

Tri-fuel gas turbine

2025.06



氢能科技 · 高效零碳

Zero Carbon Emission through Hydrogen Gas Turbine

Marvel-Tech is the world's first tri-fuel gas turbine OEM



- Shanghai Marvel-Tech Co., Ltd. is a **high-tech enterprise** in the field of green energy founded in 2015 in Shanghai. The company is committed to the development of a **new generation of zero-carbon fuels turbine technology**. Marvel-Tech is the **first and only company worldwide** that has developed and manufactured **tri-fuel combustion (H2/NH3/NG) turbine** to empower green economy.

Management Team's Solid Track Record

Key Clients



The 1st steam turbine in China for concentrated solar power



50MW NG gas turbine



660MW USC steam turbine



World's largest SCO2 turbine



APU air inlet / Nacelle



Leading Investors Backing Marvel-Tech

Key Investors

Top VC in China



Top 3 wind turbine OEM in the world



A full range of R&D centers, Test Centers and Production Site



**R&D Center
(Shanghai)**

- ✓ Area: 3,000 m²
- ✓ R&D Center for gas turbine development and H₂/NH₃ combustion technology
- ✓ >100 R&D Engineers, over 50% have masters or doctors' degree, covering GT development from scratch to product



**H₂/NG Gas Turbine Test Stand
(Hangzhou)**

- ✓ Area: 5,000 m²
- ✓ H₂/NG Combustor test stand
- ✓ Gas Turbine Assembly Workshop
- ✓ H₂/NG GT engine test stand (up to 5MW)
- ✓ the first 100% H₂ GT in China successfully developed



**Combustion Research Center
(Shanghai)**

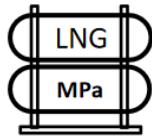
- ✓ Area: 5,000 m²
- ✓ H₂/NH₃/CH₄O atmospheric combustion test stand
- ✓ Gas Turbine Assembly Workshop
- ✓ 3D printing workshop for advanced burner nozzle development



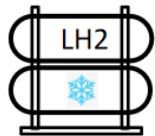
**Production Center
(Chifeng)**

- ✓ Area: 50,000 m²
- ✓ H₂/NH₃/NG full pressure combustion test stand
- ✓ Gas Turbine Assembly Workshop
- ✓ H₂/NH₃/NG GT engine test stand (up to 50MW)
- ✓ Green H₂/NH₃ supply from wind and solar power to enable the P-X-P chain

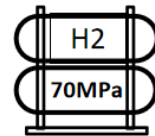
Different hydrogen carriers



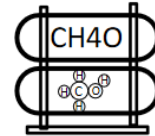
Natural Gas



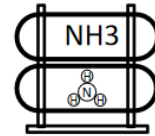
Liquid Hydrogen



High Pressure Hydrogen



Methanol

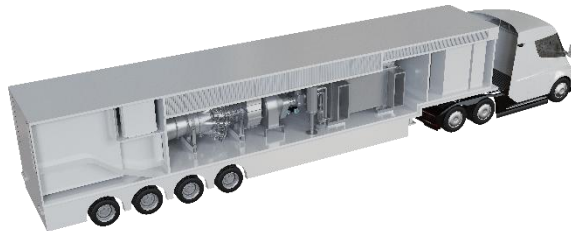


Ammonia



Gas Turbine Package Solution:

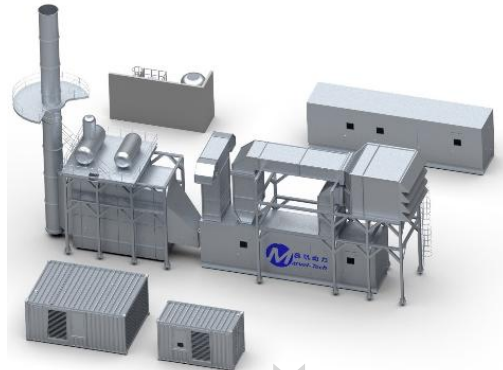
- Mobile version: Mobile Power Unit



Electricity

Gas Turbine Package Solution:

- Stationary version: CHP Power Plant



Electricity



Steam

MGT8000

A Gas Turbine for all Hydrogen Fuels

A New ZERO Emission Solution in Hydrogen Era

➤ Flexible Operation

Can direct burn pure H₂, NH₃ and CH₄

Online Fuel Switch over among H₂, NH₃ and CH₄ in tri-fuel combustor

➤ Best solution to NH₃ long duration energy storage

PEM fuel cell can only use 99.99% pure H₂

Piston Engine can not burn pure NH₃

Limited power of fuel cells and piston engines

➤ High & Stable Performance

>80% overall efficiency (electricity + steam)

>8000 kWe electric power output

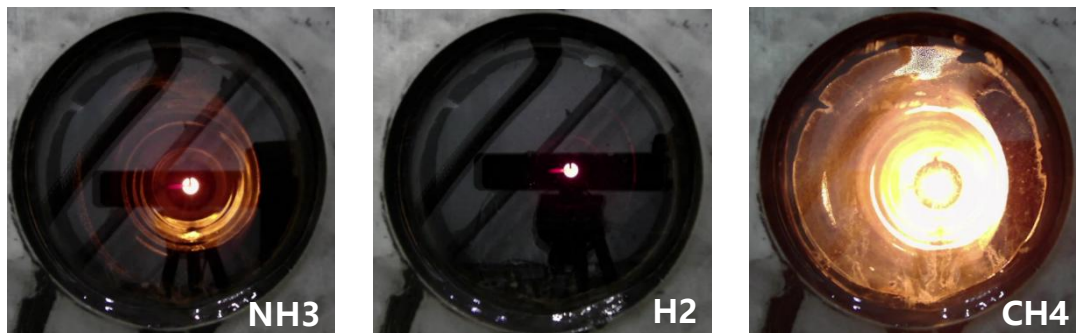
>16 t/h high pressure steam generation

>30000EOH between Overhaul

Technology: tri-fuel combustion and mobile power unit

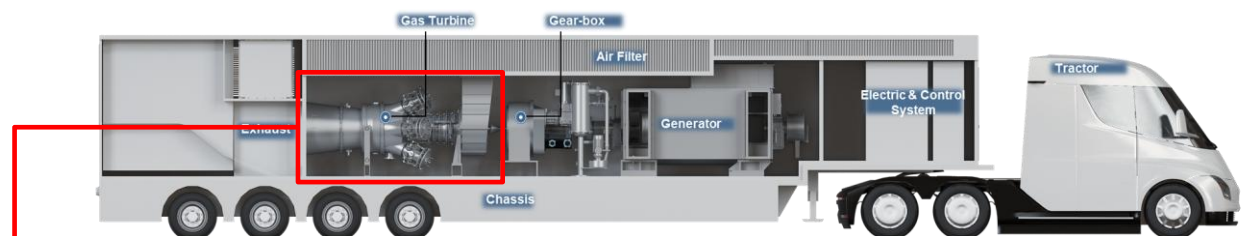


Worldwide **FIRST** Gas Turbine Tri-fuel Combustor (H₂/NH₃/CH₄)



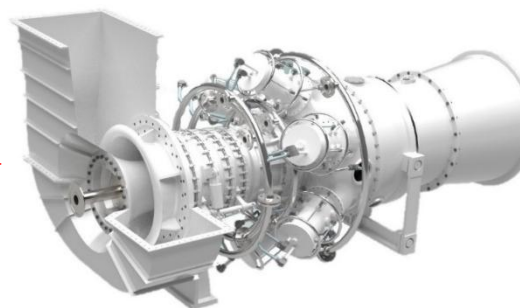
SGS Approved technology

Worldwide **FIRST** large size Carbon-neutral mobile Power Generator



Main Features

- highly integrated design, one truck for everything
- Compact and lightweight, 17m long and 70 tons
- High mobility, and adaptable to various road conditions
- Multiple fuel flexibility (NG, H₂, NH₃, etc.)
- Easy and quick installation, starting up within 4 hours after parking

