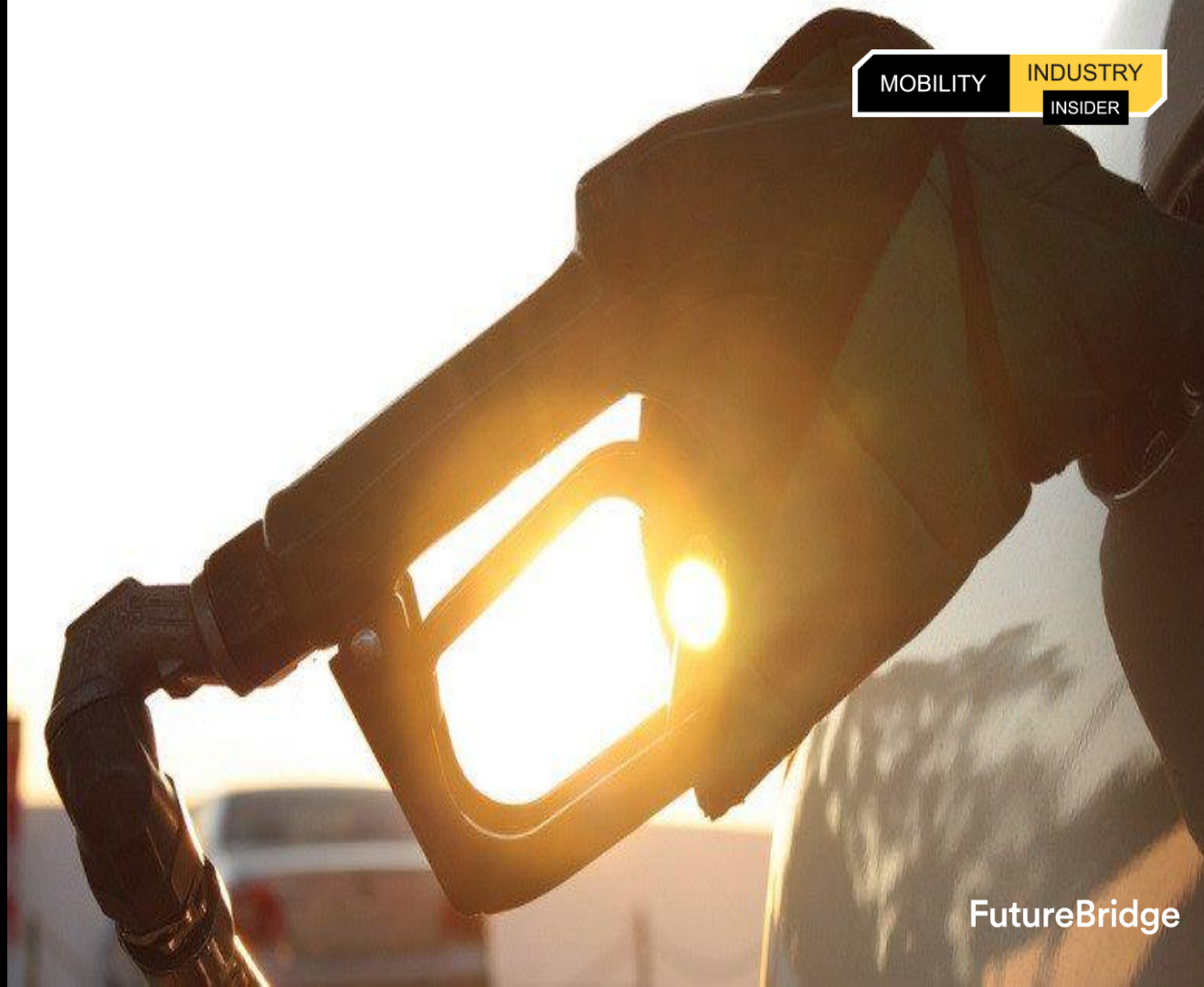
Alternative Fuels

APRIL | 2020

BULLETIN



WHAT'S INSIDE!

