



Methanol Institute's 30th Year Anniversary

Gregory Dolan, CEO

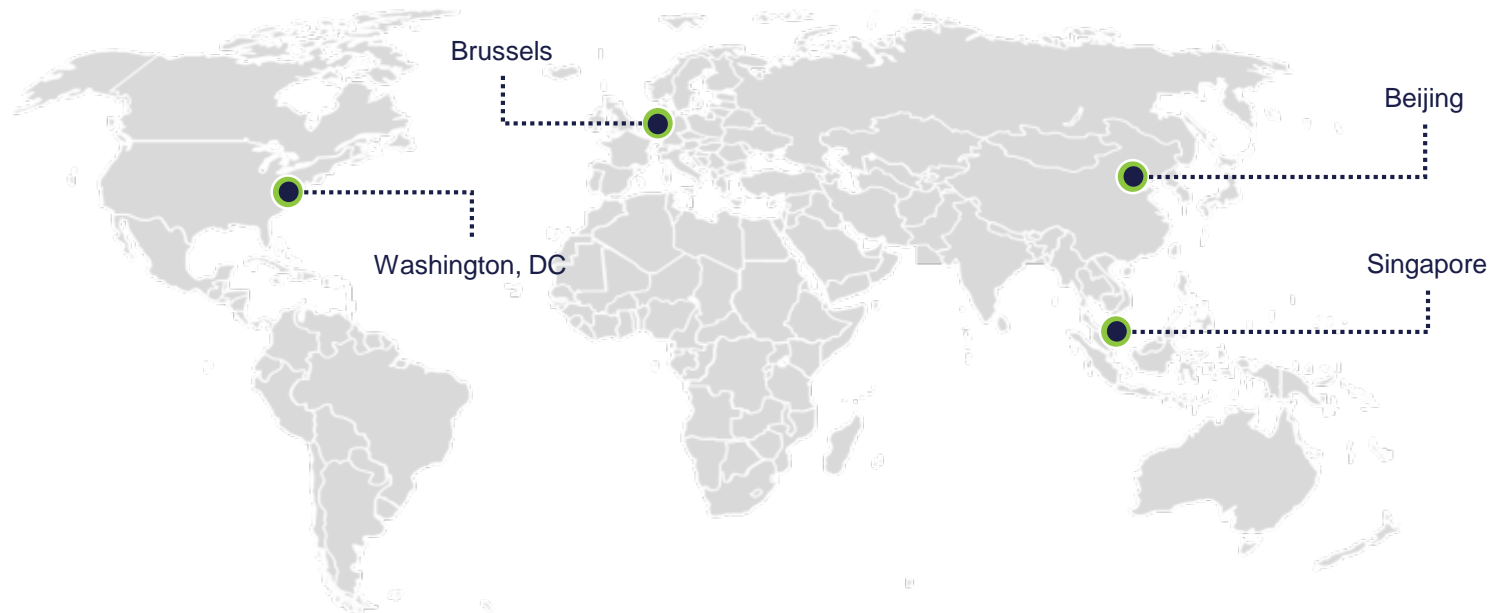
Ray Lewis – Founder/Past President

Argus Methanol Forum -- Houston

10 September 2019

MI HISTORY

- The Methanol Institute (MI) was established in 1989
- 30 years later, MI recognized as the trade association for the global methanol industry
- Facilitating methanol's expansion from our Singapore headquarters and regional offices in Washington DC, Brussels, and Beijing



MEMBERS

<https://www.methanol.org/join-us/>

Tier 1



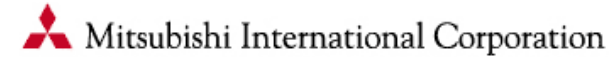
Tier 2



Tier 3



Ecofuel



Tier 4



Advent



HALDOR TOPSOE



NAKHODKA FERTILIZER PLANT



CLARIANT



CoogeeChemicals

OLAHMOTORS

OUR TEAM


Greg Dolan, CEO

- Joined MI in 1996 and held a variety of senior management positions within MI before being named CEO in 2013
- 10 years as a press officer for the State of New York and 2 years as legislative assistant in the US Senate
- Has authored or co-authored many works on the topic of methanol and is based in Washington, D.C.


Chris Chatterton, COO

- Joined MI in 2015 with more than 20 years executive level experience in energy, oil & gas and petrochemicals
- Led several, successful energy and agriculture initial public offerings (IPOs) and cross-border private placements
- Based in Singapore


Tim Chan, Manager of Government & Public Affairs – Asia Pacific/Middle East

- Joined MI full-time staff in 2018, after serving as an intern in 2016/2017
- Has also worked for Singapore Ministry of Transport and GR firm Burson-Marsteller
- Based in Singapore


Larry Navin, Director of Government & Public Affairs – Americas/Europe

- Extensive multi-lateral experience to include US-India Business Council, US Dept of Commerce Int'l Trade Administration
- Prior to joining MI, Mr Navin also held roles with the Overseas Private Investment Corporation (OPIC) and the US Senate
- Based in Washington, D.C.


Eelco Dekker, Chief EU Representative

- Joined MI in 2014 with an extensive background in European fuel blending, energy applications and regulatory affairs
- Former Chief Marketing Officer at BioMCN, with over 10 years in commercial roles with DSM and Ciba Specialty Chemicals
- Based in Brussels


Kai Zhao, Chief China Representative

- Joined MI in 2015 and serves concurrently as Director and project researcher at the Academic Board Office of the Centre for Global New Energy Strategy Studies (CGNESS) at Peking University, a position he has held for the last 8 years
- Based in Beijing


Belinda Pun, Executive Assistant

- Joined MI in 2018 after 17 years of experience as Executive Assistant and Administrative Manager
- Previously worked as office manager for Siemens Postal, Parcel & Airport Logistics
- Based in Singapore


Novpreet Bajwa, Operations and Web/Media Coordinator

- Joined MI in 2018
- Background in social media campaigns, web site optimization, web quality assurance, and office administration
- Based in Washington, DC

AMERICAN METHANOL INSTITUTE FOUNDER AND PAST PRESIDENT – RAY LEWIS





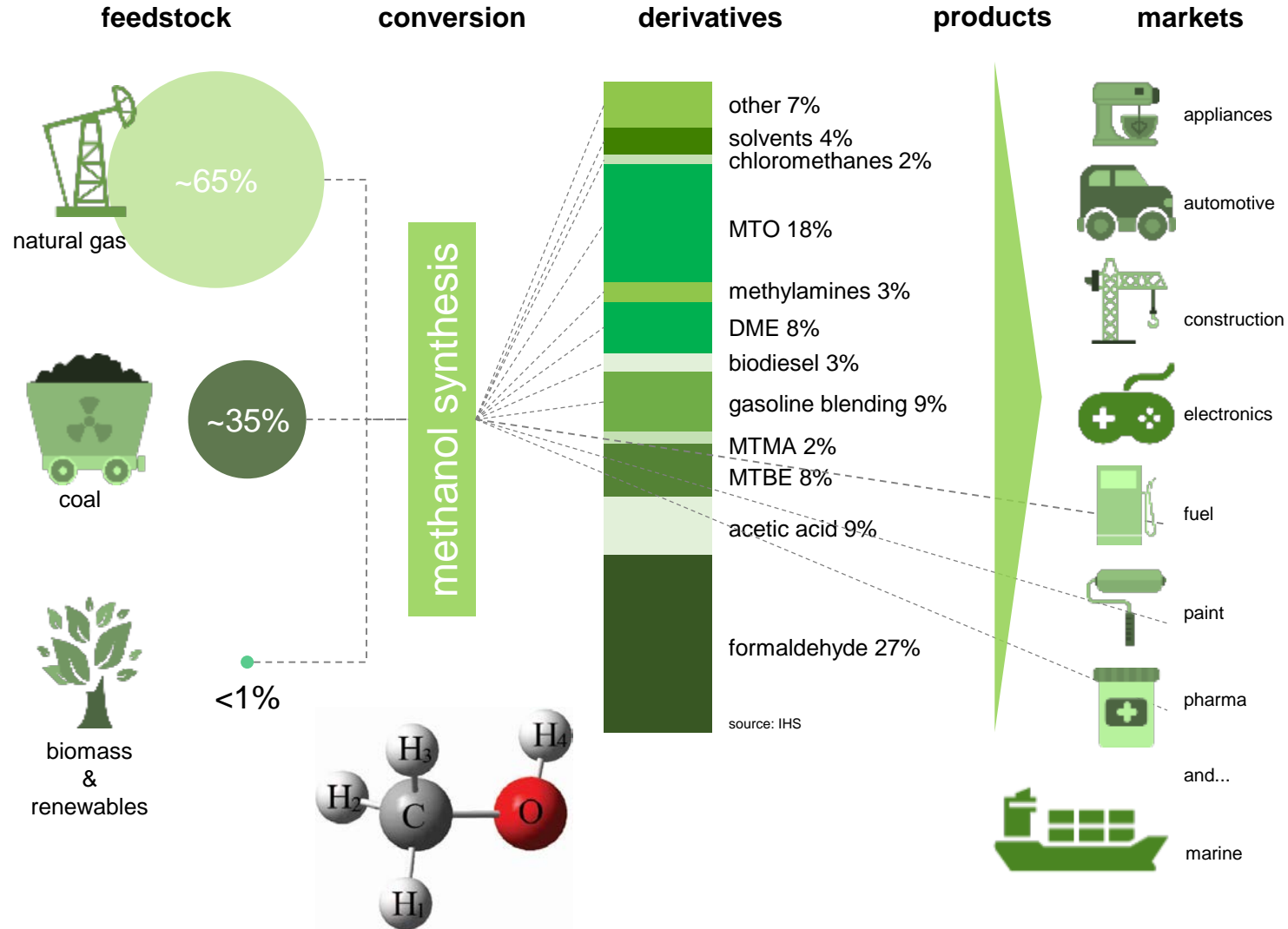
Methanol as an Energy Source: New Markets for Methanol

