CLIENT

INSTALLATION ON CLIENT SITE – 1 DAY
COMISSIONING – 1 DAY

Application 1 – BACK-UP POWER

DATA CENTERS; HEALT-CARE FACILITIES;
TELECOMMUNICATION, MANUFACTURING & PHARMA

- Back-up power needs for 48h or more
- Dual function – grid balancing & peak shaving & back-up power
- Green energy – generation can be fully renewable base

PARAMETER	TRADITIONAL SOLUTION: LI-ION BATTERY	GRZ SOLUTION: DASH POWER
Backup Power (Avg.)	300 kW	300 kW
Backup Power Duration	72h	72h
Fire Hazard	High	None
Footprint	400 m²	60 m²
Lifetime	< 10 years	20+ years
CAPEX	9'000'000 €	5'500'000 €



Application 2 - GRID BALANCING & PEAK SHAVING

GRID OPERATORS, ELECTRICAL VEHICULE CHARGING, MANUFACTURING PLANTS

Prevent costly infrastructure upgrades like transformer replacements by providing localized peak power

Lower electricity costs by reducing peak demand, directly cutting monthly power supply fees

Meet the growing demand for fast charging stations without the need for new grid infrastructure



PARAMETER	DASH POWER SYSTEM
Power Output (Peak)	500 kW
Investment Cost (Incl. Installation)	1.8M€
Power Shaved (Monthly)	500 kW
Peak Power Value (Avg. €/Month)	35-40€
Typical ROI	< 10 years