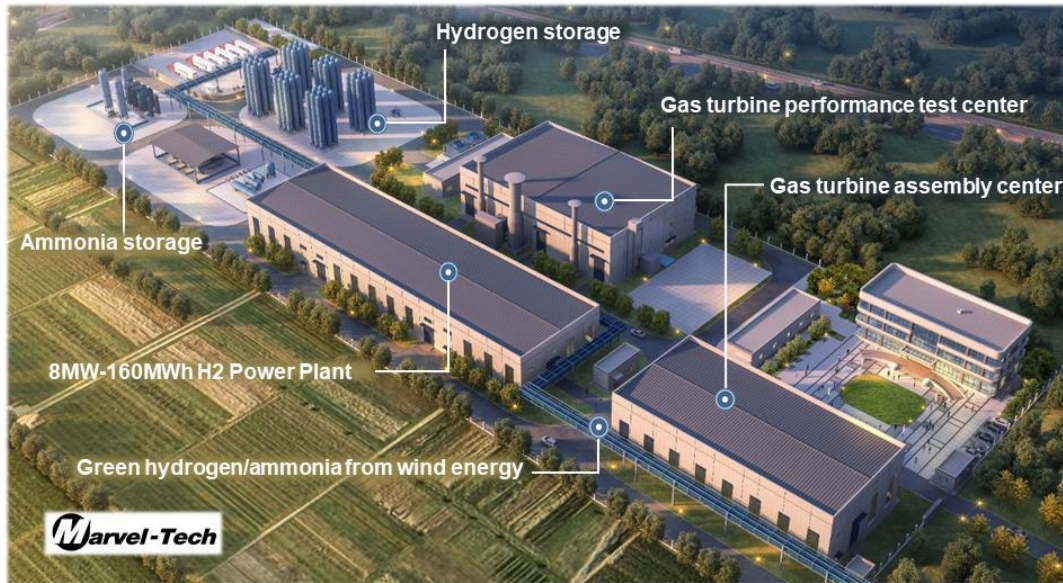


Core gas turbine engine

Chifeng Production Center



World's only GT center with onsite green Hydrogen/Ammonia production



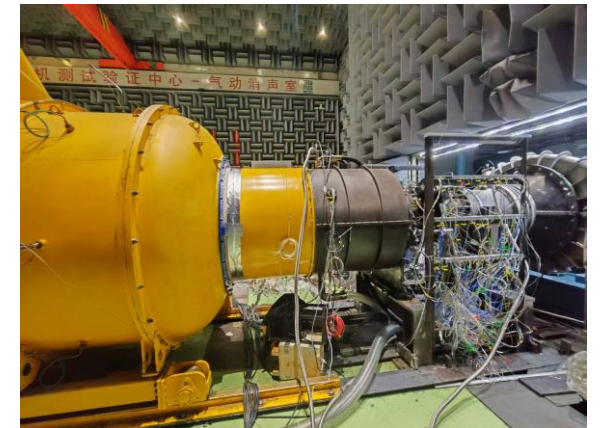
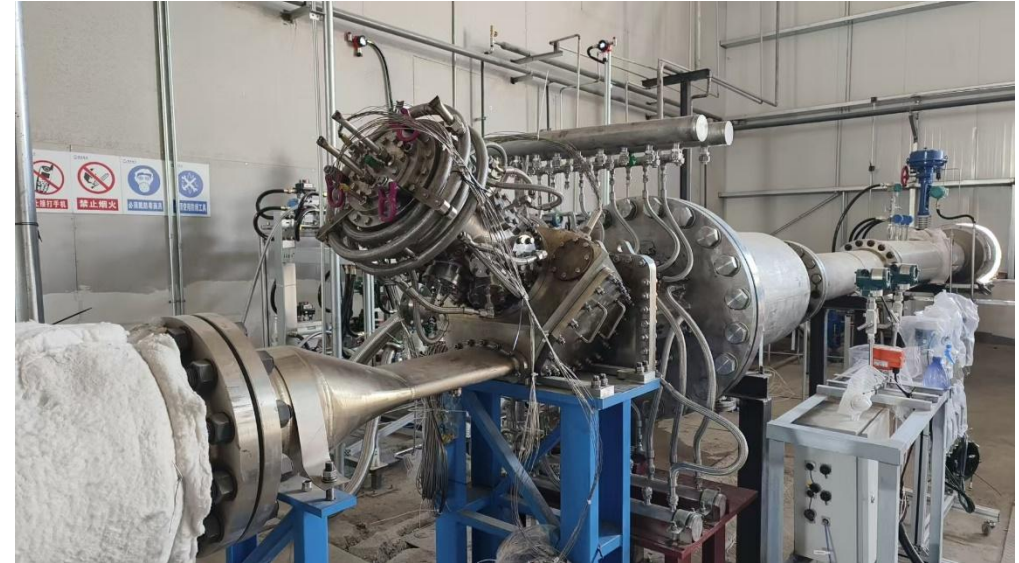
Gas Turbine manufacture capability:

- **20 units of tri-fuel gas turbines per year**

Fuel flexibility for performance testing:

- High pressure H₂ storage > 10 t
- Liquid Ammonia storage > 100 t
- Natural Gas pipeline connection

Chifeng Production Center



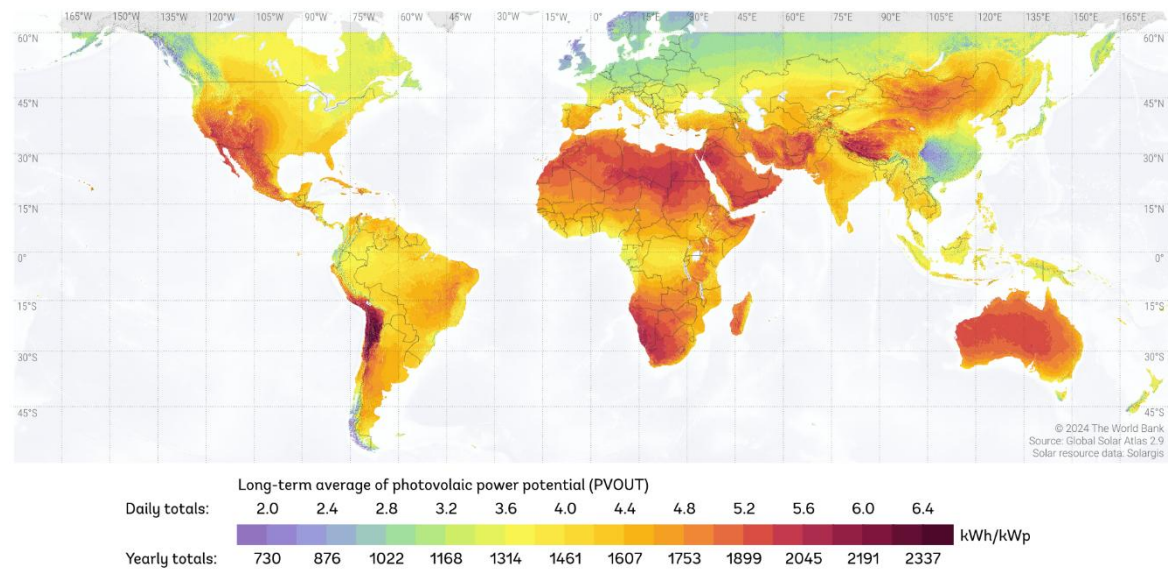
Chifeng Production Center



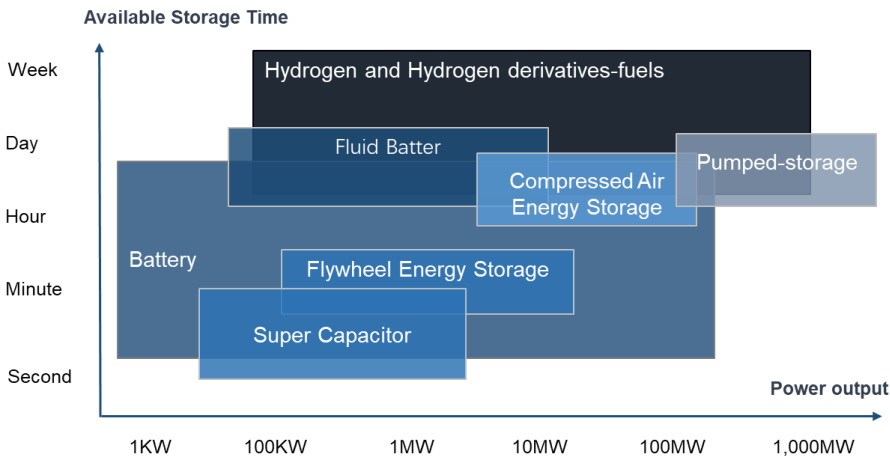
Market: transport of renewable energy



Long distance transportation of renewable energy



- ✓ There are many areas with very limited renewable energy resources.
- ✓ Import hydrogen-based molecules to achieve carbon neutral.
- ✓ Direct burning of $\text{NH}_3/\text{CH}_4\text{O}$ in gas turbine to generate electricity is the most efficient and economic way.



Main characteristics		Ammonia	Liquefied hydrogen	LOHC (benzyltoluene)
Storage density	Volum. [kg H ₂ /m ³ of carrier]	121.2 ¹	70.8	55.2
	Gravim. [kg H ₂ /t of carrier]	177.5 ¹	1,000	62.7
Energy needs	Conversion [MWh/t H ₂]	5.75	12.0	0.5
	Reconversion [MWh/t H ₂]	11.2	0.6	15.0
Technological and process maturity	Conversion – Small scale	■	■	■