**Gregory Dolan, CEO – Methanol Institute
Argus Methanol Forum -- Houston
10 September 2019**

01

METHANOL ECONOMY

BROAD FEEDSTOCK RANGE, MANY APPLICATIONS



METHANOL IS A VERSATILE FUEL SOURCE

Out of the ~80 million metric tons of methanol sold globally in 2018, energy and fuel uses represent 40% of total demand

FUELS

- Neat fuel
- Low blends
- High blends
- GEM
- MTBE
- Biodiesel
- DME & OME
- MTG

TECHNOLOGIES

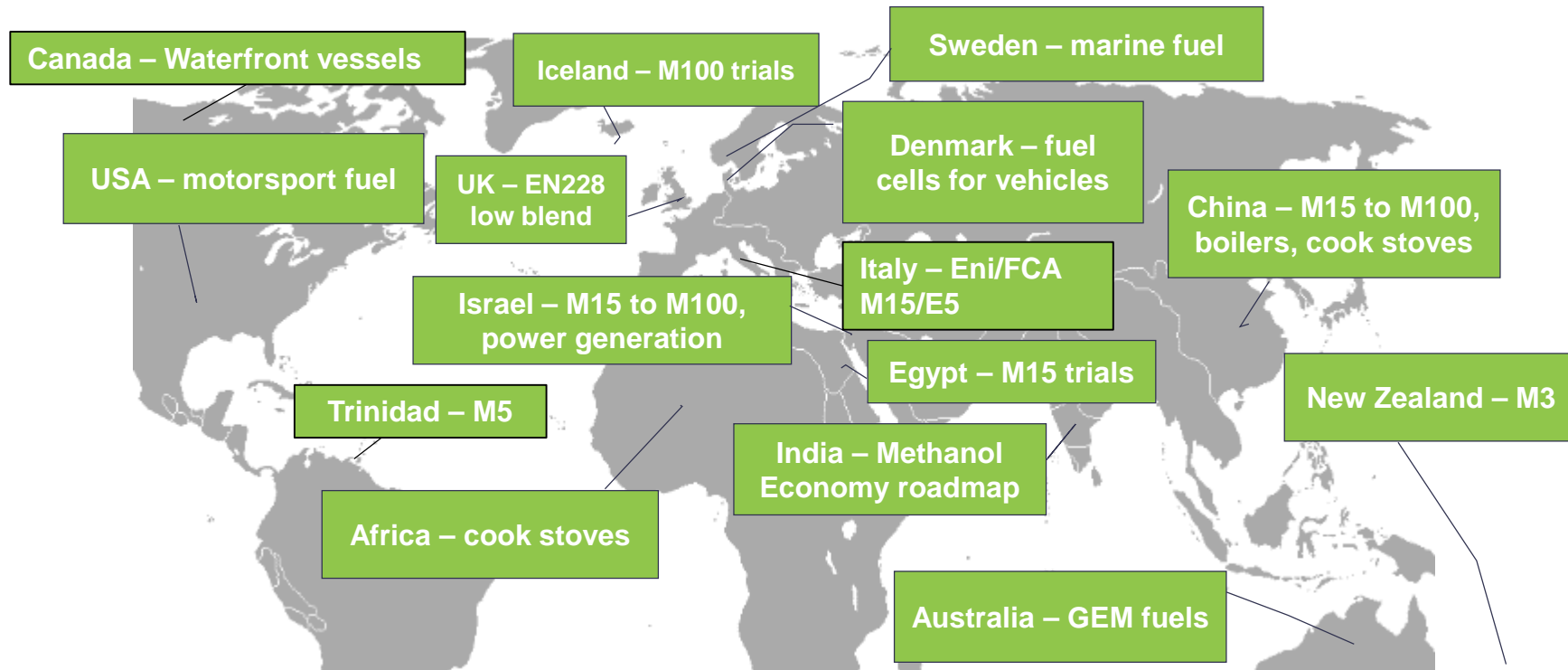
- SI & CI engines
- Turbines
- Fuel cells



SEGMENTS

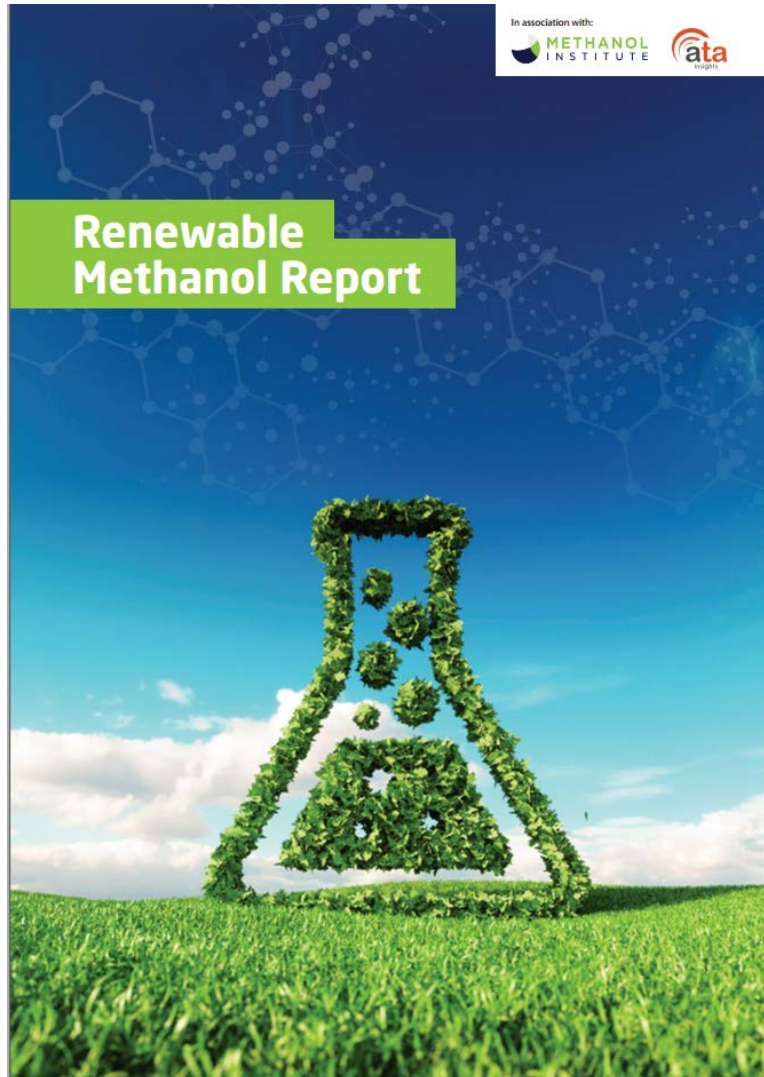
- Road & non-road transportation
- Power & heat generation
- Marine