8. HyCo Hydrogen Compressors

No moving parts

HyCo - Metal Hydrides for Hydrogen Compression





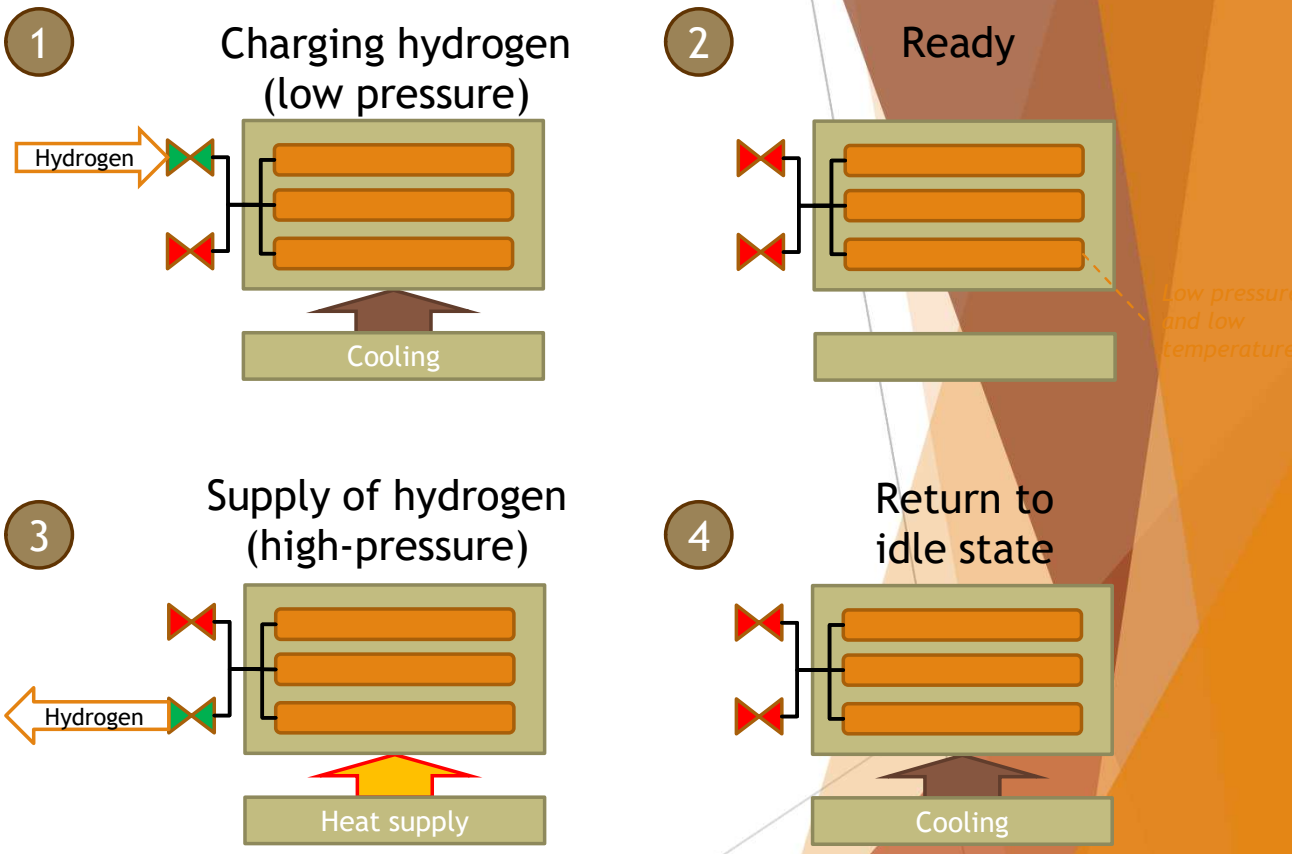


Hydrogen Compression

- Combined storage / compression units
- Thermally powered compression
- Silent, vibration-less, without leakage, and with minimal maintenance
- Many years experience with laboratory compressor deliveries delivered in 4 continents

HyCo – A Revolutionary H_2 Compression Technology

- No moving parts – resulting in noise free, vibrationless operation and minimal maintenance
- Use of thermal energy instead of mechanical energy
- Combined storage and compression function in a single device, resulting in a simplified chain and a more compact setup
- Very high safety to the low-pressure, solid-stage storage technology
- Patented technology



HyCo: On-site HRS (I)



Renewable Electricity



H_2 (30 – 40 bar)



H_2 (380 bar)



H_2 Pipeline (30 – 40 bar)

- Hydrogen truck mobility will be come one of the preferred options for logistics companies and fleet operators
- HyCo is the only element needed between the hydrogen source (e.g., electrolyzer or pipeline) and the vehicle
- HyCo stores and compresses hydrogen
- It offers both functions of storing and compressing the hydrogen

Description	Unit	Value / Range
OPEX per year[1]	EUR	41'100.-
Number of refuelling per year	1/Year	1'000
Quantity of H_2 processed	kg_{H2}/Year	28'000
Cost of H_2 at inlet	EUR/kg_{H2}	5.00
Market Price H_2 at Public HRS	EUR/kg_{H2}	20.00
Discount rate		5%
Lifetime considered	Years	20
Levelized cost of hydrogen in the vehicle tank	EUR/kg_{H2}	≈ 8.6

[1] Considering electricity costs of EUR 0.16/kWh and EUR 15'900.- maintenance costs per year, grid-fee exemption to be expected in the future in many markets

HyCo: On-site HRS (II) - preliminary specifications

Parameter	HyCo HRS-28	HyCo HRS-56	…
Storage & Refueling Capacity	28 kg_{H2}	56 kg_{H2}	…
Absorption Flow Rate (Max)	5.6 kg_{H2}/h	11.2 kg_{H2}/h	…
Desorption Flow Rate (Max)	112 kg_{H2}/h		…
Inlet Pressure	30 – 40 bar(g)		…
Outlet Pressure	380 bar(g)		…
Time for Refueling (Truck)	15 min		…
Number of parallel refueling	1		…
Product Shape	20' ISO Container		…
Footprint	14.8 m^2		…
Weight	11'800 kg	19'600 kg	…
Electrical Power Supply	80 A / 400V 3P	160 A / 400V 3P	…
Expected Energy Consumption	< 6 – 8 kWh/kg_{H2}		…
Refueling Protocol	SAE J2601/2		…
Ambient temperature	-10 to +38 °C		
Compliance	ATEX Directive 2014/34/EU Machinery Directive 2006/42/EC Pressure Equipment Directive 2014/68/EU Low Voltage Directive 2014/35/EU		



20ft-ISO containerized plug & play design

- Example daily operation of HyCo HRS-28:

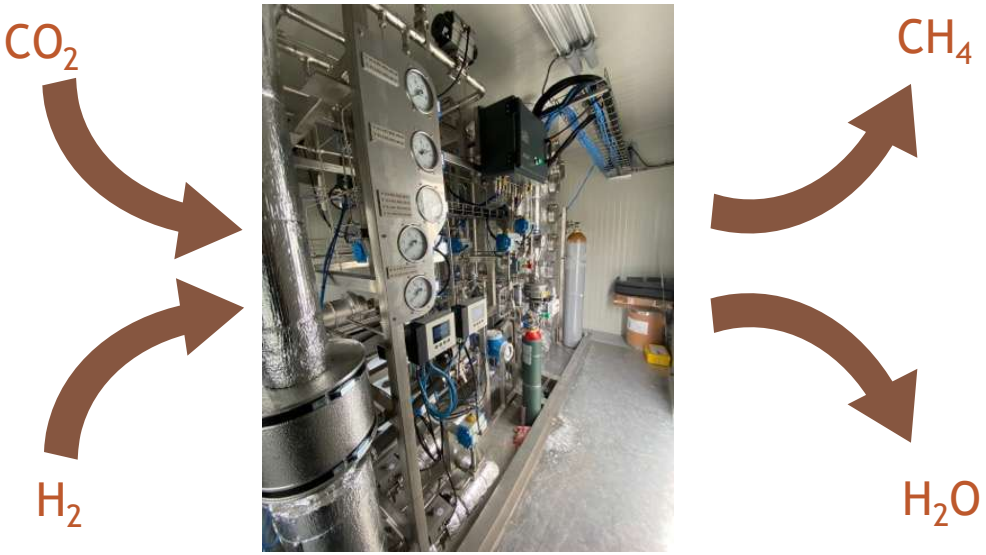
Time	State / Action
Start of day	HyCo system ready and full
06:30	Refueling of truck / bus 1
07:00 – 12:00	Recharging system
12:00	Refueling of truck / bus 2
…	…

- Up to 4x28 kg refueling over 24 hours or 112 kg/day

9. UPSOM Methanation Reactor

$CO_2 + H_2 \Rightarrow CH_4$ (Methane/Biogas)

Certified Technology for CO2 Methanation with H2



UPSOM – Methanation Reactor

- A new methanation technology with **improved efficiency and reduced costs**
- Directly convert CO_2 and H_2 into synthetic methane via the Sabatier process

$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$

- Synthetic methane is a **100% carbon-neutral** replacement for fossil natural gas
- New world record in **conversion with over 99% conversion efficiency** in a single stage thanks to novel catalyst and innovative reactor design
- Systems have been operational for 3 years
- Applications:
  1. Upgrade of raw biogas
  2. Use of CO_2 from flue gases
  3. Storage of surplus electric energy in synthetic methane



UPSOM – Methanation Reactor



Hydrogen buffer storage (DASH technology)

