

December 2023

Advanced Motor Fuels News



AMF wishes you and your loved ones a happy holiday season and a fantastic start to 2024! Thank you for your readership.

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DEMONSTRATION / IMPLEMENTATION / MARKETS

EU Project on the sustainable production of solar fuel

In October 2023, the EU project "SUNGATE" was launched under the leadership of the Fraunhofer IME in collaboration with 11 partners from industry and research. The aim of the project is to develop a novel, sustainable and cost-efficient biohybrid technology based on artificial photosynthesis that will enable the highly efficient and scalable production of solar fuel. The interdisciplinary project consortium consists of 12 industrial and research partners from six EU countries and Turkey.

The project is being funded with €4.9 million under Horizon Europe (<https://cordis.europa.eu/project/id/101122061>).

Source:

https://www.ime.fraunhofer.de/de/presse/eu_projekt_sungate.html (in German)

EU Project on green methanol

The EU project "CONVERGE" validated a state-of-the-art process for green methanol production. The process is more efficient and less expensive than existing technology, giving it a competitive advantage over fossil fuels. Project partners delivered a methodology to identify biomass supply chains for the four technological solutions. Case scenarios were applied to the Central European, Mediterranean, North Sea and Scandinavian regions. They identified five supply chain case scenarios and related business cases in 69 districts that have the most potential. In addition, the project team assessed the environmental impact of the entire process in these regions.

The project was funded with €5.1 million under Horizon 2020 (<https://cordis.europa.eu/project/id/818135>).

Source: <https://cordis.europa.eu/article/id/443169-advanced-process-makes-biodiesel-greener-cheaper-and-competitive>

EU Project on advanced biofuels from sewage

The EU project "TO-SYN-FUEL" and its 13-member consortium demonstrated for the first time on a pre-commercial scale the decentralised conversion of sewage sludge into drop-in biofuels. Abundant toilet waste may soon be powering our cars rather than accumulating in landfills. Crude oil was obtained via thermo-catalytic reforming (TCR®) technology from sewage sludge produced by wastewater treatment plants. The crude oil was converted via hydrogenation and distillation processes into drop-in biofuels that meet European standards for gasoline and diesel (EN 228 and EN 590, respectively). TO-SYN-FUEL's gasoline and diesel have all the properties of fossil fuel-derived counterparts and can be used directly in unmodified vehicles.

The project was funded under Horizon 2020 with €12.3 million (<https://cordis.europa.eu/project/id/745749>).

Source: <https://cordis.europa.eu/article/id/443176-from-domestic-sewage-waste-to-your-gas-tank-advanced-biofuels-from-sewage>.

Partnership for eMethanol production expanded

Liquid Wind announces a further strengthening of its partnership with pan-European decarbonization leaders to include plans of developing and marketing 10 additional eMethanol facilities in the Nordics by 2027.

The partnership was initially formulated in 2020 among key partners such as Alfa Laval, Carbon Clean, Siemens Energy and Topsoe. With this latest expansion in its commitment, the partnership will increase production efficiency to further ramp up design and execution of plants to produce a nominal 100,000 tons eMethanol per year with the aim to develop and market an additional ten Core eMethanol Plants (CMP) before the end of 2027.

Source:

<https://www.biofuelsdigest.com/bdigest/2023/11/11/liquid-wind-and-partners-expands-partnership-to-accelerate-efuel-production-capacity/>

Raízen starts world's largest cellulosic ethanol plant

Brazilian ethanol giant Raízen has started operations of the new second generation ethanol plant (E2G) at the Bonfim Bioenergy Park, in the city of Guariba.

With a total investment of R\$1.2 billion it is the largest cellulosic ethanol plant in the world, with a contracted commercialization level of 80% of its nominal production capacity of 82 thousand cubic meters (82 million liters) annually. Consequently, Raízen establishes itself as the largest global producer and the only one operating two E2G plants on an industrial scale (Bonfim and Costa Pinto, both in the State of São Paulo), totaling a nominal capacity of 114 million liters.