GLOBAL METHANOL FUEL EXAMPLES



<https://www.methanol.org/energy/>

RENEWABLE METHANOL REPORT

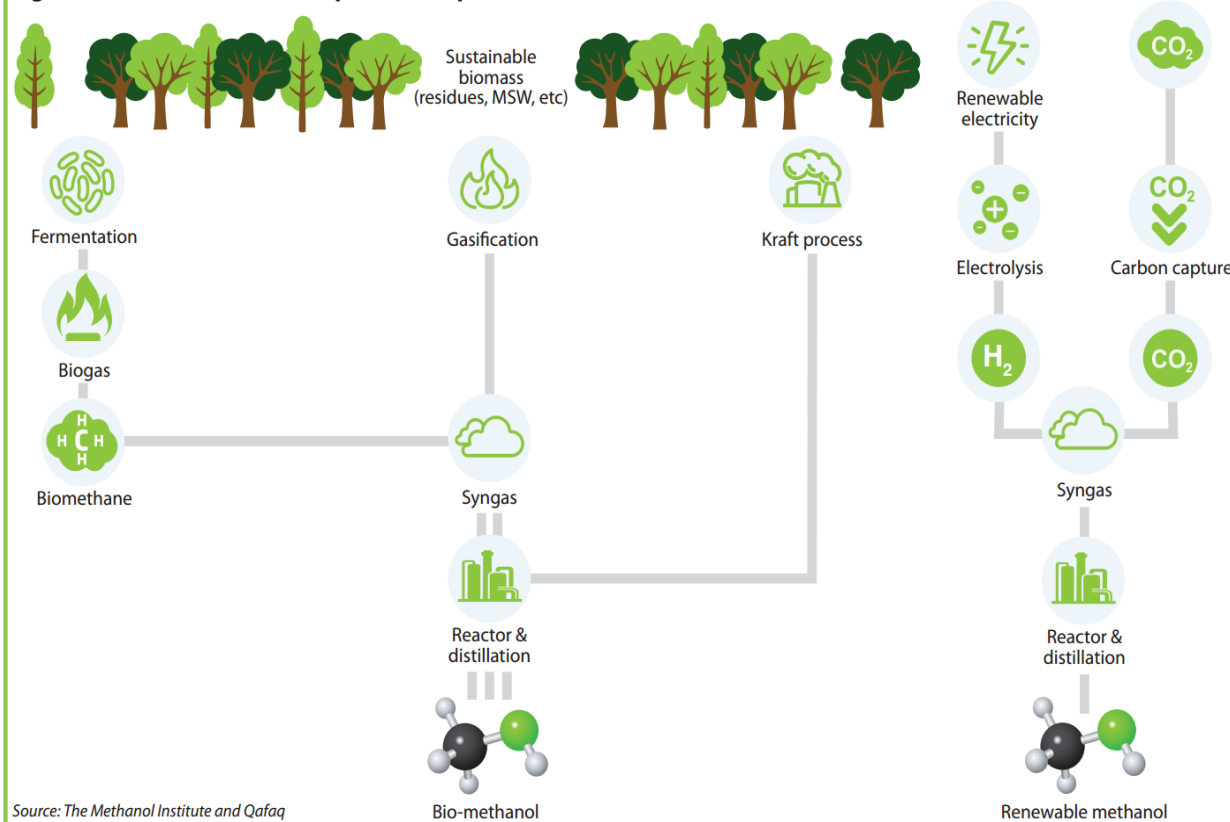


- 2 February: MI releases *Renewable Methanol Report* prepared by ATA Insights
- Contents:
 - Executive summary
 - Why consider renewable methanol?
 - Renewable methanol production
 - Case Studies: CRI, Enerkem, BioMCN
 - Applications and uses of renewable methanol
 - Conclusions and how to find out more
- Free download here:
<http://bit.ly/2UeJpJp>

RENEWABLE METHANOL REPORT



Figure 1. Renewable methanol production processes from different feedstocks



Renewable methanol is an ultra-low carbon chemical produced from sustainable biomass, often called bio-methanol, or from carbon dioxide and hydrogen produced from renewable electricity.

Renewable Methanol Emission Reductions: CO₂ by up to 95%; NO_x by 80%; virtually eliminating SO_x and Particulate Matter (PM)

RENEWABLE METHANOL TRACKER



Methanol category	Commercial	Feasibility and R&D	
Bio-methanol	<ul style="list-style-type: none"> ⌚ BASF (GER) ⌚ BioMCN (NL) ⌚ Enerkem (CAN) ⌚ New Fuel (DEN) ⌚ Nordic Green (DEN) ⌚ OCI (USA) 	<ul style="list-style-type: none"> ⌚ Biogo (GER) ⌚ Enerkem (NL) ⌚ LowLands Methanol ⌚ Heveskes Energy (NL) ⌚ NREL (USA) ⌚ Origin Materials (USA) ⌚ Södra (SE) 	<ul style="list-style-type: none"> ⌚ ENI (IT) ⌚ Osaka University (JAP) ⌚ New Fuel A/S (DEN) ⌚ GasTechno (USA)
Renewable methanol	<ul style="list-style-type: none"> ⌚ CRI (IC) ⌚ Innogy (GER) ⌚ Air Co (USA) 	<ul style="list-style-type: none"> ⌚ Advanced Chemical Technologies (CAN) ⌚ Asahi Kasei (JPN) ⌚ Blue Fuel Energy (CAN) ⌚ bse Engineering (GER) ⌚ Catalytic Innovations (USA) ⌚ CRI (CN/GER) ⌚ Gensoric (GER) ⌚ Infracore (GER) ⌚ Liquid Wind (SE) ⌚ MefCO2 (GER) ⌚ Neo-H2 (USA) ⌚ Port of Antwerp (BE) ⌚ Quantiam Technologies (CAN) ⌚ STEAG (GER) ⌚ Swiss Liquid Future (CH) ⌚ thyssenkrupp (GER) ⌚ USC (USA) ⌚ ZAST (GER) 	<ul style="list-style-type: none"> ⌚ ETH Zurich (CH) ⌚ Total (FRA) ⌚ ENI (IT) ⌚ Maire Tecnimont (IT) ⌚ Haldor Topsoe (DEN) ⌚ Port of Rotterdam (NL)
Low carbon methanol	<ul style="list-style-type: none"> ⌚ GPIC (BAH) ⌚ Methanex (CAN) ⌚ QAFAC (QAT) ⌚ SABIC (KSA) 	<ul style="list-style-type: none"> ⌚ Carbon2Chem (GER) ⌚ FRESME (SE) ⌚ GasTechno (USA) ⌚ Haldor Topsoe (DEN) ⌚ Maverick Synfuels (USA) ⌚ NCF (CN) ⌚ OPTIMEoH (GER) 	<ul style="list-style-type: none"> ⌚ BASF (GER) ⌚ Argonne (USA) ⌚ Cardiff University (UK)

SOLAR METHANOL ISLANDS

- Researchers from Norway and Switzerland have proposed using “solar methanol islands” as tool for reducing greenhouse gas emissions
- Use photovoltaic cells to convert solar energy into electricity, then powering hydrogen production and CO₂ extraction from seawater to produce liquid methanol
- Requires wave height less than seven meters and water depth less than 600 meters
- 70 artificial islands cover one kilometer square
- 3.2 million floating islands would produce enough methanol to exceed total global emissions of fossil fuels



<https://www.newsweek.com/giant-floating-islands-that-turn-atmospheric-co2-fuel-could-prevent-climate-change-scientists-say-1441793>

02

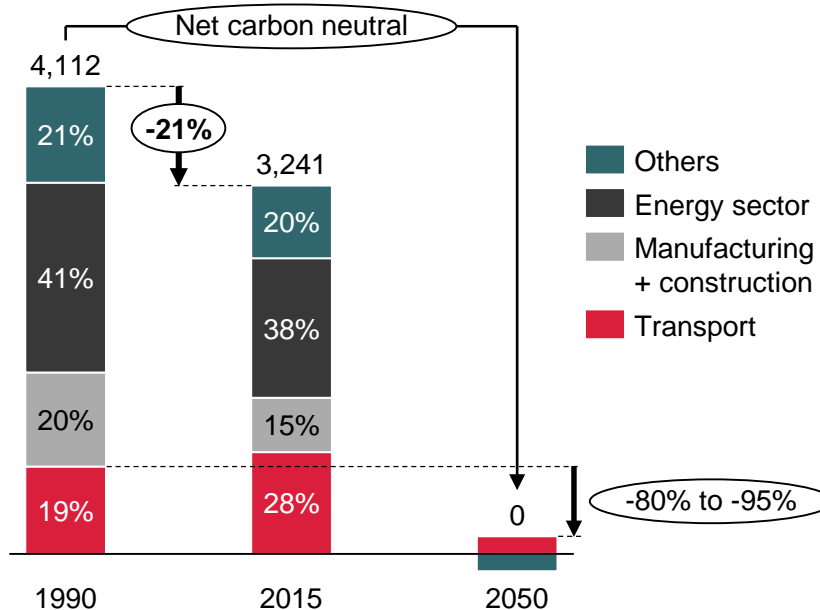
**EU E-FUELS/
POWER-TO-X**

EU IS COMMITTED TO ESTABLISH A CARBON NEUTRAL ECONOMY BY 2050 – RENEWABLE ENERGY ACCOUNT FOR 95%

EUROPEAN COMMISSION GHG REDUCTION OBJECTIVES FOR 2050



CO₂ emission in the EU in million tons



- It is assumed, the electricity generation achieves zero net emissions by 2050
- The transport sector target is less than for the overall economy
- The transport sector needs to cut its greenhouse gas emissions by 80% to 95% by 2050 compared to 1990