- BMW iHydrogen NEXT is coming with Toyota's fuel cell technology
- McLaren believes in synthetic fuel-powered IC engine
- Daimler-Volvo to produce fuel cell trucks
- Valero closed ethanol plants due to the outbreak of coronavirus pandemic.
- Benz-SWEG collaboration for fuel cell bus

Researchers are focusing on cheap hydrogen production and catalysts for fuel cells.

Read our Spotlights to understand how synthetic fuel is gaining attention in the automotive sector.

- Players believing in synthetic biofuels as potential savior for internal-combustion engines

Learn more about Alternate fuels : launches, startups, collaborations, competitor movement

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03 **University of Southampton** researchers to convert water into hydrogen using solar energy

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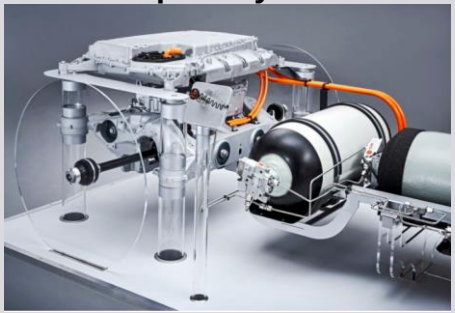
-Expert Says-



"We are convinced that various alternative powertrain systems will exist alongside one another in future, as there is no single solution that addresses the full spectrum of customers' mobility requirements worldwide. The hydrogen fuel cell technology could quite feasibly become the fourth pillar of our powertrain portfolio in the long term. The upper-end models in our extremely popular X family would make particularly suitable candidates here."

- Klaus Fröhlich, Member of the Board of Management of BMW AG, Research and Development

03 Apr 2020

Mercedes-Benz & SWEG launching eCitaro bus with fuel cell technology

The Daimler Buses and German Transport Company SWEG and Daimler Buses signed a letter of intent to bring the first Mercedes-Benz eCitaro REX with a fuel-cell range extender out of series production onto the road.

- The eCitaro bus with a fuel cell range extender that generates electricity from hydrogen.

Analyst comment: Mercedes developed strong experience some years ago with hydrogen buses, and SWEG is developing concepts for hydrogen-powered vehicles from 2022. The company is currently developing a concept for supplying the city bus with hydrogen.

Read this story

04 Apr 2020

BMW's new SUV reaffirms longer-term commitment to fuel cell technology

BMW and Toyota are working together to develop the next-generation hydrogen fuel cell vehicle - the BMW iHydrogen NEXT based on X5 SUV.

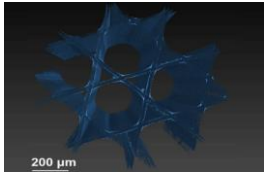
- According to BMW, the fuel cell system for the powertrain of the iHydrogen NEXT generates up to 125 kW (170 hp) of electrical energy from fuel cell reaction.

Analyst comment : BMW has collaborated with Toyota on hydrogen technology since 2013, and Toyota developed the fuel cells to be used in the BMW iHydrogen NEXT. BMW iHydrogen NEXT has a pair of 700 bar tanks that can hold six kilos of hydrogen and can refuel within three to four minutes.

Read this story

08 Apr 2020

Researchers converting water into hydrogen



Researchers at the University of Southampton have transformed optical fibers into photo catalytic micro reactors that converts water into hydrogen fuel using solar energy.

- The microstructured optical fiber canes (MOFCs) with photocatalyst generate hydrogen that could power.

Analyst comment : Alongside hydrogen generation from water, the multi-disciplinary research team is investigating the photochemical conversion of carbon dioxide into synthetic fuel. The unique methodology presents a potentially feasible solution to eliminate greenhouse gases and sustainable chemical production.

Read this story

-Expert Says-

Players who believed in synthetic fuel:

Audi BMW mazda

"We take our CO2 targets very seriously and want to be a role model on CO2, but that doesn't mean we will exclude the combustion engine."