Source:

<https://www.indianchemicalnews.com/general/raizen-commences-operation-of-worlds-largest-e2g-plant-19195>

New green ammonia platform established

Energy leaders Gentari, the clean energy division of Malaysia's Petronas, GIC, and AM Green, established by the founders of Indian renewable energy giant Greenko, have joined forces to create one of the world's largest green ammonia platforms. This visionary partnership aims to produce an impressive 5 million tons of green ammonia by 2030, equivalent to approximately 1 million tons of green hydrogen.

The primary focus of this collaboration is the production of green ammonia at multiple locations in India. This endeavor is expected to play a pivotal role in accelerating India's progress toward achieving its net-zero targets while also benefiting OECD markets.

Source: <https://guildhall.agency/gentari-gic-and-am-green-partner-to-develop-green-ammonia-platform/>

Biomethane supply project in Indonesia

Pertamina, JGC, Osaka Gas and INPEX have been jointly studying use of palm oil mill effluent (POME)-based biomethane for some time. Recently, a decision was made regarding use of PT Perusahaan Gas Negara natural gas pipelines, which, along with the memorandum of understanding for feedstock procurement concluded with palm plantations and the expressions of interest received from customers, has led the participants to begin in-depth discussions. This phase will involve technical assessment of supply chain development, and biomethane production and supply, assuming that biomethane production would begin in southern Sumatra in 2025.

Source:

<https://www.jgc.com/en/news/assets/pdf/20230925e.pdf>

Topsoe signs first Australian green ammonia contract

Denmark-headed Topsoe, a global leader in carbon emission reduction technologies, has announced that it has signed a contract with Allied Green Ammonia, an Australian developer of energy infrastructure projects, for the delivery of its green ammonia technology for Allied's project in Gove, Northern Territory, Australia. The produced green ammonia is intended to be exported from Gove to the expanding Southeast Asian markets where demand for electro-fuels (e-fuels) continues to grow.

Source: <https://bioenergyinternational.com/topsoe-signs-first-australian-green-ammonia-tech-contract/lant/>

POLICY / LEGISLATION / MANDATES / STANDARDS

Provisions for transport fuels finalized in Fit for 55 package

In July 2021, the European Commission released the "Fit for 55" package, aimed at achieving the European Union's goal of reducing greenhouse gas (GHG) emissions by 55% in 2030 compared to 1990 levels. This policy update provides an overview of the final revision of the recast Renewable Energy Directive (RED III), ReFuelEU Aviation regulation, and FuelEU Maritime regulation, as agreed upon after the trilogue discussion between the European Commission, European Parliament, and the Council of the European Union.

Source: <https://theicct.org/publication/fuels-fit-for-55-red-iii-jul23/>

DOE funds clean energy transition

The U.S. Department of Energy (DOE) has announced to provide \$264 million for basic research in support of the Energy Earthshots Initiative. The initiative will accelerate breakthroughs of more

abundant, affordable, and reliable clean energy solutions within the decade. They will drive the major innovation breakthroughs needed to solve the climate crisis, reach 2050 net-zero carbon goals, and create the jobs of the new clean energy economy. In regards to the transport sector, funding is available for hydrogen and sustainable fuels.

Source: <https://www.energy.gov/energy-earthshots-initiative>

India moves forward with bioCNG blending mandates

The Government of India has taken a major step towards enhancing the use and adoption of biomethane. The National Biofuels Coordination Committee (NBCC), chaired by the Union Petroleum Minister announced on November 24, 2023, the introduction of phase-wise mandatory blending of biomethane in compressed natural gas (CNG) for transportation as well as domestic segments of the City Gas Distribution (CGD) sector.

The key objectives of the CBG Blending Obligation (CBO) are to stimulate demand for bioCNG in the CGD sector, import substitution for Liquefied Natural Gas (LNG), saving on foreign exchange, promoting circular economy and assist in achieving the target of net zero emissions.

