

Methanol & Hydrogen Fuel Cell and System

Version V5



CONTENTS



Why Methanol



DMFC



HTMFC



Methanol Reforming



Why Methanol



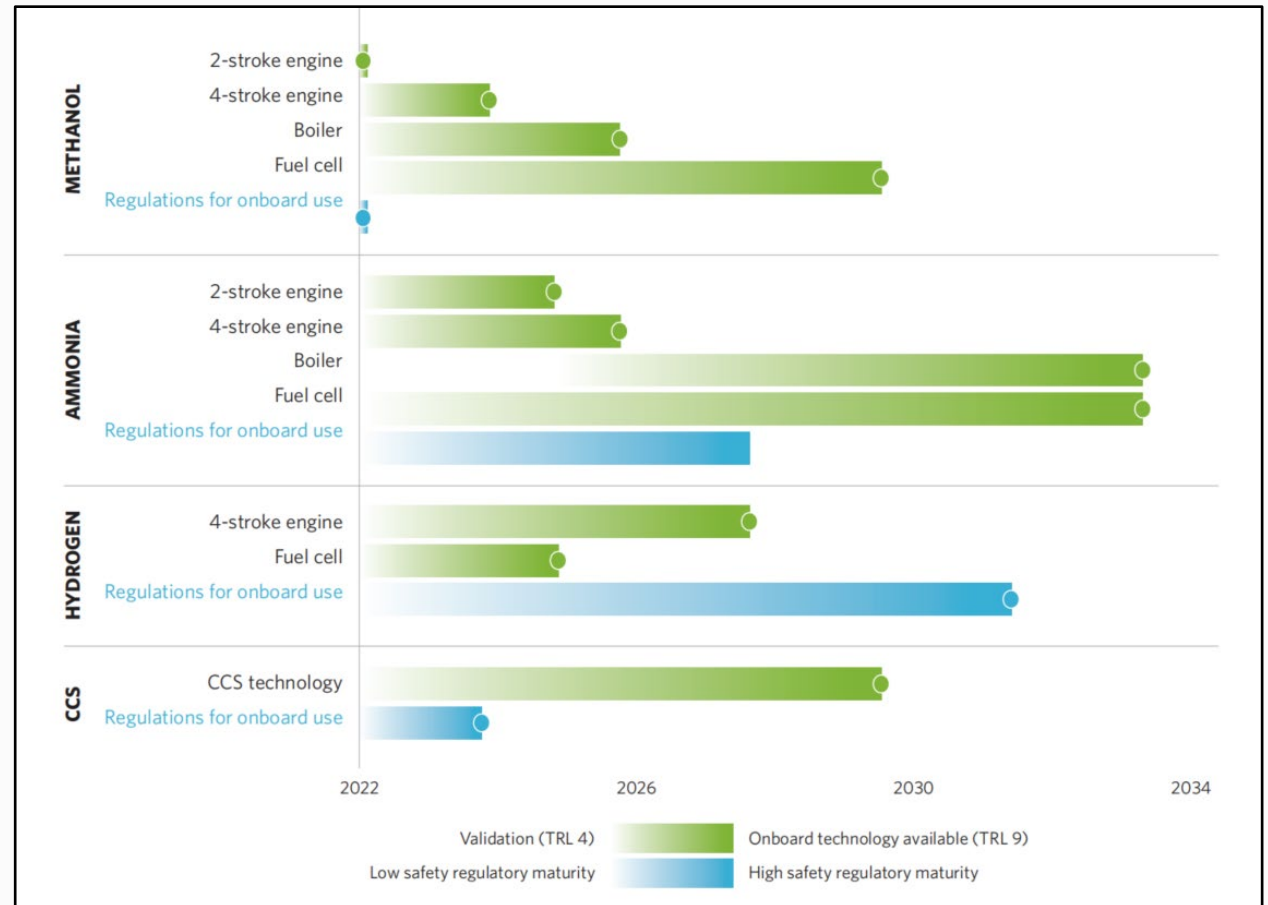


Why is methanol receiving attention?



Useage forecast

The safety maturity of methanol as an alternative marine fuel has been achieved



DNV conducted an evaluation of the expected availability of alternative marine fuel technologies in 2022