— Matthias Rabe, Technical Chief of VW.

07 Apr 2020

Research work to enhance the catalytic activity for hydrogen production via water splitting

Griffith UNIVERSITY

Researchers from Griffith University (Australia) found a new catalyst for fuel cells, CoSe2 for oxygen evolution in water splitting by incorporating both Fe dopants, and Co vacancies into atomically thin CoSe2 nanobelts.

- Both the iron doping and creating cobalt vacancies, when applied individually, improve the Nano belt's ability to speed up reactions.

Analyst comment : CoSe2 nanobelts are ultrathin sheets made out of a lattice of cobalt (Co) and selenium (Se). Both the iron doping and creating cobalt vacancies, when applied individually, improve the nanobelt's ability to speed up reactions to a small degree.

Read this story

07 Apr 2020

Volkswagen trusting on combustion engine powered by biofuel

Volkswagen believes combustion engines still have a long future despite reports other car-makers could leave them for pure-electric or fuel-cell vehicles.

- According to VW increasing restrictions on CO2, and other emissions will boost the development of more environmentally-friendly fuels.

Analyst comment : The move by Volkswagen to continue investing in combustion engines reflects a similar approach by BMW that says it remains committed to traditional petrol for another 30 years and carry on selling diesel for at least another two decades.

Read this story

09 Apr 2020

McLaren looks towards synthetic fuels as a potential savior for internal-combustion engines

McLaren to develop a prototype that can run on synthetic fuel.

- The company is going to pair the new technology with a hybrid system that would reduce emissions even further.

Analyst comment : Synthetic fuel could help the transport sector reduce its reliance on fossil fuels and meet "net-zero" greenhouse gas emission goals. Bosch is one of the main manufacturers of synthetic fuels. Audi is researching in this area and has developed synthetic natural gas, synthetic diesel, and synthetic gasoline. Porsche also believes in synthetic fuels and continuing the production of petrol engine model 911.

Read this story

-Expert Says-

"Electrification of road transport is a key element in delivering the so called Green Deal, a carbon neutral Europe and ultimately a carbon neutral world. Using hydrogen as a carrier of green electricity to power electric trucks in long-haul operations is one important part of the puzzle, and a complement to battery electric vehicles and renewable fuels. Combining the Volvo Group and Daimler's experience in this area to accelerate the rate of development is good both for our customers and for society as a whole. By forming this joint venture, we are clearly showing that we believe in hydrogen fuel cells for commercial vehicles. But for this vision to become reality, other companies and institutions also need to support and contribute to this development, not least in order to establish the fuel infrastructure needed."

— Martin Lundstedt, Volvo Group

President and CEO

13 Apr 2020

H2-Share's first hydrogen-powered rigid truck hits Netherlands road

Hydrogen fuel cell rigid truck built by VDL started its first demonstration with Breytner as part of the EU-funded H2-Share project in the Netherlands.

- For large heavy-duty vehicles that travel longer distances, electric trucks with a hydrogen fuel cell range extender are a zero-emission solution.

Analyst comment: The objective of H2-Share (Hydrogen Solutions for Heavy-duty transport Aimed at Reduction of Emissions in North-West Europe) is to facilitate the development of a market for low-carbon heavy-duty vehicles on hydrogen for logistics applications and to gain practical experience in different regions in North-West Europe.

Read this story

13 Apr 2020

Daimler collaborates with Volvo Trucks for fuel cell systems

Daimler and Volvo started a joint venture to develop, manufacture, and market fuel cell systems for trucks and other applications.

- Daimler will place its developments in fuel cell systems in the joint venture. Volvo Group pays EUR 0.6 billion for its 50% ownership in the joint venture.

Analyst comment: Daimler is planning to manufacture hydrogen-powered heavy-duty vehicles as a part of their CO2-neutral driving operation by 2039. Volvo Group is a part of an association named "Hydrogen Europe" that receives support from the European Union's Horizon 2020 research and innovation program.