Source: [https://bioenergyinternational.com/india-moves-forward-with-biocng-blending-mandates/#:~:text=The%20National%20Biofuels%20Coordination%20Committee,Gas%20Distribution%20\(CGD\)%20sector.](https://bioenergyinternational.com/india-moves-forward-with-biocng-blending-mandates/#:~:text=The%20National%20Biofuels%20Coordination%20Committee,Gas%20Distribution%20(CGD)%20sector.)

Japan to launch centre for decarbonisation

On 27 October, Japan's Prime Minister, KISHIDA Fumio, announced the intention to establish a new centre within the Economic Research Institute for ASEAN and East Asia (ERIA) to include around 8 billion yen in related budget for fiscal 2023. This centre will serve as a policy platform aimed at formulating visions to achieve net-zero emissions and implementing related policy coordination with ASEAN countries. The initiative is set to materialise through the Asia Zero Emission Community (AZEC) Leaders' Meeting, scheduled to take place on the sidelines of the ASEAN Japan Commemorative Summit in December 2023, marking the 50th Year of ASEAN-Japan Friendship and Cooperation.

Source: <https://www.yomiuri.co.jp/economy/20231105-OYT1T50173/> (in Japanese)

SPOTLIGHT SHIPPING

Ørsted announces funding partners for FlagshipONE

Ørsted announced that the EU-Catalyst Partnership, which consists of the European Commission, Breakthrough Energy Catalyst, and the European Investment Bank, has vowed to support Ørsted's FlagshipONE project, highlighting the innovative

nature of this project and its potential to contribute to the decarbonisation of shipping. FlagshipONE is Europe's largest e-methanol plant and is currently the world's strongest proof point that carbon-neutral shipping is possible.

Breakthrough Energy Catalyst is a first-of-its-kind model, bringing together government partners and leading organisations from across the private sector to fund and scale emerging climate technologies. Breakthrough Energy Catalyst will acquire a 15 % equity interest in FlagshipONE and provide a grant to the project, subject to the fulfilment of funding conditions.

Source:

<https://orsted.com/en/media/newsroom/news/2023/12/oerste-d-partners-with-breakthrough-energy-catalyst-771311#:~:text=Today%2C%20at%20COP28%2C%20C3%98rsted%20announced,potential%20to%20contribute%20to%20the>

Volvo switches to renewable fuels for ocean freight

Volvo Cars has announced a new initiative to use renewable fuel for inbound ocean container transports of production material destined for manufacturing plants based in Europe and the Americas, as well as all spare parts distribution. Volvo is working on this initiative its logistics partners Maersk, Kuehne+Nagel and DB Schenker to use Fatty Acid Methyl Esters (FAME) based mainly on waste cooking oil. The initiative will not use feedstocks related to palm oil. The company expects to achieve a reduction in CO2 emissions by 55,000 tons over a year from this effort.

Source:

<https://www.renewableenergymagazine.com/biofuels/volvo-cars-switches-to-renewable-fuels-for-20230705>

Maersk signs landmark green methanol agreement

The offtake agreement between Maersk and Chinese developer Goldwind, a global leader in clean energy, reaches into the next decade and marks the first large scale green methanol offtake agreement for the global shipping industry.

The volumes combine a mix of green bio-methanol and e-methanol, all produced utilising wind energy at a new production facility in Hinggan League, Northeast China, around 1000km northeast of Beijing. Production is expected to begin in 2026. Following this signed offtake agreement, Goldwind expects to confirm a final investment decision for the facility by the end of the year.

Source:

<https://www.maersk.com/news/articles/2023/11/22/maersk-signs-landmark-green-methanol-offtake-agreement>

Evergreen and CIP partner up for e-fuels production

Evergreen and Copenhagen Infrastructure Partners (CIP) have signed a Memorandum of

Understanding (MOU) to jointly explore production and usage of carbon-neutral e-fuels. CIP has signed the MOU on behalf of its Energy Transition Fund.