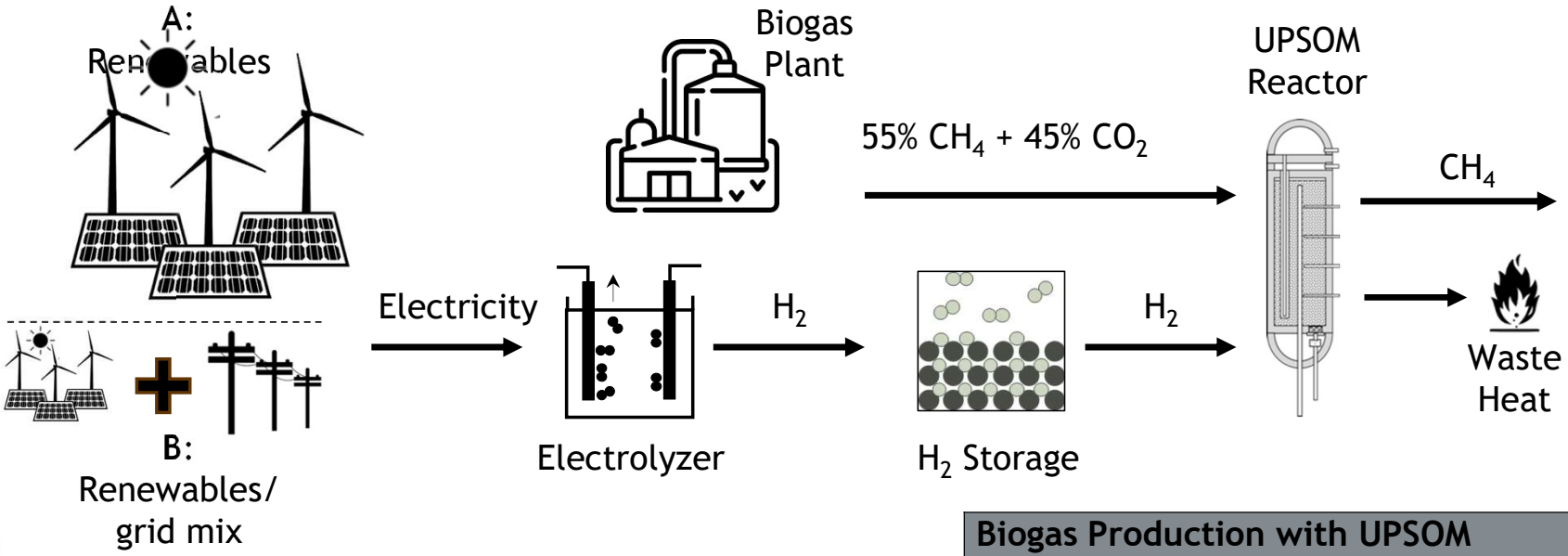
Electrolyzer

UPSOM methanation reactor

☛ Click to watch project video!
https://www.youtube.com/watch?v=Wsf8s-93K2s

Parameters	UPSOM-500	UPSOM-1000
Methane production (CH_4)	3.2 – 16.2 kg_{CH4}/h	7.4 – 37.5 kg_{CH4}/h
Hydrogen consumption (H_2)	1.6 – 8.1 kg_{H2}/h	3.7 – 18.75 kg_{H2}/h
Carbon dioxide consumption (CO_2)	8.9 – 44.4 kg_{CO2}/h	20.6 – 102.7 kg_{CO2}/h
Power (Eq. CH_4 HHV)	45 – 225 kW	104 – 520 kW
Input pressure of H_2 and CO_2 and operating pressure	10 bar(g)	
Average operating temperature	250°C	
Product shape	20ft-ISO Container	
Weight of complete containerized solution	9'800 kg	14'800 kg
Electrical power supply	32 A / 400V 3P	
Standby power consumption	500 W	
Dynamic operation	0% – 100% - 0% in seconds	
Start-up time from cold	15-30 minutes	
Compliance	ATEX Directive 2014/34/EU PED Directive 2014/68/EU LVD Directive 2014/35/EU	

Business Case: UPSOM



- Basic principle: **double the CH_4 output** with the same biomass input.
- The treatment of of raw biogas with UPSOM is a sustainable business model with great potential and interesting return.
- The cost of the synthetic methane produced is competitive with biogas prices in many market conditions.

Biogas Production with UPSOM Technology	A: Renewables	B: Renewables/ Grid mix
Operating hours per year (h/Year)	3000	8000
Cost of electricity (EUR/MWh_e)	40	80
CO_2 absorbed per year (t_{CO2}/Year)	493	1315
Compensation for CO_2 usage (EUR/t_{CO2})	100	100
Cost of synthetic methane (EUR/MWh_{CH4})	**111**	**138**

Assuming: customary subsidy on CAPEX (50%), 25 years lifetime, 3% interest rate, no sale of heat. Typical benchmark for biomethane price (animal manure): EUR 120-150/MWh_{CH4}

PHOTO – GAZ-NAT – SWISS GAS DISTRIBUTOR





UPSOM – Methanation Reactor



Hydrogen buffer storage (DASH technology)

Electrolyzer

UPSOM methanation reactor

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Power (Eq. CH_4 HHV)	45 – 225 kW	104 – 520 kW
Input pressure of H_2 and CO_2 and operating pressure	10 bar(g)	
Average operating temperature	250°C	
Product shape	20ft-ISO Container	
Weight of complete containerized solution	9'800 kg	14'800 kg
Electrical power supply	32 A / 400V 3P	
Standby power consumption	500 W	
Dynamic operation	0% – 100% - 0% in seconds	
Start-up time from cold	15-30 minutes	
Compliance	ATEX Directive 2014/34/EU PED Directive 2014/68/EU LVD Directive 2014/35/EU	

11. Green Amoniac

Modular container mounted, quick deployment technology

Green Ammonia Solutions from Volta-Swiss

- Volta-Swiss represents and work with a Modular Green Ammonia plant manufacturer
- We offer modular solution for small and large scale
- 2 sizes
  - Small modular production unit – 2000 of Ammonia per Year
  - Large modular production unit – 20000 of Ammonia per Year

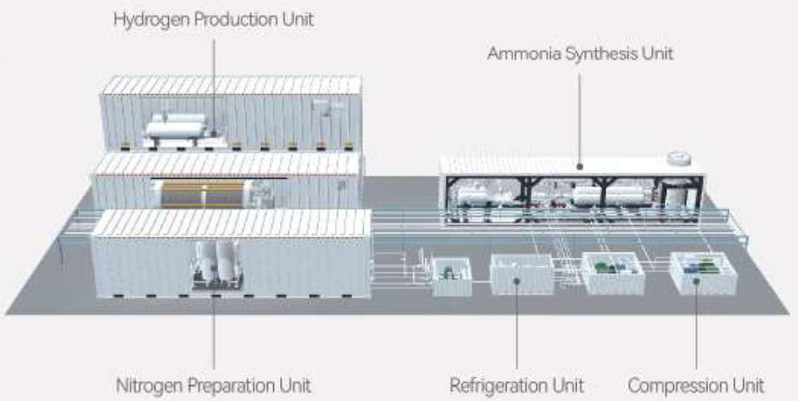




- Low Pressure Operation: 10–15MPa
- High Ammonia Net Value: ≥12%
- System Resistance: < 0.3MPa
- High-efficient Waste Heat Recovery
- Turn-down Ratio: 30–110%