	Conversion – Large scale	■	■	■
	Storage	■	■	■
	Transportation – Ship	■	■	■
	Transportation – Rail	■	■	■
	Transportation – Truck	■	■	■
Operational value propositions	Advantages	• High storage capacity • Mature value chain, except for cracking process	• No reconversion required • High purity hydrogen	• Easy to store and transport (diesel-like liquid) • Use of existing infrastructure
	Disadvantages	• Additional purification step needed • High energy requirements for cracking process	• Boil-off losses along value chain • High energy requirements for liquefaction • Storage and transport complexity	• Number of cycles impact environmental footprint • High energy requirements for dehydrogenation
	Safety	• Acute toxicity, flammable, explosive under heat, toxic to aquatic life	• Highly flammable with no visible flame, can form explosive mixtures with air	• Low toxicity, non-explosive, hazardous to aquatic environment

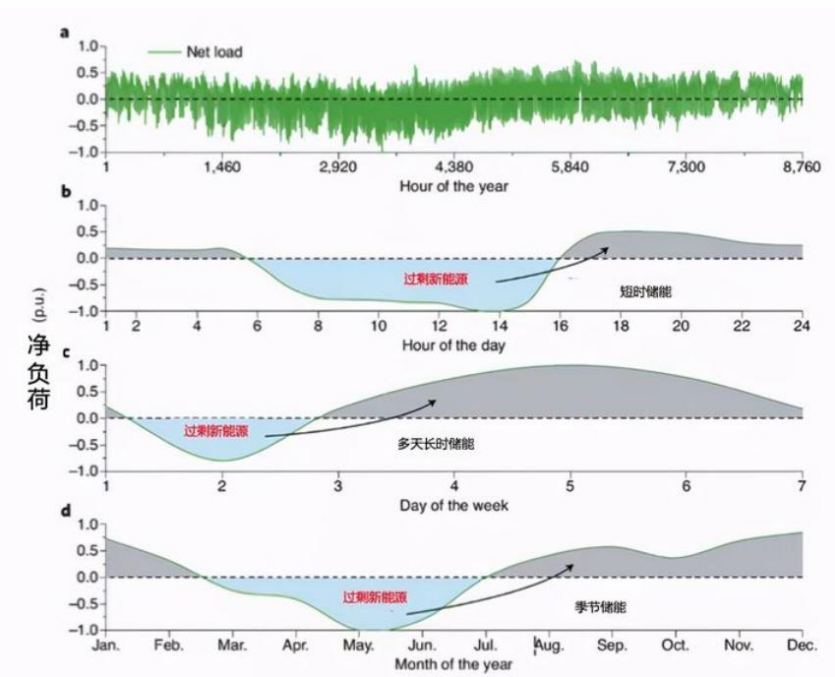
¹ Properties of liquid ammonia
Source: IEA, Roland Berger