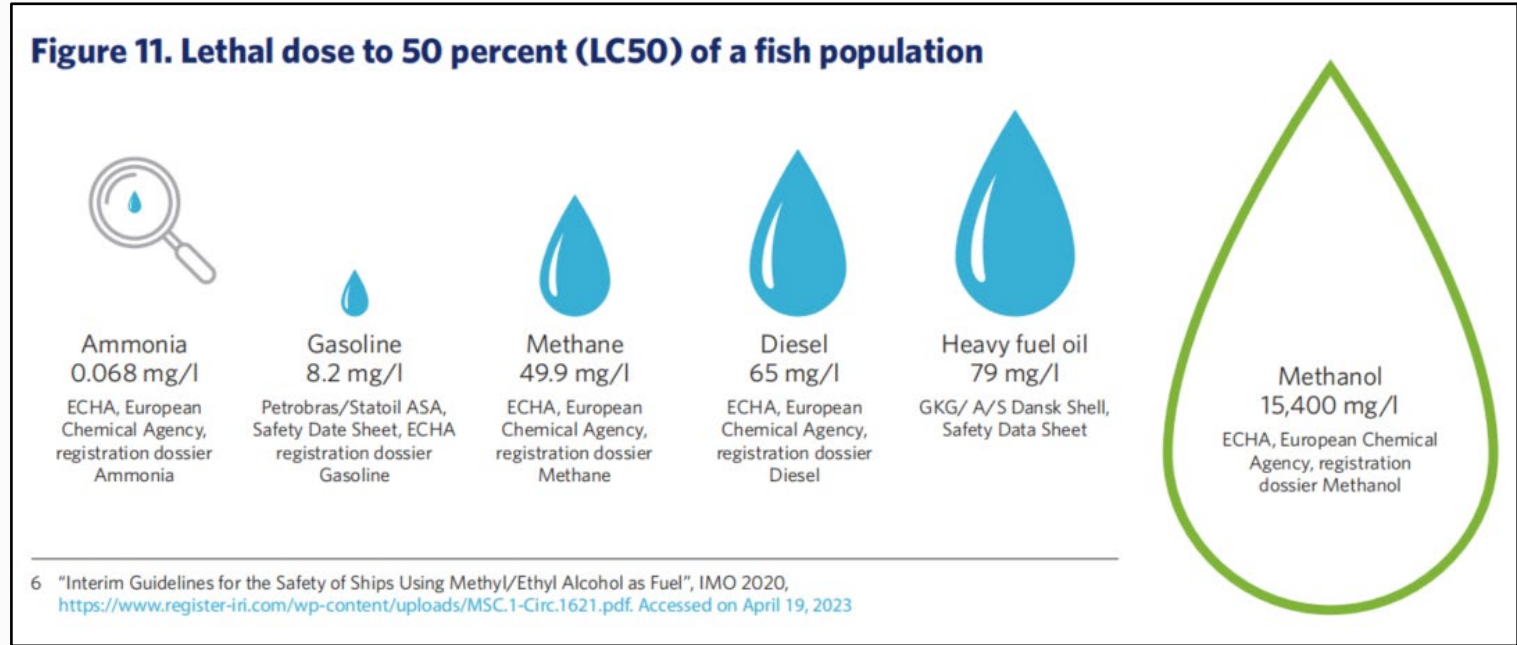


Why is methanol receiving attention?



Leakage pollution

Methanol leakage causes minimal ecological damage and threat



Lethal dose to 50% of a fish population



Why is methanol receiving attention?



Excellent physical and chemical properties

Excellent conditions in terms of volumetric energy density, storage pressure, and temperature



Fuel type	LHV* [MJ/kg]	Volumetric energy density [GJ/m ³]	Storage pressure [bar]	Storage Temperature [°C]
MGO	42.7	36.6	1	20
LNG	50	23.4	1	-162
Methanol	19.9	15.8	1	20
Liquid ammonia	18.6	12.7	1/10	-34/20
Liquid hydrogen	120	8.5	1	-253
Compressed hydrogen	120	7.5	700	20