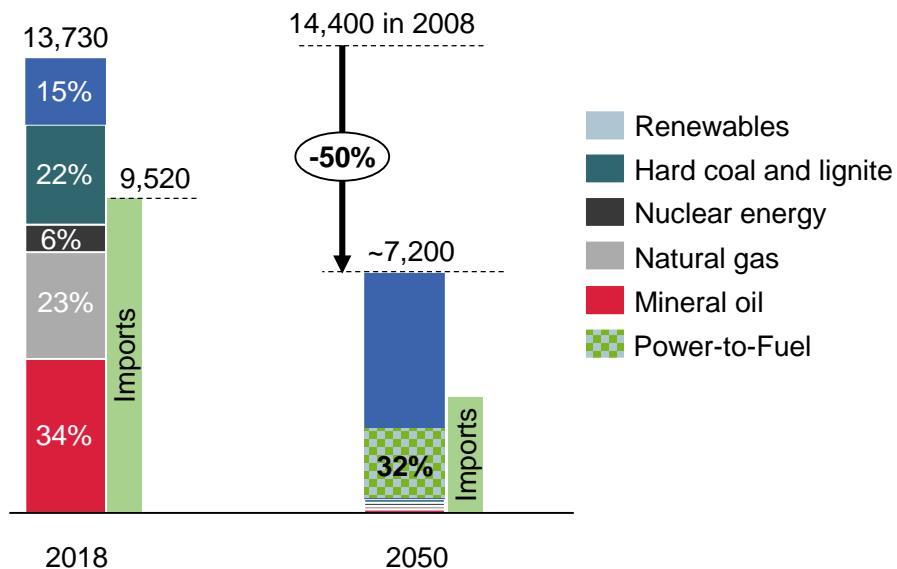
Source: European Commission, FEV

IN 2050 GERMANY WILL RELY ON IMPORTED CHEMICAL ENERGY CARRIERS – BUT THEY HAVE TO BE SYNTHESIZED FROM RENEWABLES

IMPORT OF SYNTHETIC FUELS IN 2050 EQUALS UP TO 50% OF TODAY'S MINERAL OIL IMPORTS



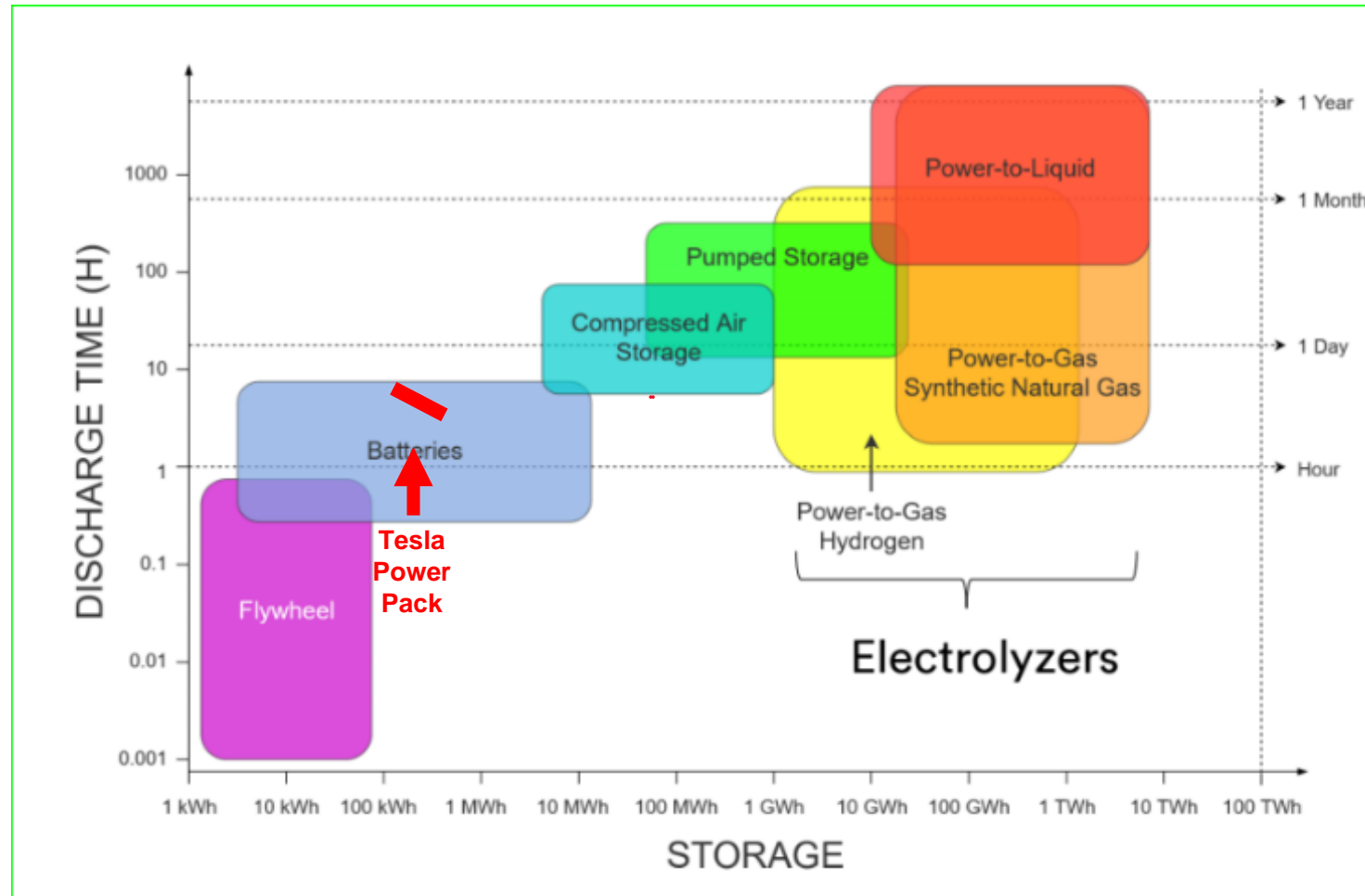
Primary energy carriers in PJ



Source: European Commission, BMWi Energiedaten, AG Energiebilanzen, ewi gGmbH "Evolution scenario"

- Primary energy use will be shortened by 50% compared to 2008
- Fossil fuels will provide only 5% of the total primary energy consumption
- Import of renewable electricity to Germany will increase
- Up to one third of the total energy consumption might be covered by Power-to-Fuels, thereof**
 - 75% are imported from outside Europe**
 - 17% are imported from inside Europe**

POTENTIAL TO STORE EXCESS RENEWABLE POWER



Sources: Laura Nereng, 3M, 2017;
Tesla July 2017 announcement extrapolation



Carbon Recycling International

03

METHANOL ROAD TRANSPORT FUELS

CHINA M100

- Dec 2018: MIIT completes acceptance of all methanol pilot demonstration programs
- **March 2019: MIIT and 7 other ministries announce methanol policy paper for M100**
- MI issues press release and briefing report
- <https://www.methanol.org/wp-content/uploads/2019/03/A-Brief-Review-of-Chinas-Methanol-Vehicle-Pilot-and-Policy-20-March-2019.pdf>
- “Paper 61” encourages commercial introduction of M100 vehicles
- Currently over 20,000 methanol-fueled taxis operation for total of 125 million kilometers
- Approval of 32 product models from 9 methanol vehicle manufacturers



CHINA M100

- M100 methanol fuel consumption for taxi is 13.5 litres/100 km, with energy consumption of 237.8 MJ



Table 2 Taxi Fuel Cost Comparison of Taxi in Jin Zhong City

	Gasoline	CNG	M100
Fuel Price RMB/L	5.51	3.5 RMB/m ³	1.8
Fuel Economy L/100km	8	8.8 m ³ /100km	13.5
Fuel Cost Saving %	37.5	10.6	--

Note: the fuel price is based on the operation in November of 2015;

GEELY M100 VEHICLES

- China's Geely Automotive Holdings is global leader in the commercialization of M100 vehicles
- Geely has two methanol engine and five methanol vehicle manufacturing bases, with an annual methanol vehicle production capacity of 300,000 - 500,000 cars
- Geely M100 taxi fleet to hit 20,000 cars in June 2019, consuming 200,000 MT year