Read this story

15 Apr 2020

Valero has closed ethanol plants due to COVID-19

Valero Energy Corp has temporarily idled eight of its ethanol plants and is reducing production at six of its remaining ethanol plants .

- Demand for gasoline as well as ethanol decreasing due toCOVID-19.

Analyst comment: The pandemic and social distancing rules are negatively affecting the biofuel sector. The restrictions on movements and social contact have spread almost as fast as the virus itself, e.g. disrupting industrial production and lowering trade and shipping activities. Moreover, the peak is yet to come, as officials warn that the number of cases will continue to grow.

Read this story

SPOTLIGHT

Alternative Fuels

Players believing in synthetic biofuels as a potential savior for internal-combustion engines

The automotive industry is under increasing pressure to reduce carbon emissions originating from fossil fuels. Renewable synthetic fuel is an advanced biofuel that is made from the same renewable resources as biofuels but using a process that involves heat, pressure, and hydrogen to create a cleaner fuel that's chemically identical to petroleum diesel. Players such as VW, Porsche, and Mazda trusting on the long-term future of internal-combustion vehicles by pointing to the potential of synthetic and biofuels.

Fischer-Tropsch synthesis : syngas to liquid fuels

- Lower technical risk - proven technology
- Scalable process – fuel produced without the volume limitations
- CO2 capturing technology – CO2 is a raw material

Suppliers of renewable synthetic fuels:

BOSCH ExxonMobil REG

McLaren is developing a prototype powered by synthetic fuel.

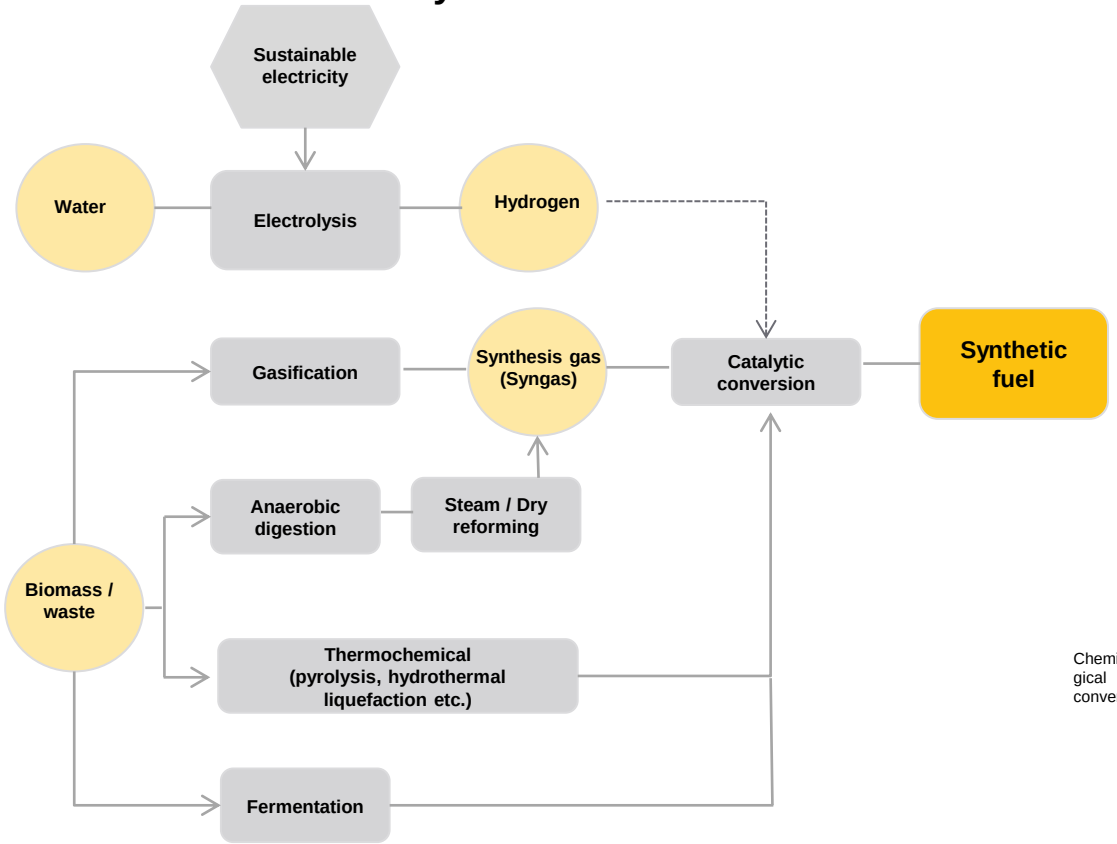
Mazda is continuing its involvement in joint research projects and studies to promote adoption of biofuels from microalgae. Mazda6 sedan runs on synthetic diesel.