*LHV: Lower heating value. Based on De Vries (2019)
Source: IRENA

Parameter comparison

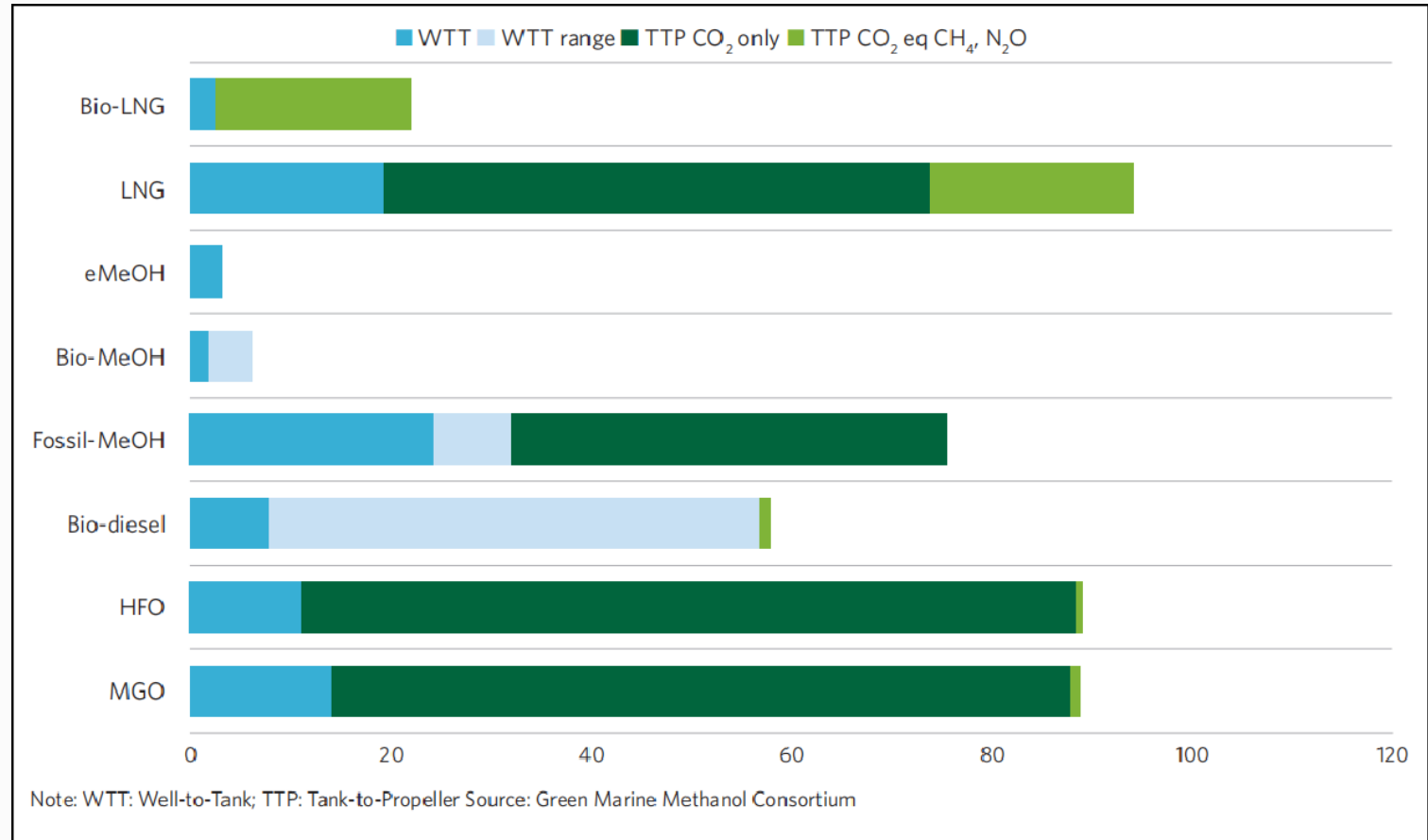


Why is methanol receiving attention?