ITALY M15/E5 BLENDING

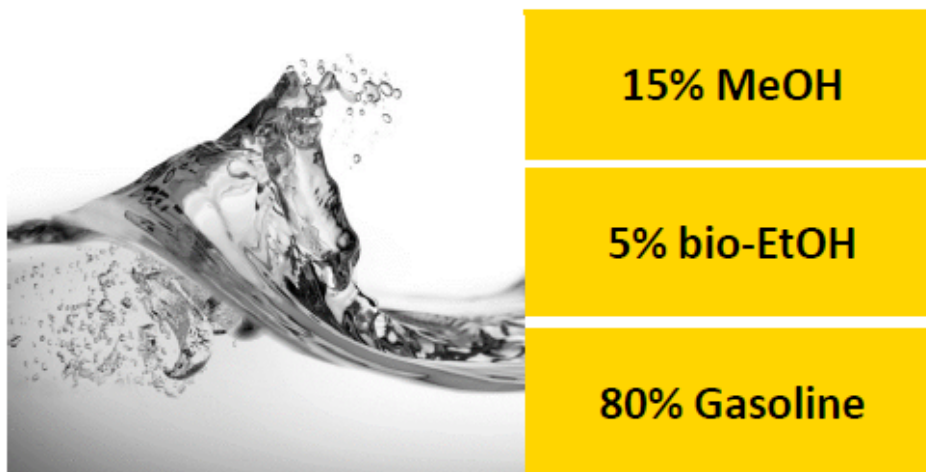
- 21 November 2017: With Italian Prime Minister, the CEOs of Eni and Fiat Chrysler Automobile sign MOU for joint development of technology reducing CO₂ of road transport vehicles
- Eni had developed an “A20” fuel blend of 15% methanol and 5% bioethanol
- New blend demonstrated in 5 FCA Fiat 500 vehicles in Eni’s Enjoy car-sharing fleet



https://www.eni.com/en_IT/media/2017/11/eni-and-fca-sign-research-agreement-for-joint-projects-to-significantly-reduce-co2-emissions-produced-by-road-transport-vehicles



A20: a New Methanol-based Alternative Fuel



- Formula Cost Reduction
- “Transparent” to all the E10 car vehicles
- No-chemical corrosion problems
- No-phase separation (in the car tank and gas-station)

CUNA specification (NC 627-02 July 2018)

Property	Units	Limits MIN – MAX	
Research octane number, RON		100	
Motor octane number, MON		86	
Lead content	mg/l		5.0
Density (at 15 °C)	kg/m ³	720.0	775.0
Sulfur content	mg/kg		10.0
Manganese content	mg/l		2.0
Nitrogen content	ppm		100
Oxidation stability	minutes	360	
Existent gum content (solvent washed)	mg/100 ml		5
Water content	% (m/m)		0.2
Oxygen content	%(m/m)		10.0
Methanol	%(V/V)	12.0	16.0
Ethanol + other Alcohols (C3-C4)	%(V/V)	4.0	6.0
Ethers (5 or more C atoms) other oxygenates	Volume blending of these components is restricted to 10.0 % (m/m) maximum oxygen content including methanol oxygen.		

CUNA NC 627-02 include also the evaporative class parameters to prepare A20 grade for summer, winter and transition period

A20 RESULTS

- “... the new alternative fuel emits up to 3% less in CO₂ exhaust emissions quantified using the new Worldwide Harmonized Light Vehicle Test Procedures (WLTP).
- “The formula was designed to reduce direct and indirect CO₂ emissions and is compatible with the majority of petrol cars sold from 2001 onwards...”



Eni and FCA have developed A20, a new fuel that pairs emissions reduction with energy efficiency

San Donato Milanese (Milan), 3 April 2019 - Within the scope of the agreement signed in November 2017, Eni and FCA have teamed up to develop "A20", a new fuel with a low level of emissions due to its 15% methanol and 5% bio-ethanol alcohol content. By harnessing its low carbon content, bio component and high octane number, the new alternative fuel emits up to 3% less in CO₂ exhaust emissions quantified using the new Worldwide Harmonized Light Vehicle Test Procedures (WLTP).

The formula was designed to reduce direct and indirect CO₂ emissions and is compatible with the majority of petrol cars sold from 2001 onwards, which accounts for more than 60% of the petrol cars in Italy, equivalent to approximately 12 million vehicles.

An initial test run of five Fiat 500s from the Eni Enjoy fleet in Milan ended successfully a few weeks ago. The cars were rented out around 9,000 times and travelled for 50 thousand kilometres during the 13 months of the test without experiencing any problems, demonstrating a reduction in emissions and better performance as a result of the high octane number.

In the meantime, Eni and FCA are working to improve the A20 formula even further by increasing the amount of hydrocarbon components from renewable sources with a view to further reducing "Well-to-Wheel" CO₂ emissions (this parameter evaluates emissions by taking production, transport and fuel consumption into consideration).

GERMAN C3 MOBILITY

- C3 Mobility for Closed Carbon Cycle
- Joint public/private partnership with German Ministry of the Economy and Energy and German automotive industry
- Two-year, €24 million program



Assoziierte Partner und im Unterauftrag



METHANOL ALREADY ESTABLISHED PLATFORM MOLECULE FOR THE CHEMICAL INDUSTRY/ FUEL PRODUCTION AND AN EXCELLENT FUEL!

METHANOL IS A PROBABLE SOLUTION TO IMPORT RENEWABLE ENERGY TO GERMANY/EUROPE

MeOH is used as fuel already



- First series production M100 truck, claiming 18% costs savings/year
- Methanol is used from M5 to M100
- Applications range from PC to HD

Source: bigwheels.my

MeOH is promising alternative for SI and commercial engines

- Methanol is cheap to produce
- Established product and building-block (chemical industry)
- Handling and infrastructure is considered to be more complex
- Available applications very limited (EN228 limits MeOH to 3% v/v, but push from Asia)

	Fuel costs	Availability	Technology Readiness Level	Fuel distribution	Compatibility with existing vehicles
Methanol	+/o	o	+/o	o	o/-

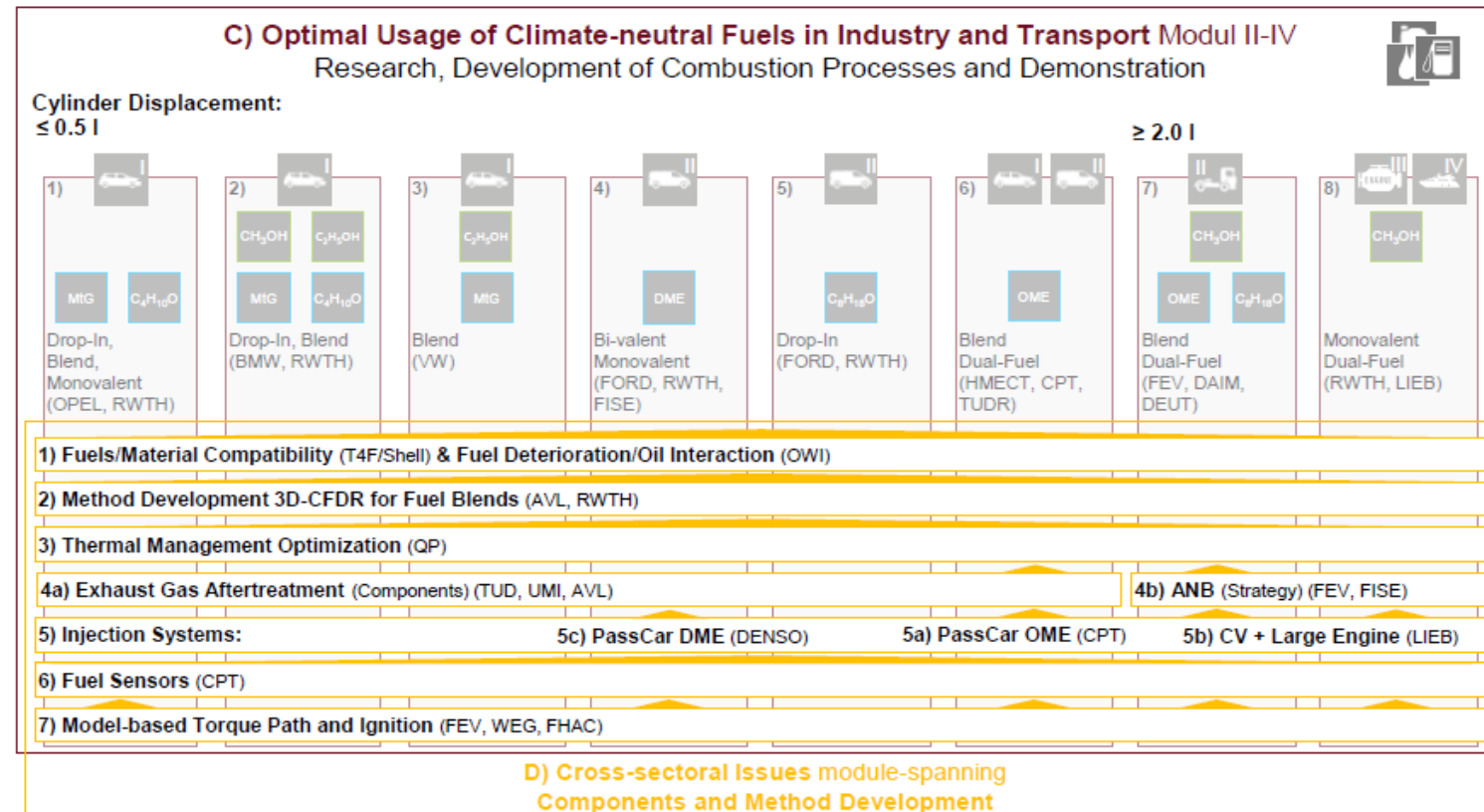
Methanol utilization in transport will significantly rise