■ Proven & commercial ■ Prototype demonstrated ■ Technology validated or under development

Market: storage of renewable energy



Long duration energy storage for renewable energy



1KWh energy storage cost:

Battery >> H2 >> NH3

Short duration energy storage:

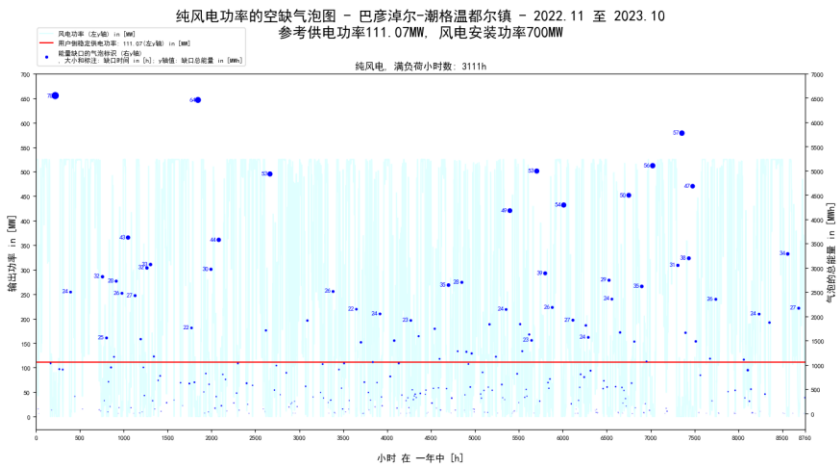
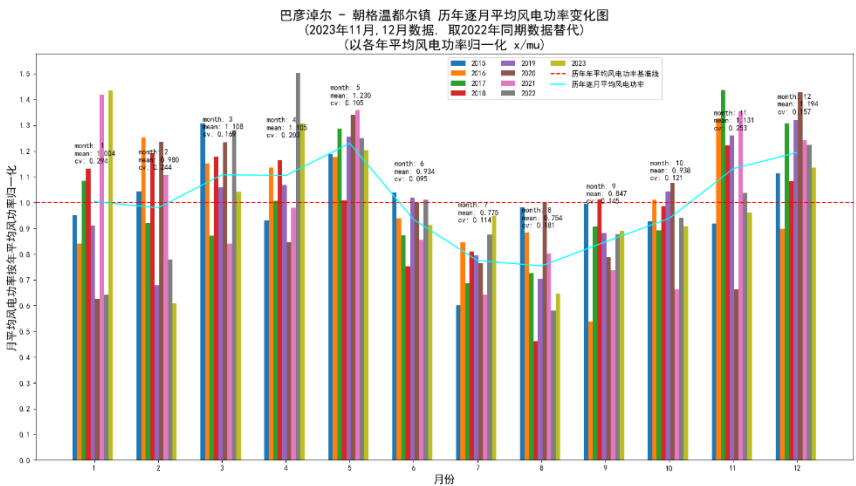
- Battery
- High efficiency (85%)

Medium duration energy storage:

- H2 + Gas Turbine

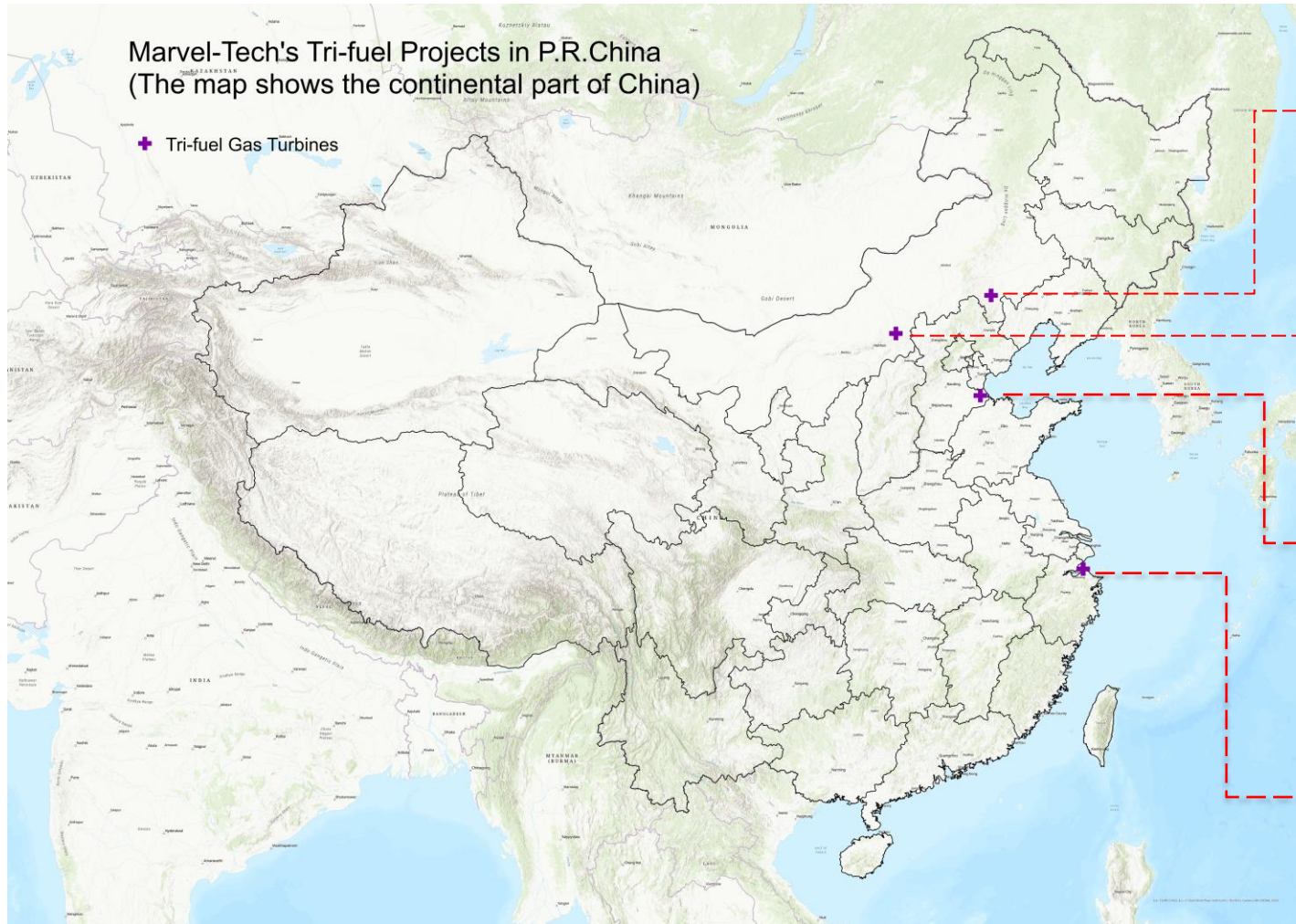
Long duration energy storage:

- Ammonia + Gas Turbine



- ✓ Area with rich renewable energy: MENA, China, US, Australia.
- ✓ Surplus renewable energy be stored in hydrogen-based molecules for long duration energy storage
- ✓ Gas turbine using these hydrogen carriers can provide electricity for grid-peaking or off-grid backup.

Projects of Marvel-Tech



Marvel-Tech's Tri-fuel Projects in P.R.China
(The map shows the continental part of China)

✚ Tri-fuel Gas Turbines

Ultra long duration energy storage

- 8MW / 160 MWh
- H2 / NH3 dual fuel

Emergency back up for IDC

- 8MW
- NH3 only

Ultra long duration energy storage

- zero-carbon industry park
- 8MW / 224 MWh
- H2 / NH3 dual fuel

Combined heat and power generation

- H2 / CH4 dual fuel



Thank you !