The cooperation will have several aspects including production of e-fuels in Taiwan based on offshore wind, but also exploration of a broader supply of green fuels such as e-ammonia and e-methanol. Taiwan plays a vital role in the global supply chains not only as a producer, but also as a container ship operator, controlling about 10% of the world's container shipping fleet.

Source: <https://www.globenewswire.com/news-release/2023/10/20/2763893/0/en/Evergreen-and-CIP-team-up-to-explore-green-shipping-fuels.html>

SPOTLIGHT AVIATION

Preem to become a leading European SAF player

Swedish oil refiner and renewable fuel major Preem has announced it will invest approximately € 500 million, to repurpose its refinery in Lysekil, north of Gothenburg. The investment represents an important step for the company as it phases out fossil production in favor of renewable fuels for road and air transport. Through this investment, Preem aims to become one of the most important producers of sustainable aviation fuels (SAF) in Europe

Source: <https://www.investingothenburg.com/news/all-news/preem-invests-renewable-fuels-production#:~:text=Preem%20has%20announced%20it%20will,for%20road%20and%20air%20transport>

Galp and Mitsui team up for SAF project

Portuguese oil company Galp has teamed up with Japan's Mitsui to invest €400 million in an industrial-scale plant to produce biodiesel and sustainable aviation fuel (SAF) from waste at its Sines refinery.

The hydrogenated vegetable oil (HVO) plant will have a production capacity of 270,000 metric tons per year. It will transform waste materials, such as used cooking oils, into renewable biodiesel and SAF.

Source: <https://biofuels-news.com/news/galp-and-mitsui-team-up-for-biofuel-plant-project/>

Neste, ISCC, DHL pilot new SAF tracking system

Neste, ISCC and DHL Group joined forces to pioneer and test a system through which airlines, logistics service providers and end customers such as corporates can credibly report the emission reduction achieved by using sustainable aviation fuel (SAF) to reduce their carbon footprint from air travel and transport.

The ISCC Credit Transfer System, SAF use and related sustainability benefits, namely greenhouse gas (GHG) emission reductions, are tracked and transferred via a registry operated by ISCC. This

newly developed system provides full traceability of SAF transactions and related sustainability benefits. This ensures that companies purchasing SAF and airlines using the fuel, are able to credibly and transparently claim emission reductions and use them towards their climate targets, while reducing the risk of incorrect sustainability claims and double counting of SAF volumes and their GHG emission reduction.

Source: <https://biodieselmagazine.com/articles/neste-isc-dhl-pilot-a-new-saf-tracking-system>

Honeywell and GranBio to produce SAF

GranBio's AVAPCO received an \$80 million grant for a demonstration plant in the U.S., which is expected to produce about 2 million gallons of sustainable aviation fuels (SAF) per year by 2026. Honeywell's ethanol-to-jet (ETJ) technology will be combined with GranBio Technologies' patented cellulosic ethanol AVAP technology to produce carbon-neutral SAF from biomass residues at GranBio's upcoming U.S. demonstration plant.

Source:

<https://www.energytech.com/renewables/article/21275404/honeywell-and-granbio-produce-carbonneutral-saf-from-biomass-residues>

Southwest signs SAF deal with USA BioEnergy

Southwest Airlines today announced an offtake agreement with USA BioEnergy for up to 680 million gallons of neat sustainable aviation fuel (SAF). Over the term of the 20-year agreement, once blended with conventional jet fuel, the SAF could produce the equivalent of 2.59 billion gallons of net-zero¹ fuel and avoid 30 million metric tons of CO₂. Southwest Airlines plans to begin purchasing SAF from USA BioEnergy's facility near Bon Wier, Texas, as early as 2028. Additionally, as part of the offtake agreement, Southwest and USA BioEnergy have established a long-term strategic relationship offering Southwest the opportunity to purchase up to another projected 180 million gallons of SAF per year from future planned production facilities.