Emissions

Biomethanol and renewable methanol exhibit excellent low emission performance



Emission comparison

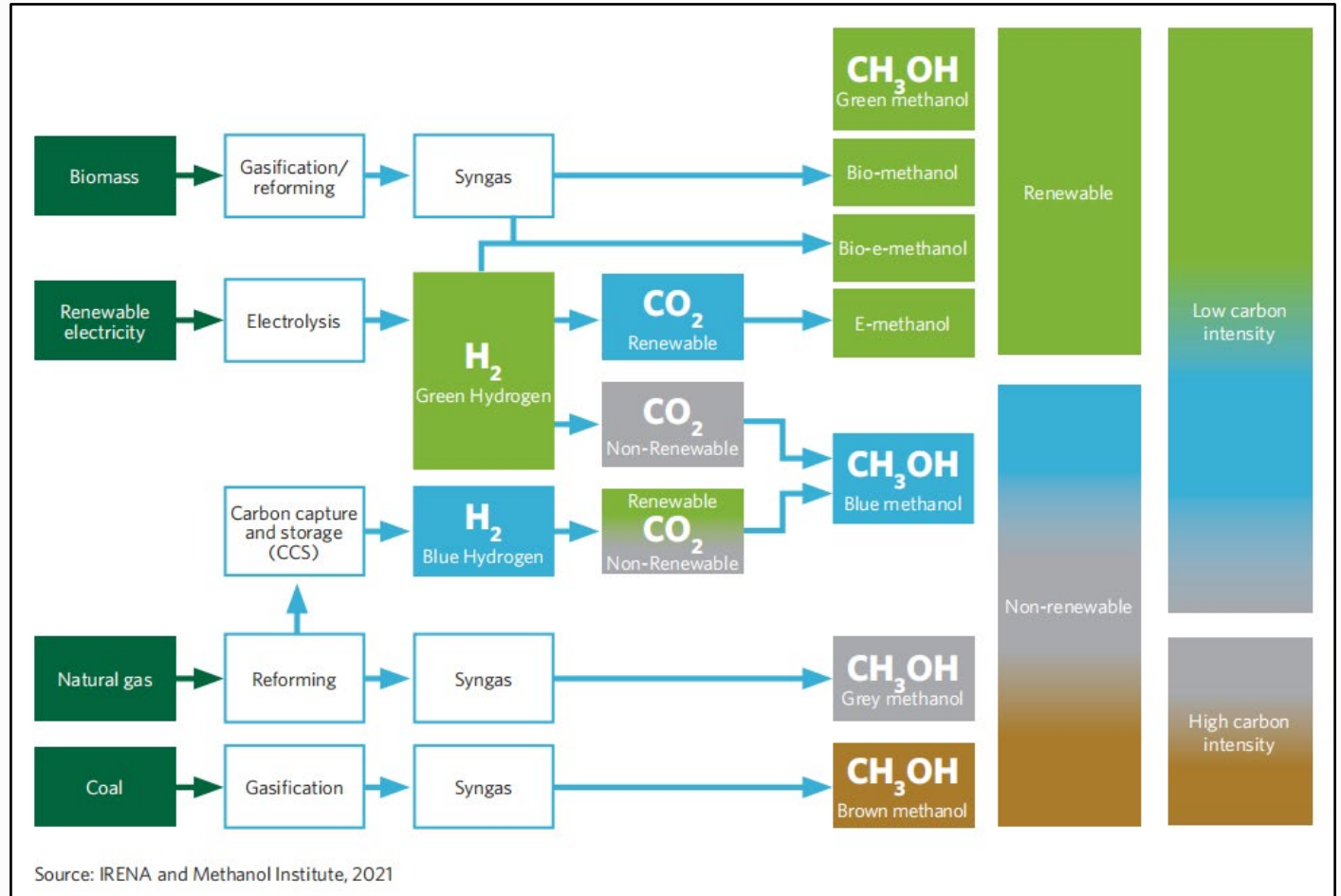


Why is methanol receiving attention?



Green methanol

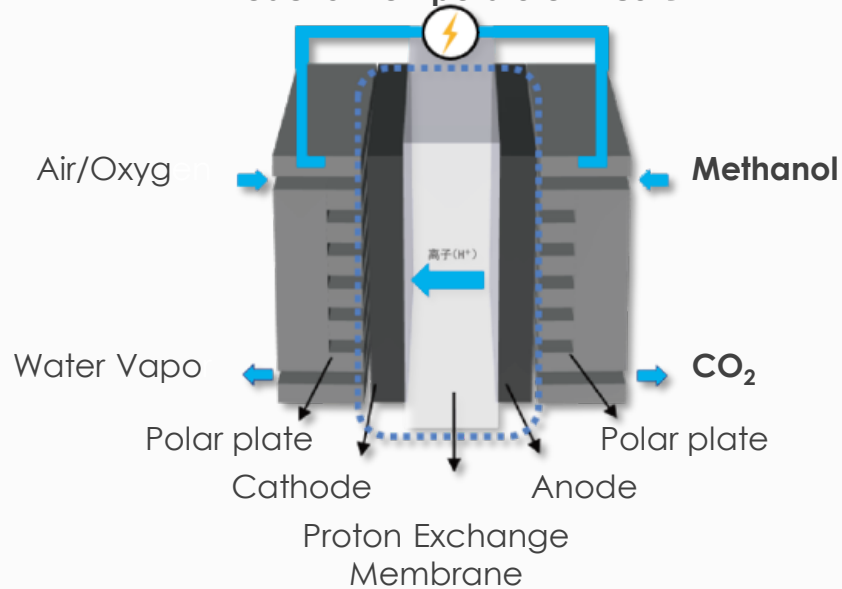
The popularization and cost reduction of bio methanol and renewable methanol will change the energy landscape







Basic principles of methanol fuel cell

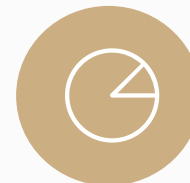
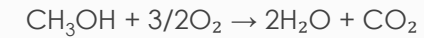


Input

A certain proportion of methanol aqueous solution and air



Reaction



Output

Direct current, water, small amount of CO₂, heat



Datasheet of DMFC



Model	DMFC-KH-50R	DMFC-KH-85R	DMFC-KH-130R	DMFC-KH-200R
Max. output power	50W	85W	130W	200W
Output power at 6000th hour	35W	60W	91W	140W
Max. charging current @10.5V (12V battery pack)/21.0V(24V battery pack)	3.3A / 1.7A	8.1A/4A	12.4A/6.2A	N.A./9.5A
Fuel consumption	0.8~1.1L/kWh (depending actual running environmental conditions)			
Fuel type	99.85% IMPCA standard methanol or DI water/methanol mixture(Methanol ≥60%)			
Operating temperature	-20°C~+50°C/-4°F~+122°F			
IP-Class	IP42			
Recommended altitude	≤3000m ABS			
Data interface	RS485 ModBus Slave Communication Protocol, 5-pin M16 aviation connector			
Weight	7.1kg	7.5kg	13kg	14kg
Size(L*W*H)	334*150*275mm	334*150*275mm	357*232*318mm	357*232*318mm
Warranty	24 months within 6000 hours			
Certificates	CE, FCC, CNAS			