Audi is researching in this area and has developed synthetic natural gas, synthetic diesel, and synthetic gasoline.

VW is researching on synthetic fuel in collaboration with Shell. The company is promoting internal combustion engines powered by synthetic fuel.

Porsche is holding on synthetic fuels and continuing the production of petrol engine model 911.

Production routes for synthetic fuels



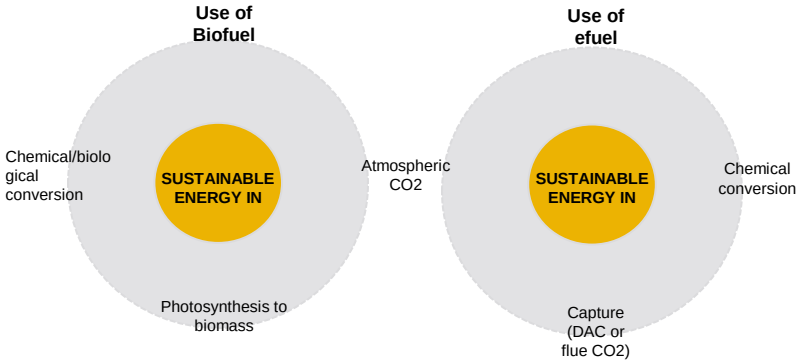
Synthetic fuels : Carbon based liquid fuels manufactured, via chemical conversion processes, from a carbon source such as coal, carbon dioxide, natural gas, biogas or biomass.

1. **Electrofuels (efuels)**

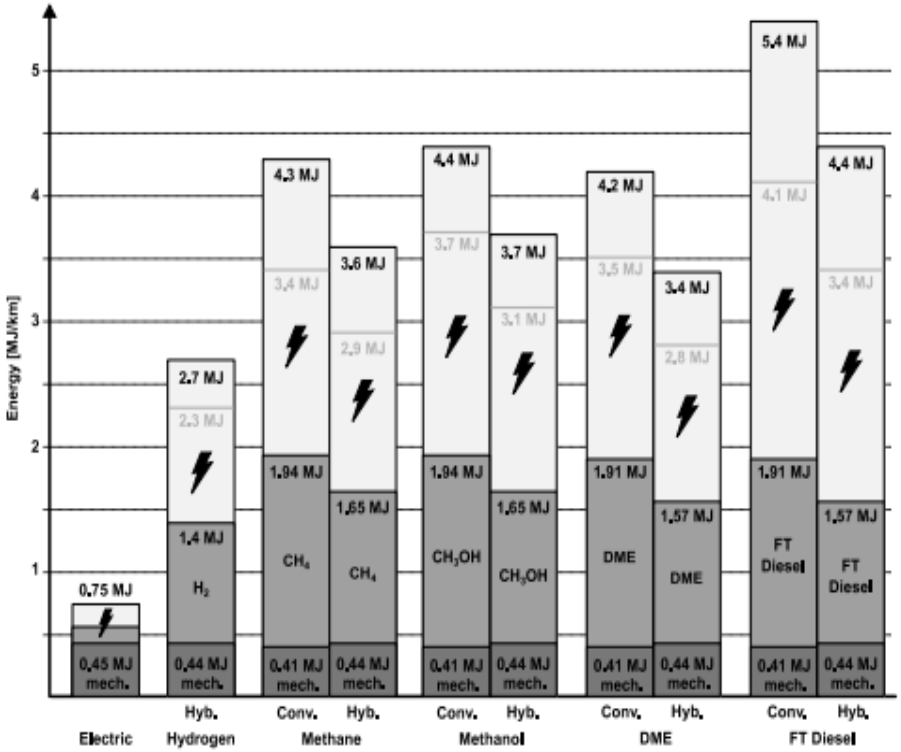
These are synthetic fuels manufactured using captured carbon dioxide or carbon monoxide together with low-carbon hydrogen. They are termed electro- or efuels because the hydrogen is obtained from sustainable electricity sources e.g. wind, solar and nuclear power.