GERMAN C3 MOBILITY

C3-Mobility - Climate-neutral Fuels for Future Traffic

Project Structure

Usage of Climate-neutral Fuels



Benedikt Heuser, 2019

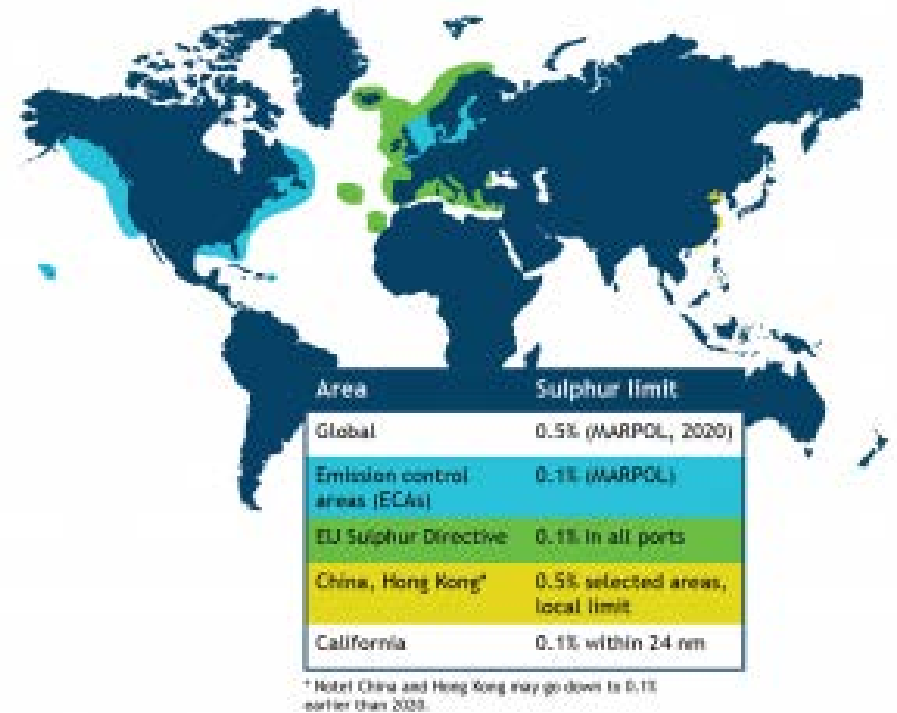
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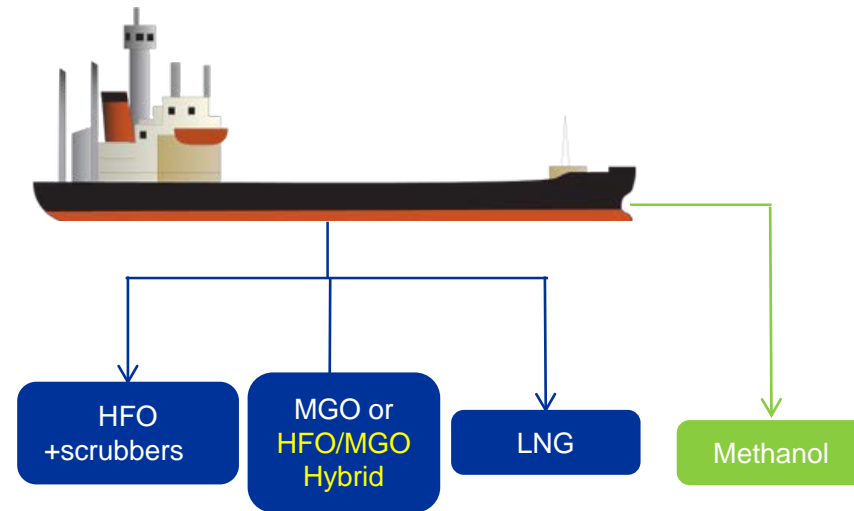
Methanol Marine Fuels

EMISSIONS REGULATIONS DRIVING

- The International Maritime Organization has adopted emission regulations transforming the shipping industry
- In 2020, global SO_x reductions take effect
- By 2050, greenhouse gas emissions must be cut in half



OPTIONS AVAILABLE TO SHIP OWNERS



<https://www.methanol.org/marine-fuel/>

METHANOL VESSELS ON THE WATER

DUAL FUEL



9x - **+2**

chemical
tankers

MOL, WL,
Marinvest

2 stroke
MAN

new build

1x

ROPAX
ferry

Stena Line

4 stroke
Wärtsilä

retrofit

1x

Pilot
boat

MI/SMA
ScandiNaos

high speed
Scania,
Weichai

retrofit

1x

dry
bulk

Jiang
Long

DMCC
Yuchai

new build

FUEL CELL



2x

Tourist
Boat
propulsion

Innogy
HTWG
Konstanz

SerEnergy fuel cells

retrofit

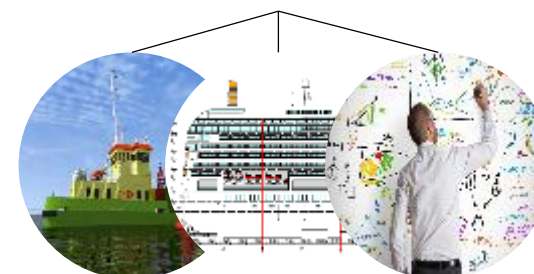
1x

Ferry
hotel load

Viking Line

retrofit

PROJECT and R&D



Cruise ships, fishing boat,
barge, dredge, a.o.

SUMMETH/MARTEC,
Lean Ships, Methaship,
Billion Miles, FiTech, India,
PCG Product Vessel, NTU Test
Port of Rotterdam Barge, **Green
Maritime Methanol, FastWater**

SI hybrid, dual fuel, fuel cells

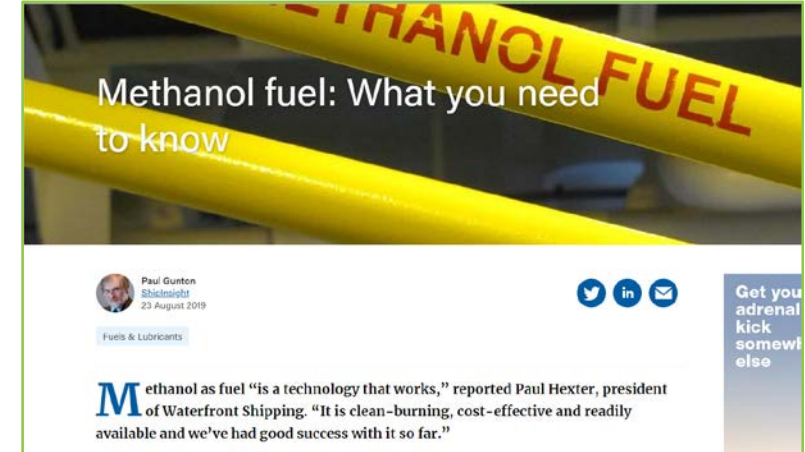
new build & retrofit

WATERFRONT SHIPPING – AUGUST LAUNCH



“We are very excited by the performance of our first seven methanol-fuelled vessels that have proven the safety and reliability of the technology. With this second generation of vessels, we will benefit from innovative technological advances that will continue to optimize performance and efficiency,” says Paul Hexter, President, Waterfront Shipping Ltd. “On an energy-equivalent basis, methanol is cost competitive over energy price cycles and we see significant value creation opportunities from using a methanol flex-fuel engine.” 20 August

<https://www.globenewswire.com/news-release/2019/08/20/1904546/0/en/Industry-Welcomes-Second-Generation-Low-Emission-Methanol-Fuelled-Vessels.html>