Applications

Mission-critical Communications



Signal Repeater



Ground Receiver



Marine Network



Forest Network

Critical Sensors



Pipeline Monitoring



Avalanche Monitoring



Weather Monitoring



Earthquake Monitoring



Wind Measurement

Critical Control



Smart Mining



Flow Control



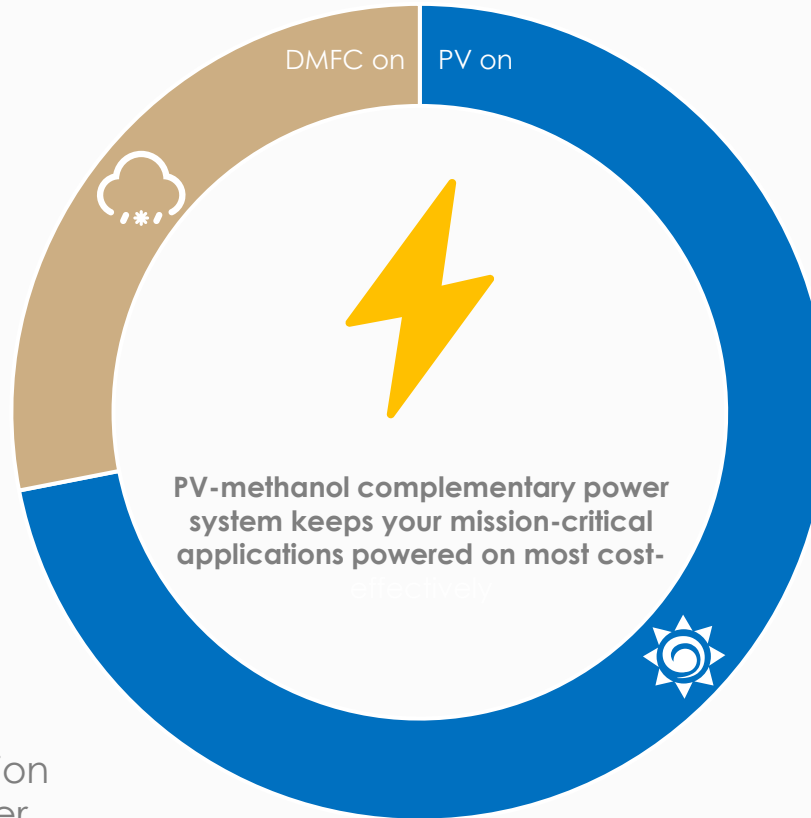
Entertainment



APPLICATIONS - DMFC-PV COMPLEMENTARY



Long-lasting independent power solution
Providing power regardless of weather conditions



Base station/signal repeater
critical base stations for IoT



Surveillance
spotting wild life and intruders



Weather Monitoring
Continuous data under all weather conditions



Border Guard
Leaving no trespassers unalarmed

Designed life cycle up to more than 5 years



CCTV SITE POWER SUPPLY



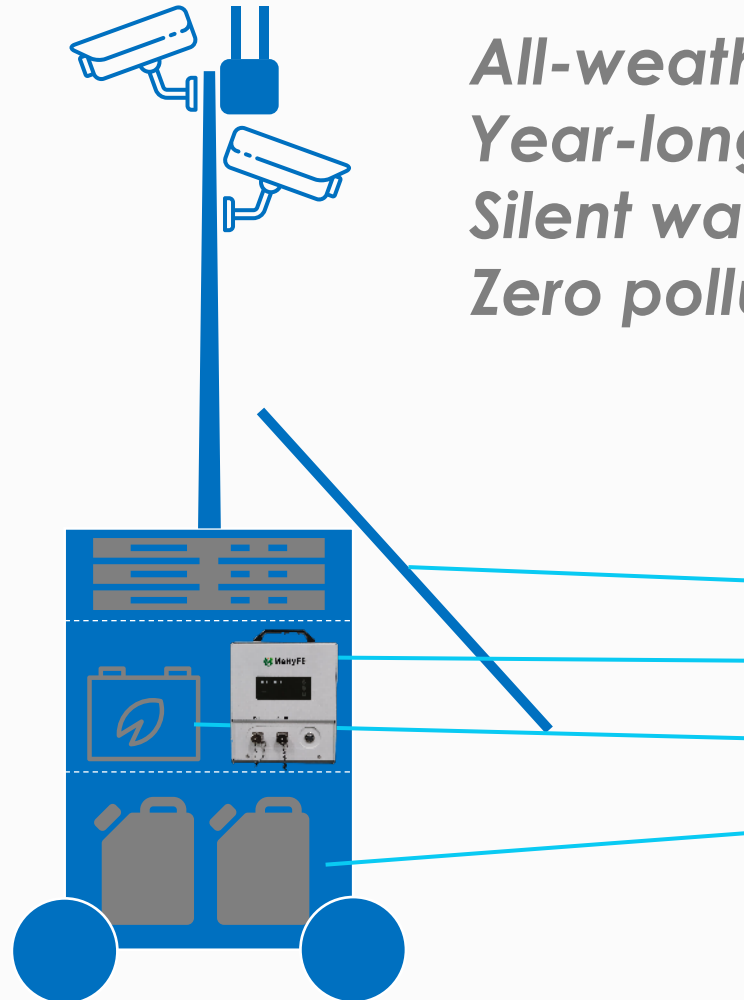
Challenge:

Construction sites are dynamic and often disconnected from stable utility power during early phases. Monitoring systems—security cameras, motion sensors, and remote access points—must operate continuously in rough outdoor environments. Frequent site layout changes and long construction timelines require power systems that are both flexible and autonomous. Diesel gensets add noise and fuel logistics burden. A modular, silent, and low-touch power supply ensures safety compliance and site visibility.

Typical Power Demand: 40–100W for camera systems, routers, and perimeter sensors.



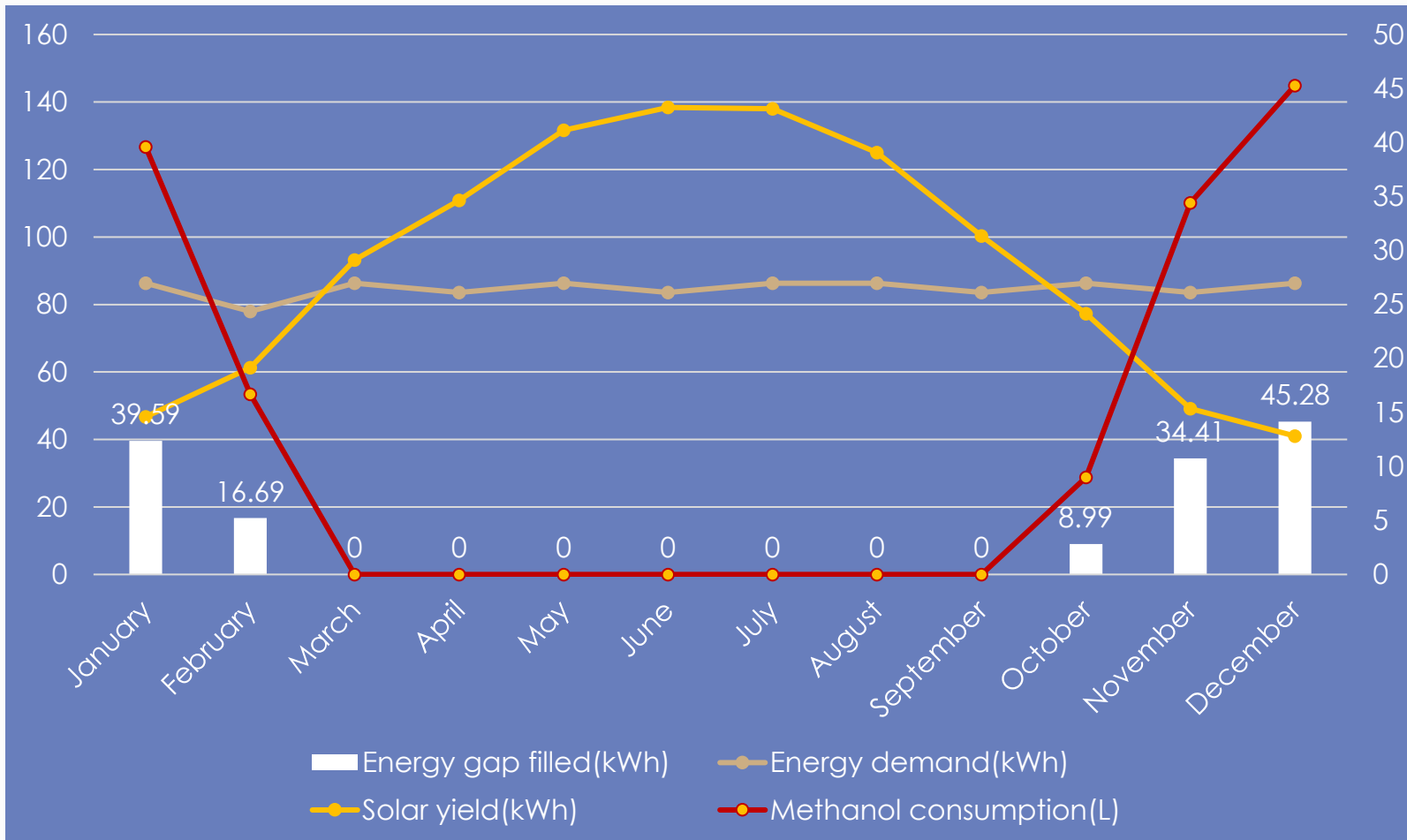
If power is granted, all else follows



All-weather durable
Year-long energy autonomy
Silent watch
Zero pollution

- PV panels to harvest solar power
- KH fuel cells to bridge the gap during sunless weathers
- Battery to store energy
- Methanol canisters to fulfil whole year energy demand