Small modular 2.000 tons/year of Amonia production unit – For Flexible production needs

- 2000 tpa ammoniac production
- Easy deployable modules, fast installation & commissioning
- Short delivery times (~ 9 month)
- Fully automised, on site and remote survaillance
- Flexible operations, integrated buffers for Hydrogen and front-end power
- Very competitive pricing



◀ LAYOUT DIMENSIONS

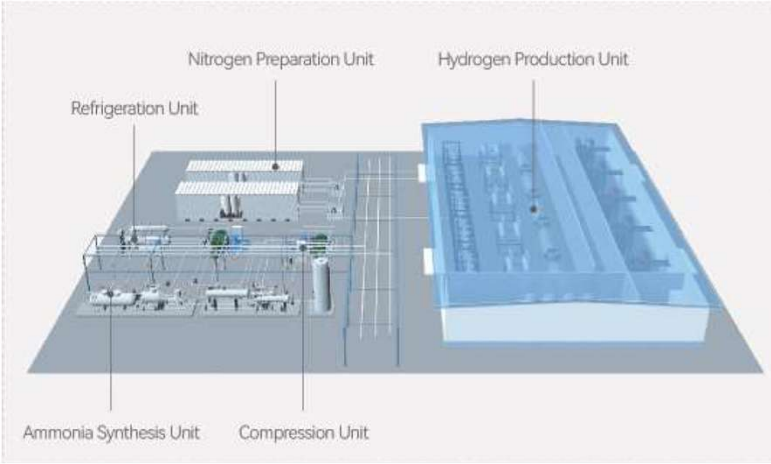
Unit	Length (m)	Width (m)	Height (m)
Hydrogen Preparation Unit	13	6	5.5
Nitrogen Preparation Unit	10	6	2.9
Compression Unit	10	5	1.7
Ammonia Synthesis Unit	12	2.5	2.8
Refrigeration Unit	6	2.5	2.5

MAIN PARAMETERS

Unit	Hydrogen Preparation Unit	Nitrogen Preparation Unit	Compression Unit	Ammonia Synthesis Unit	Refrigeration Unit
Cooling Water (T/h)	80	10	5	6	20
Electricity Consumption (kWh/h)	2,500	60	55	37.5	85
Floor Area (m^2)	78	60	50	30	15

20.000 tons/year of Amonia production unit – For high production needs

- 20000 tpa ammoniac production
- Easy deployable modules, fast installation & commissioning
- Short delivery times (~ 9 month)
- Fully automised, on site and remote survaillance
- Flexible operations, integrated buffers for Hydrogen and front-end power
- Very competitive pricing



◀ LAYOUT DIMENSIONS

Unit	Length (m)	Width (m)	Height (m)
Hydrogen Preparation Unit	60	28	10
Nitrogen Preparation Unit	15	7	4
Compression Unit	14	10	2.5
Ammonia Synthesis Unit	12	7	4.5
Refrigeration Unit	10	3.5	3

MAIN PARAMETERS

Unit	Hydrogen Preparation Unit	Nitrogen Preparation Unit	Compression Unit	Ammonia Synthesis Unit	Refrigeration Unit
Cooling Water (T/h)	800	100	50	60	200
Electricity Consumption (kWh/h)	25,000	600	550	132	650
Floor Area (m^2)	1,680	105	140	84	35

11. SWISS & EU FINANCING SUPPORT

FINANCING SOLUTIONS

Volta-Swiss can offer client financial service support to realise the hydrogen and renewable energy projects:

1. EU funding via “Climate Action” and “Innovation funds”

2. UBS/Crédit Suisse and the Swiss governmental agency SERV => we can help to acquire very advantageous financing opportunities:

Key Features of UBS&SERV funding:

- Financing duration: 2 to 10 years (duration up to 20 years possible in special cases)
- Yearly interest rate: between 2% to 6%, depending on the risk rating and the duration
- The higher the amount, the cheaper the financing

Conditions of UBS&SERV funding:

- Minimal project volume: EUR 1M
- Solvable partner/customer (must be demonstrated to SERV)
- Down-payment of min. 15% of the total project volume at order

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QUESTIONS ?