According to a survey conducted by the Methanol Institute – an industry body whose members include companies involved in methanol production and distribution – methanol is already potentially available from most of the world’s top ports (by tonnage). Chris Chatterton, the institute’s chief operating officer, told ShipInsight on 22 August that its full data will be published “in about a week” but provided a summary that showed its survey had covered 151 ports, of which 97 had “methanol directly in, or in close proximity to, the port.” Those include 88 of the top 100 ports. 23 August

<https://shipinsight.com/articles/methanol-fuel-what-you-need-to-know>

MAN DUEL-FUEL ENGINE WATERFONT CONFIGURATION

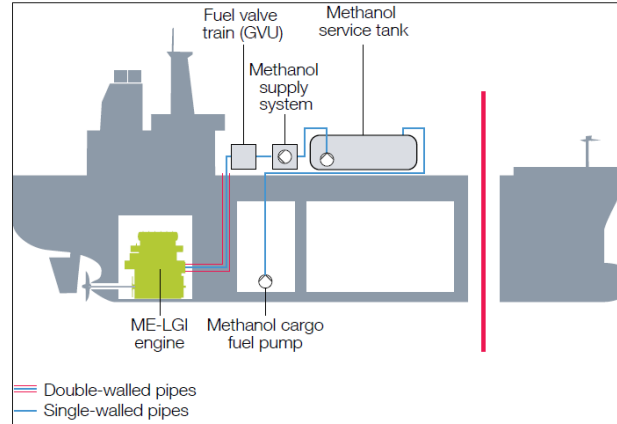
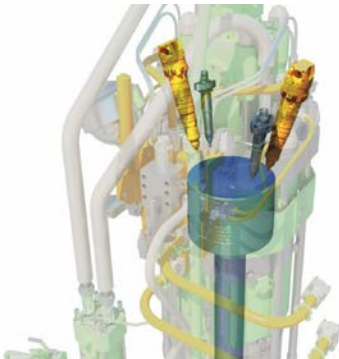


Fig. 4: ME-LGI system overview



“We developed the ME-LGIM engine in response to interest from the shipping world in alternatives to heavy fuel oil. With the growing demand for cleaner marine fuels, methanol is a sulphur-free alternative that meets the industry’s increasingly stringent emission regulations.”

René Sejer Laursen, Promotion Manager at MAN Energy Solutions

<https://marine.man-es.com/two-stroke/2-stroke-engines/me-lgim>

METHANOL BUNKERING EASY AND CLEAN

- Liquid at atmospheric pressure
- Available in many ports around the world and along rivers
- Low infrastructure cost
- Flexible, modular system
- Environmentally friendly as it's **biodegradable**



05

CHINA HEAT MARKETS

METHANOL INDUSTRIAL BOILERS IN CHINA

- Industrial boilers are widely used for heating and industrial stream
- Many cities in China prohibiting use of coal and diesel fuels
- Capacity ranged from 1 to 20 ton/hour
- One steam ton capacity consumes 110 kg of methanol, and runs 24/7
- Methanol fuel is used neat or as blend with diesel fuel
- Standards developed with MI and Methanex support
- *Estimated more than 1000 units, consuming over 2 MMTs methanol in 2017*
- *Growing to 5 MMT in 5 years*

<https://www.methanol.org/energy/boiler-cookstoves/>

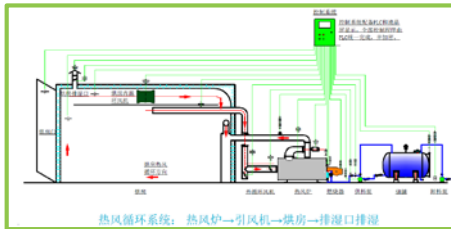
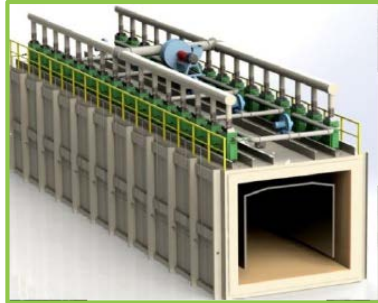


METHANOL COOK STOVES IN CHINA



- **Different types methanol cook stoves:** Single heating, stir fry, steaming
- Widely used in restaurants, central kitchens, mainly cost-driven
- Simple storage and transportation, filling the gap of pipeline NG supply
- Fuel: 100% methanol to methanol blends usually with water
- *Market for Cooking Application over 5 MMTs in China in 2017*
- *Growing to 7-8 MMT in 5 years*

GLASS/CERAMIC KILNS AND TOBACCO DRYING



- China also developing other new markets for the use of methanol:
 - **Glass/ceramic kilns** – China produced 60% of world's glass products; methanol uses less air intake and produces cleaner flue gas for superior finish
 - **Tobacco drying** – One in every 3 cigarettes smoked in the world are smoked in China

06

HYDROGEN CARRIER

METHANOL A HYDROGEN CARRIER FOR FUEL CELLS

- Blue World Technologies (Denmark)
- Palcan (China)
- Horizon Energy Systems (Singapore)
- Oneberry (Singapore)
- Alteryg (USA)
- Serenegy (Denmark)
- SFC Energy (Germany)
- Toshiba (Japan)
- Ultracell (USA)



COMMERCIAL OFFERINGS REFORMED METHANOL FUEL CELLS FOR STATIONARY POWER

MFC3000 & MFC5000
HIGH CAPACITY FUEL CELL POWER

Horizon
Fuel Cell Technology



MFC3000 & MFC5000 offer extremely long endurance power in the field compared to other alternatives. It is as quiet as a whisper and has minimal carbon emissions. Its integrated fuel cell uses an electrochemical process to generate electricity with few moving parts. The MFC3000 & MFC5000 is fueled by a safe and economical methanol-water blend.

- Uses low-volatility fuel
- 99.999% SLA, always available
- Outdoor cabinet (IP54)
- Near-silent operation
- Hybrid solution for battery charging with wind or solar power
- Remote monitoring and control functionality (TCP/IP)
- Environmentally friendly, extremely efficient
- Light and compact, ideal for rooftop sites

3kW / 5kW configurations available

The Horizon MFC 3000 & MFC 5000 offer cost-effective, long endurance power in the field compared with traditional battery / generator solutions. These systems deliver power quietly in a compact footprint, without vibrations, while emitting carbon emissions and maintenance. The MFC 3000 & 5000 systems efficiently deliver DC power using a safe and economical methanol-water blend as fuel.

HYBRID SOLAR MFC3000 & MFC5000 CONFIGURATIONS
MFC3000 & MFC5000 can be combined with a PV solar system to reduce fuel consumption and provide an even longer lasting power source. If the solar modules can produce adequate electricity, the solar system takes over and MFC3000 & MFC5000 goes into standby mode.

APPLICATIONS

- Battery / Generator replacement
- Off-Grid continuous power
- On-Grid back-up power
- Telecom Sites
- Airfield Lighting
- Road Lighting

Contact: sales@horizonfuelcell.com www.horizonfuelcell.com

altergy
Leading the Fuel Cell Revolution

POWERING TELECOM APPLICATIONS EVERYWHERE WITH MODERN TECHNOLOGY

Deliver non-stop, reliable power with fuel flexibility, regardless of location

Telecom centers increasingly outpace to provide voice, video and data services to customers. Customers expect constant connectivity. Power outages not only equal loss of connectivity but loss of connectivity, especially in remote locations – which customers no longer tolerate. Backup power must be a priority, not an afterthought.

Batteries and generators have been the popular choice for backup power, but because of their superior technology, fuel because of corporate profits. Batteries typically cannot provide the very runtimes and require frequent replacement, while generators are noisy, bulky and break down too often. That's where Alteryx comes in.

Alteryx has developed breakthrough fuel cell technology built to the highest standards, delivering the most reliable, cost-effective backup power solution available today. These next generation solutions allow telecom providers to overcome their networks and meet customer connectivity demands.

For locations where hydrogen fuel may be difficult to obtain, Alteryx offers an advanced fuel cell backup power system integrated with a state-of-the-art industrial reformer. Alteryx's Freedom Power System EX EX-2 for industrial reformers delivers a reliable backup power system that can integrate seamlessly with established network infrastructure, simplify fuel logistics and provide optimal runtimes.

With the largest deployed fuel cell fleet in telecom and CATV, Alteryx is the perfect backup power partner since 2003.