2. **Synthetic biofuels**

Fuels synthesized from biomass or waste or biofuels using chemical or thermal processes. The production of fuels using biomass and only biological processes are outside the scope of this briefing (for example, bioethanol produced through fermentation of sugars).



Well-to-miles analysis results for different synthetic fuels – energy density comparison



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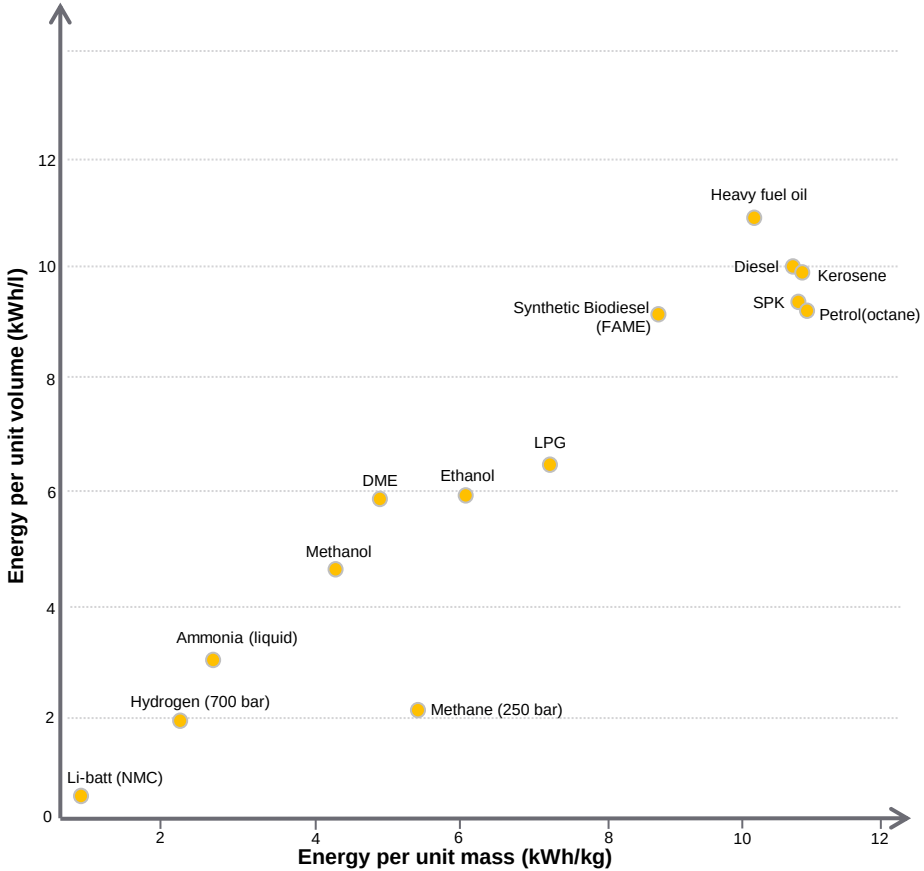