Source: <https://www.prnewswire.com/news-releases/southwest-airlines-signs-agreement-with-usa-bioenergy-to-purchase-up-to-680-million-gallons-of-sustainable-aviation-fuel-301975922.html>

Airbus becomes strategic partner of DG Fuels

Airbus has become a strategic partner with DG Fuels (DGF), an emerging producer of sustainable aviation fuel (SAF). DGF's fuel production system is based entirely on cellulosic waste products, such as wood waste from the logging industry, and renewable energy sources, such as wind and solar power. The plant aims to have an initial production capacity of (454 million litres of SAF per year on average, which could save approximately 1.5 million tons of CO₂ emissions annually from 2026.

Source: <https://www.airbus.com/en/newsroom/press-releases/2023-09-airbus-partners-with-dg-fuels-to-foster-sustainable-aviation-fuel>

Study on decarbonizing aviation in Latin America

Airbus and LATAM have funded a study at Massachusetts Institute of Technology to examine scenarios for the deployment of sustainable aviation fuels (SAF) in Latin America to 2050, and explore pathways related to low-carbon hydrogen, direct air capture, and bioenergy with carbon capture and storage. The study will evaluate the use of incentives, carbon taxes and carbon offsets, among other quantifiable policy instruments, to compensate emissions in aviation. The analysis will include actionable recommendations for Brazil, Chile, Colombia, Ecuador, Mexico and Peru on pathways for decarbonizing the aerospace sector. The results of the study are planned to be published in April 2024.

Source: <https://globalchange.mit.edu/news-media/jp-news-outreach/airbus-latam-airlines-group-fund-mit-joint-program-study-options>

First A380 flight powered by SAF

Emirates became the first airline to operate an Airbus A380, the world's largest passenger airliner, using 100% sustainable aviation fuel (SAF) in one of its engines. The jet used conventional jet fuel in three of its four Engine Alliance GP7200 engines and 100% SAF in the fourth engine, marking another milestone in the industry's growing momentum to bring standardization, certification, and adoption of 100% SAF closer to reality.

Source: <https://www.ge.com/news/reports/a-jumbo-moment-for-saf-emirates-operates-first-a380-using-100-sustainable-aviation-fuel-in#:~:text=sustainable%20aviation%20fuel,A%20Jumbo%20Moment%20for%20SAF%3A%20Emirates%20Operates%20First%20A380%20Using,Aviation%20Fuel%20in%20One%20Engine&text=Today%2C%20Dubai%20Dbased%20Emirates%20became,in%20one%20of%20its%20engines.>

Test flight with palm oil-blended jet fuel in Indonesia

Flag carrier Garuda Indonesia said it has completed a test flight using a palm oil-blended jet fuel on a Boeing 737-800NG aircraft. The plane flew more than 130 km from the capital Jakarta to Pelabuhan Ratu in the southern part of Java Island in a one-hour return flight, using jet fuel containing 2.4% palm content. The palm-oil blended jet fuel was produced by Indonesian state energy firm PT Pertamina at its Cilacap refinery, using hydroprocessed esters and fatty acid (HEFA) technology and is made of refined bleached deodorized palm kernel oil.

Source: <https://www.reuters.com/sustainability/flag-carrier-garuda-indonesia-completes-flight-test-with-palm-oil-blended-jet-2023-10-10/>

Petronas and Idemitsu sign deal to develop SAF

Malaysian state oil company Petronas and Japan's second-biggest oil refiner Idemitsu signed a preliminary agreement to collaborate on development and distribution of sustainable aviation fuel, the companies said on Thursday.

They will focus on a feasibility study to scale-up bio feedstock possibilities, production cost analysis and security in ensuring a steady and efficient supply chain for the sustainable development of SAF.