Alteryx's Freedom Power fuel cells provide freedom from:

- Batteries
- Generators
- Pollution
- Noise
- The Grid

Alteryx's Freedom Power System EX (FPE-EX)
Fuel flexibility where hydrogen availability is limited

- Extended runtime up to 100 hours
- Proven, well-known concept with batteries and generators
- Simple, low-cost maintenance
- Also delivers fuel cell in support of sustainability
- Reduces theft of batteries and fuel
- Made in USA

Datasheet
v1.0-0116

Product Introduction

- Aquasol hydrogen generator MYFC-2
- Aquasol hydrogen generator P63
- Aquasol hydrogen generator PL401



ENEKO POWER
A BSH POWER

Methanol Power System
H₃ 30kW Rack



- 30 kW power output
- Scalable system
- Liquid or alcohol operation
- Configurable LV/MV or inverted power output
- Simple installation and autonomous operation

Methanol system. The scalable reformer methanol fuel cell rack can deliver 30kW output and the embedded charge controller enables regulated DC power for various applications. The MFC features catalytic startup enabling fast startup and minimum power consumption in standby and during the startup process. A separate panel for safety and operation is available for the system.

Methanol fuel cell. High temperature PEM with an integrated methanol reformer for onsite hydrogen generation enables high power density and high fuel energy density. The fuel is a methanol mix fuel readily available through several global suppliers. The integration of fuel cell and reformer enables a highly energy efficient system due to reuse of fuel cell waste heat for the reformer process.

Multiple applications. The methanol power system has multiple applications both off- and on-grid including applications in critical backup power or temporary power for remote applications. Other markets include Wireless Base Stations, Secure Communications Networks and auxiliary power units.

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TECHNICS

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METHANOL FUEL CELL EV RANGE EXTENDER

- 2015: Denmark opens EU's first methanol fuel pump
- Cars/vans use Serenergy RMFC technology as range extender and CRI methanol as fuel
- Increasing range of battery powered vehicles from 200 to 800 kilometers
- April 2019, Beijing Auto Show: AlWays unveils Gumpert RG Nathalie methanol fuel cell electric supercar with a 1,200 km range and a top speed of 300 km/h



DENMARK'S BLUE WORLD TECHNOLOGIES AND CHINA'S PALCAN

MANUFACTURING PLANTS: 50,000 UNITS/YEAR – 5 kw RMFC



Launch Reception: Blue World Technologies presenting plans for large-scale manufacturing facility

Blue World Technologies today presents plans for the world's largest methanol fuel cell factory located at the Port of Aalborg ready for global export of clean energy technology. Methanol fuel cell components will be produced in high volume enabling electric vehicles to have a 1000km range with 3 minutes refuelling time.

Blue World technology is newly founded but has ambitious goals from the start by targeting the most potential markets in form of automotive and electric mobility. The challenge is daunting, but also the possibility to really make a difference in the world.

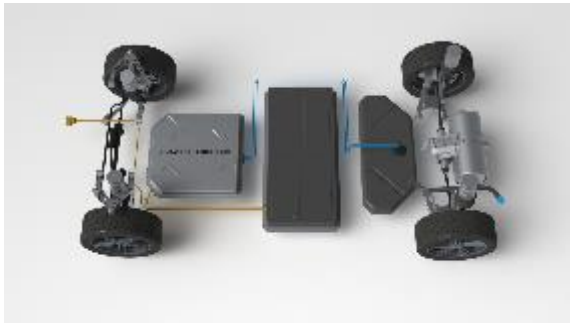
Today the mayor of Aalborg, Mr. Thomas Kastrup Larsen is attending the launch reception of Blue World Technologies on the Port of Aalborg. Furthermore, plans for the world largest methanol fuel cell manufacturing facility will be presented.



3 - Blue World Technologies - fuel cell factory visualisation

Volume production of methanol fuel cells

Blue World Technologies will establish a state-of-the-art manufacturing plant for a unique fuel cell technology platform utilizing methanol as a fuel. The plant will be highly specialized in the production of materials and components for the fuel cell and stack which can be compared to the engine block of a car. The overall effort will require several hundreds of new employees for both development and operations. The factory will be built and have initial manufacturing activity during 2019.



Our Development Plan II



“Build a 50,000 sets of fuel cell module production base (2018)”

- ▶ Industrial Base: Cixi, Zhejiang province
 - ▶ Total investment of 100 million
 - ▶ Achieve 50,000 sets of fuel cell module production capacity.
-
- ▶ Market target : Electric logistics vehicle, mobile charging vehicle, communication backup power supply, civil-military integration.



CHINA FUEL CELL PIVOT

- China now has just 1,500 FCVs and 23 hydrogen fuelling stations
- March 2018: MIIT releases plans for hydrogen fuel cell promotion as “new energy vehicles”
- Targets: 2020 – 5,000 FCVs; 2025 – 50,000 FCVs; 2030 – 1 million FCVs
- Pivot away from EV subsidies and moving support to hydrogen fuel cells
- Emphasis on commercial vehicles: buses and trucks, long-haul
- ***October 2019: MI and MIIT holding methanol seminar in Chongqing***



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CONTACTS



CONTACTS



Zhao Kai
Chief China Representative
kzhao@methanol.org

Eelco Dekker
Chief EU Representative
edekker@methanol.org

Greg Dolan, CEO
gdolan@methanol.org

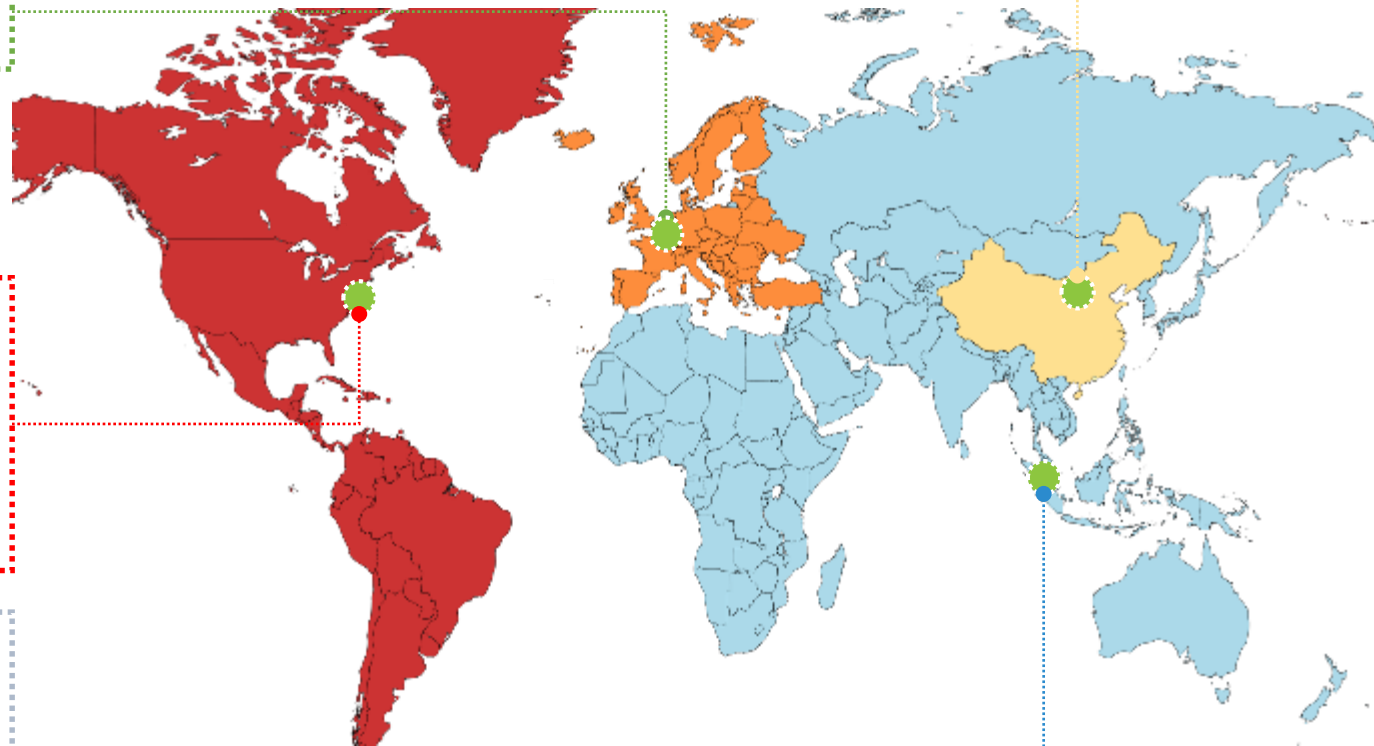
Larry Navin, Director, Government &
Public Affairs, Americas/Europe
lnavin@methanol.org

Nov Bajwa, Operations & Web
Media Coordinator
nbajwa@methanol.org

Chris Chatterton, COO
cchatterton@methanol.org

Tim Chan, Manager, Government
Relations and Business
Development, Asia Pacific/Middle
East
tchan@methanol.org

Belinda Pun, Executive Assistant
bpun@methanol.org



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www.methanolfuels.org