Uninterrupted Power All Year Round



Location: New York City
 Applications: Mobile Security Monitoring System
 Power Consumption:
 Camera: 24W*4
 Modem: 5W
 Led: 15W
 Total Power Consumption: 116W

Power supply:
 450Wp PV panel * 2
 DMFC-KH-130R * 1

Energy Gap: 144.96kWh
 Methanol Needed: ≈150L



Backup Power Supply for Isolated Drone Nest



Environment monitoring drone nests are installed in remote and isolated areas where PV panels are prone to have done time due to unpredictable weather conditions. Methanol fuel cell is a perfect patch to the entire system.

- **Client:** Geographic Disaster Monitoring Department, Tibet
- **Application:** Isolated drone nest uses fuel cell in addition to PV panels to make sure the monitoring online under any weather conditions
- **Product:** KH-130R
- **Average temperature range:** -40~40°C
- **Fuel type:** pure methanol



Stationary backup power for unmanned forest fire monitoring station, Beijing, China



- Client: Chinese Academy of Forestry
- Application: stationary backup power to the PV panels to keep forest fire monitoring system online all year round
- Product: MOC-50R with protection case
- Average temperature range: 35~43°C during summer
- Maximum ambient temperature under direct sunlight: around 50°C
- Fuel type: pure methanol

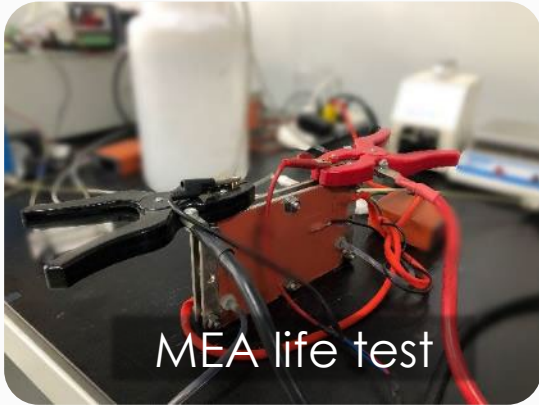
Wind Measurement Radar, Ishigawa, Japan



Ishigawa is located on the northern side of Japanese island, and confronts harsh snow directly from Siberia. During winter, snow accumulates over 50 centimeters and no solar panels can be up to the task. The client's LiDAR relies solely on Sushui's methanol fuel cell for more six months' continuous power.

- Client: Japanese Power Enterprise
- Application: Power supply for wind measurement LiDAR
- Product: DMFC-KH-130R
- Average temperature range: -10~30°C but with heavy snow
- Altitudes: ABS 3500m
- Fuel type: 60% water-methanol mixture required by local regulations

Quality Management



MEA life test



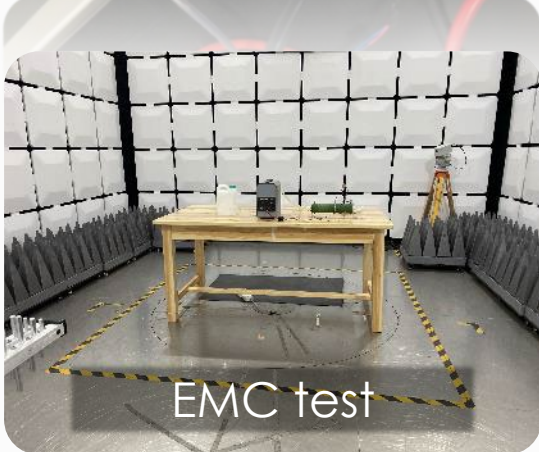
Stack fatigue test



Product environment test



Wave simulation test



EMC test



Product life test



Outdoor fatigue test



Electrochemical Test

All our products are tested to most strict standards





HTMFC Series



Single Module

Model	HTMFC U-5
Max Power	5kw
Continuous Power	4kw
Output Voltage	48V OR 560V DC
Power regulation	30~100%
Fuel	60% Methanol, 40% Deionized water
Fuel consumption	0.9L/kWh
Efficiency	46%
Operating Temp.	-20°C ~+50°C
Operating Noise	< 50dB(A)
Dimension	755 x 4550 x 265mm
Weight	65kg