Source: <https://www.reuters.com/sustainability/climate-energy/petronas-idemitsu-deal-develop-sustainable-aviation-fuel-2023-10-05/>

SPOTLIGHT ELECTRIC VEHICLES

Nikola launches hydrogen fuel cell truck

Nikola has announced the commercial launch of its hydrogen fuel cell electric vehicle. The electric truck has a range of up to 500 miles and an estimated refueling time of only 20 minutes. Moreover, the truck is expected to have one of the longest ranges of any commercially available zero-tailpipe-emission Class 8 truck. With a mixed production line at the Coolidge plant capable of producing both hydrogen fuel cell and battery electric trucks, the facility is ready to reach an annual production capacity of approximately 2,400 trucks.

Source: <https://www.fleetequipmentmag.com/nikola-launches-hydrogen-fuel-cell-commercial-ev/>

New battery production joint venture

Cummins, Daimler, and PACCAR announced a joint venture to advance lithium-iron-phosphate (LFP) battery cell production in the United States for commercial electric trucks. Chinese battery maker EVE Energy will share its LFP cell technology with the venture. The companies expect to invest between \$2 and \$3 billion to set up a 21-gigawatt hour factory to manufacture the battery cells.

Source: <https://electrek.co/2023/09/07/battery-factory-electric-trucks-us-daimler/>

Fleet reaches 2 million miles on electric school buses

First Student, one of the largest providers of school transportation in North America, reached 2 million miles driven on electric school buses. The company had 240 electric buses in operation as of March and were delivering 15-20 additional buses per month. They estimate that their electric buses will reduce carbon emissions by 30.6 million tons in the 2023/2024 school year. The company currently operates 46,000 buses and has a goal to electrify 30,000 of them by 2035.

Source: <https://www.prnewswire.com/news-releases/first-student-recognized-by-white-house-for-industry-leading-electrification-efforts-301785941.html>

Toyota adopts Tesla's charging standard

Toyota Motor agreed to adopt Tesla's electric-vehicle charging standard for its models for the North American (NA) market from 2025. Toyota Motor North America announced that it will incorporate charging ports compatible with the standard in some of its battery electric vehicles. They include a new SUV to be assembled at its plant in Kentucky. Toyota says the agreement will give Toyota drivers access to more than 12,000 Tesla chargers in the region. Nissan and Honda as well as General Motors have already adopted Tesla's charging standard.

Source: <https://pressroom.toyota.com/toyota-adopts-the-north-american-charging-standard-to-expand-customer-charging-options/>

Cooperation toward mass production of batteries

Idemitsu and Toyota announced that they have entered into an agreement to work together in developing mass production technology of solid electrolytes, improving productivity and establishment a supply chain, to achieve the mass production of all-solid-state batteries for battery electric vehicles (BEVs).

Source:

<https://global.toyota/en/newsroom/corporate/39865919.html>

SPOTLIGHT HYDROGEN

Renewable hydrogen development in Chile

The European Union and Chile signed a statement of intent to support growing renewable hydrogen industry via the Team Europe Renewable Hydrogen Funding Platform for Chile. The platform will support the decarbonisation of Chile's economy, creating green jobs and generating business opportunities for Chilean and European companies while also helping Europe meet its import demand for renewable hydrogen. European banks can provide financing to Chile of up to 200 million euros for renewable hydrogen initiatives, while the EU Latin America and Caribbean Investment Facility (LACIF) will provide an additional grant of 16.5 million euros.

Source:

https://www.eeas.europa.eu/delegations/chile/chilean-government-and-european-union-launch-two-new-cooperation-initiatives-renewable-hydrogen_en?s=192

U.S launches 7 Regional Clean Hydrogen Hubs

The U.S. Department of Energy announced \$7 billion in funding to launch seven Regional Clean Hydrogen Hubs (H2Hubs) with the goal of accelerating commercial-scale deployment of hydrogen fuel. This government investment will be matched by recipients to leverage a total of nearly \$50 billion. The effort will create a national network of clean hydrogen producers, consumers, and connective infrastructure

while supporting the production, storage, delivery, and end-use of clean hydrogen. The H2Hubs are expected to produce 3 million metric tons of hydrogen annually, reaching nearly a third of the 2030 U.S. production target and lowering emissions from hard-to-decarbonize industrial sectors that represent 30% of total U.S. carbon emissions.