FutureBridge

Comparisons and suitability of different energy sources and vehicle types based on energy density & infrastructure requirements

Vehicle and duty cycle compatibility	Synthetic fuels	Biomethane	Hydrogen	Electricity	% Contribution to UK 2017 total CO2 5
Passenger Car		CNG			7
Long-distance car		CNG			10
Urban van		CNG			2
Heavy-duty truck					5
Distribution and refueling challenge					

Distribution infrastructure challenge

Refueling infrastructure challenge

Fully compatible

Minor restrictions

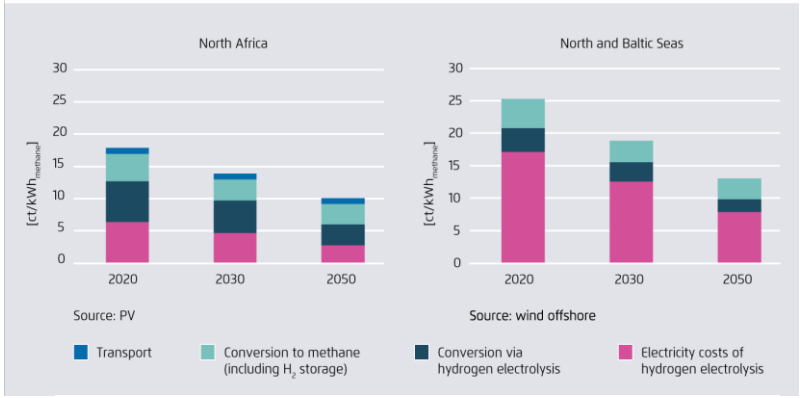
Major restrictions

Severe restrictions

Source>>

Comparison of the generation and transport costs of synthetic methane in North Africa (photovoltaic) and in the North and Baltic Seas (offshore wind) in the reference case ($ct_{2017}/kWh_{methane}$)

Figure 3



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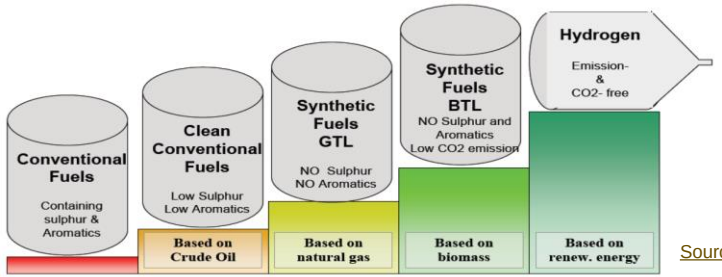
Development Steps of Future Fuels



Source>>

FutureBridge

Research paper analysis

Researchers are focusing on finding new ways to produce synthetic fuels.

Fischer–Tropsch diesel production and evaluation as alternative automotive fuel in pilot-scale integrated biomass-to-liquid process >>

Young-Doo Kim , Chang-Won Yang , Beom-Jong Kim , Ji-Hong Moon , Jae-Yong Jeong, Soo-Hwa Jeong , See-Hoon Lee , Jae-Ho Kim , Myung-Won Seo , Sang-Bong Lee , Jae-Kon Kim , Uen-Do Lee (Department of Green Process and System Engineering, University of Science and Technology (UST), India)

Process/ Experiment: In this study, a biomass-to-liquid (BTL) system involving a dual fluidized bed gasifier (DFBG), a methanol absorption tower, and an F-T synthesis process was investigated for producing clean biodiesel as an automotive fuel.

Result: biomass-to-liquid (BTL) fuel can be used as a promising alternative fuel for automotive.