Supporting non-standard customization and split installation

HTMFC Series

Standard Integrated Cabinet Series		
Fuel Cell	CS-2	CS-3
Voltage	48V DC OR 560V DC	
Lithium Battery	10~20kwh	10~40kwh
Peak Power	10kw	15kw
Continuous Power	8kwh	12kwh
Operating Temp.	-20°C ~+50°C	
Methanol Reserves	300L (About 353kwh)	
Operating Noise	< 45dB(A)	
Protection Degree	IP44	
Dimension (length, height, thickness)	1600x1200x1800mm	
Weight	~350kg	~420kg
System Configuration	Remote control module, supporting systems	



GR63 -19m Electric Cruising Catamaran

The GR63 is designed for luxury offshore cruising, with full autonomy. Clean and innovative technologies give the GR63 a durable and eco-responsible new approach to cruising. The two 100kW electric motors are powered by different innovative solutions such as solar panels, vertical axis wind turbines and fuel cells.

Technical Specifications

LOA 19.2m

BOA 9.2m

Draft 1.55m

Displ. 30t

Power 2 x 100kW

Fuel cell 4 x 5kW

Solar power 2 x 10kW

Wind power 2 x 8kW



FARAWAY - Recreational Vehicle



Power China - Unmanned patrol boat



5G Signal Tower Off grid power



METHANOL REFORMING





Methanol Reforming for Hydrogen Production + Low-temperature Hydrogen Fuel Cell



Reforming for Hydrogen Production System: 6~300Nm³/h



Hydrogen Fuel Cell System: 40~2000kw

The online analysis system is a standardized, modular, and specialized volatile gas detection system that integrates gas sampling, gas filtration, gas dehumidification, flow control, real-time concentration display, wireless data upload, and other functions; After purification treatment, the reformed gas undergoes active sampling and professional sample gas pretreatment. The clean, dry, and constant sample gas is sent to the gas analysis device to mainly detect the content of H₂, CO, H₂O and other components in the gas phase.

Based on the online analysis system and the pressure of the H₂ buffer tank, the operating parameters and hydrogen production load are automatically (or semi automatically) adjusted through the central control system to achieve safe and stable operation of the device.



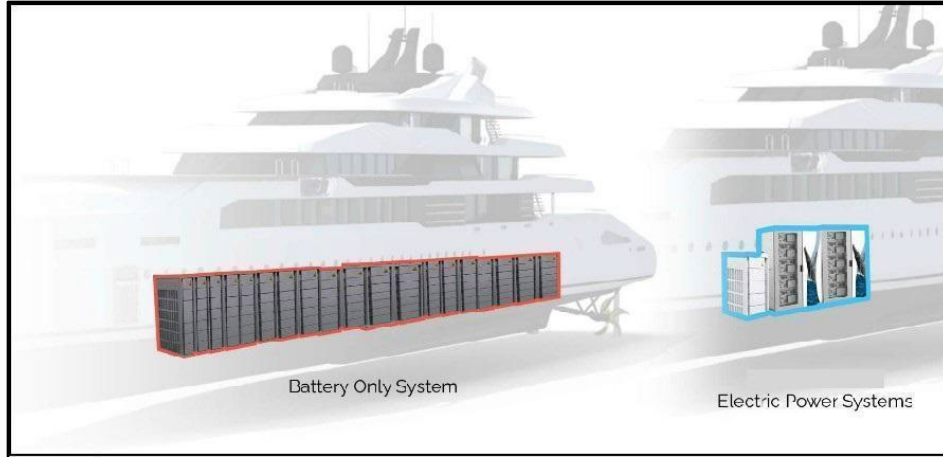
120TEU Container Vessel Application



Comparison Item	Energy Storage Lithium Battery	Methanol Reforming for Hydrogen Production + Low-temperature Hydrogen Fuel Cell
Power Supply	Limited by the battery capacity, use after charging	≥30000h
Route	Fixed route, battery needs to be replaced at a designated location	Non fixed route
Port Operation	Complicated, requiring replacement of energy storage batteries and transportation of energy storage batteries	Simple, port refueling or lifting of fixed capacity methanol tanks
Pollution	Significant risk of pollution during manufacturing and disposal processes	Discharge water and a small amount of carbon dioxide pollution-free
Quickly Expanded	no	yes



Methanol Fuel Cell vs Lithium Battery



- The weight of methanol fuel cell system is only 1/13 of that of lithium battery system
- The weight of methanol fuel cell system is only 30% of that of lithium battery system
- The comprehensive cost of methanol fuel cell system is only 1/8 of that of lithium battery system

*Note: The comparison data is based on a three-day cruising volume of 6MWh/day for the ship

Methanol vs Hydrogen



	Methanol	High Pressure Gaseous Hydrogen
Storage Tank	1000L	12 sets of 50L Gas Cylinders
Total Weight	850kg	1460kg
Hydrogen Content	99kg	13.2kg
Pressure	0	30MPa
Power	1670kwh	216kwh



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