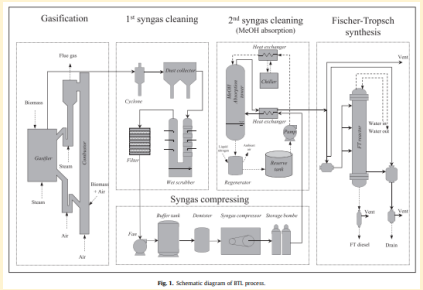


Fig. Schematic diagram of BTL process

Potential emission reductions by converting agricultural residue biomass to synthetic fuels for vehicles and domestic cooking in China >>

Xiaoliang Wang , S. Kent Hoekman , Yang Han, Judith C. Chow, John G. Watson, Xiaomeng Wu, Ye Wu, Dennis Schuetzle, Robert Schuetzle (Desert Research Institute, USA)

Process/ Experiment: Vehicle exhaust emission comparison between conventional fuels and synthetic fuels.

Result: The use of biomass for producing synthetic fuels rather than burning in the field reduces air pollution. The use of synthetic fuels reduces diesel vehicle emissions

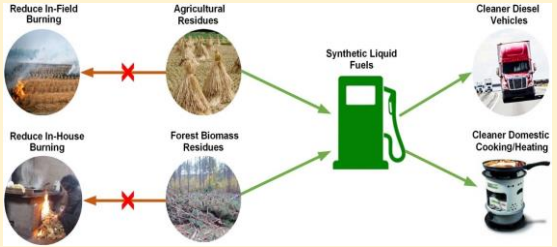


Fig. Synthetic fuel production and usage in vehicle

Techno-economic and uncertainty analysis of Biomass to Liquid (BTL) systems for transport fuel production >>

Ioanna Dimitriou(University of Nottingham), Harry Goldingay, Anthony V. Bridgwater (Aston University)

The work examines the technical and economic feasibility of Biomass-To-Liquid (BTL) processes for the manufacture of liquid hydrocarbon fuels. Six BTL systems are modeled and evaluated. Three fuel synthesis technologies are considered: Fischer-Tropsch synthesis, methanol conversion followed by Methanol to Gasoline (MTG) and the Topsoe Integrated Gasoline (TIGAS) synthesis.

Conclusions: The overall energy efficiency and production costs of the BTL designs evaluated range from 37.9% to 47.6% LHV and €17.88–25.41 per GJ of produced fuels, respectively.
Large scale biofuel production may be possible in the long term through subsidies, crude oil price rises and legislation.

COVID-19 impacts on Alternate fuel's sector

Coronavirus is negatively affecting the Oil&Gas industry. There is no difference in the Alternate fuels sector as well. The demand for vehicles, as well as fuels, has decreased due to locked down restrictions implemented by governments across the world to contain the pandemic.

24-Apr-2020

Covid-19 has been a 'knockout blow' to biofuels industry in US

Two more bioethanol plants in Iowa and Nebraska are to close as the Covid-19 pandemic continues to hit the biofuels industry. >>

24-Apr-2020

Malaysian plans for nationwide rollout of B20 biodiesel delayed

Malaysia aims to delay the nationwide adoption of plans to step up the use of palm oil in biodiesel to contain the Covid-19 outbreak. >>

27-Apr-2020

Canada's Clean Fuel Standard regulations delayed by COVID-19

Canadian government going to delay publication of proposed Clean Fuel Standard regulations that aims to reduce GHG emissions by promoting low carbon fuels, due to COVID-19 pandemic . >>

07-Apr-2020

Brazil's biofuel auction postponed

Brazil's Petroleum, Natural Gas and Biofuels Agency (ANP) announced that it is suspending the second phase of the 72th biodiesel auction. >>

21-Apr-2020

Neste joins a European alliance calling for a 'green recovery' after pandemic

Neste has joined an alliance of cross-party political decision-makers, businesses, NGOs and other stakeholders in a call for a 'green recovery' after the coronavirus, Covid-19, crisis in Europe. >>

02-Apr-2020

Biodiesel producers suffer as cooking oil supplies are hit

Biodiesel producers have raised concerns that there could be a fall of 70-90 % of cooking oil supplies since deliveries are hampered by restrictions imposed to try and control the spread of Covid-19. >>

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