Source: <https://www.energy.gov/articles/biden-harris-administration-announces-7-billion-americas-first-clean-hydrogen-hubs-driving>

Port hydrogen production facility in operation

FuelCell Energy and Toyota Logistics Services (TLS) have completed a first-of-its-kind “Tri-gen system” at the Port of Long Beach. The system uses steam methane reformation and high temperature carbonate fuel cells to produce electricity, hydrogen, and water from biogas. The system can produce up to 1,200 kg/day of hydrogen, which will be used to supply a nearby heavy-duty hydrogen station supporting TLS logistics and drayage operations at the port. In addition, it will be used to fuel the company’s fleet of Toyota Mirai.

Source: <https://www.greencarcongress.com/2023/09/20230908-trigen.html>

AMF NEWS

AMF ExCo 66

The 66th AMF ExCo meeting took place in October 2023 in Leipzig, Germany. The meeting was held in conjunction with a meeting of IEA Bioenergy Task 39 (Biofuels). More than 40 participants from both networks engaged in information exchange on the production and use of biofuels and related policies. Topics of common interest include biofuels and e-fuels, their use in aviation and shipping, LCA and certification schemes, and work on a White Paper pointing out the opportunities that advanced motor fuels offer. The joint information exchange also included a public workshop, see <https://www.dbfz.de/en/events/international-expert-workshop> for details.

AMF is working on a new Strategic Work Plan, and revised strategic objectives and priority research areas were discussed during the meeting. It is important to note that sectors that can electrify will be able to decarbonize more quickly, and the use of advanced motor fuels – while remaining important in the legacy fleet and in remote regions or regions with extreme climate – will be most needed in the hard-to-electrify sectors. This is why the focus of AMF work is shifting from road transport to non-road mobile machinery, aviation and shipping.

Recent AMF work on aviation and shipping has been concluded and final reports and key messages have been published, see publications section for their

reports. Both sectors remain important for AMF work, and a follow-up Task on SAF is in the pipeline.

Also upcoming is a collaboration with the Sustainable Combustion TCP on exhaust after-treatment systems. Finally, Task 65: Powertrain options for non-road mobile machinery was successfully kicked-off during the ExCo meeting.

Ongoing AMF Tasks

The full list of current AMF projects includes:

- Task 65: Powertrain options for non-road mobile machinery
- Task 64: E-fuels and End-Use Perspectives
- Task 62: Wear in engines using alternative fuels
- Task 61: Remote Emission Sensing
- Task 28: Information Service & AMF Website

Link: https://www.iea-amf.org/content/projects/ongoing_projects

PUBLICATIONS

Sustainable Aviation Fuels - Status quo and national assessments

The results of AMF’s first project on SAF were published in a final report and a key messages document. These summarize the status quo of production technologies as well as current challenges for SAF deployment. National assessments of 6 countries provide an overview on measures taken to stimulate SAF production and use. The study found that, although SAF production technologies other than hydrotreatment still have to be further developed and deployed, neither production technology nor technical issues when operating aircrafts on SAF are seen as the main challenges. Implementing SAF is primarily an economic challenge, rather than a technical one.

https://iea-amf.org/content/projects/map_projects/63

The Progress of Advanced Marine Fuels

Global marine shipping is a sector which is hard to electrify and therefore in need of advanced motor fuels for a sustainable future. In short sea shipping battery electric propulsion can however be, and already is, an alternative. AMF has thus investigated several applications of advanced motor fuels in marine engines, including bio-intermediates from catalytic pyrolysis or hydrothermal liquefaction, biodiesel blends, methanol, methane, hydrogen, ammonia, and propane. The report considers fuel availability as well as the impact on Sulphur, NOx, Black Carbon, and GHG emissions.

https://iea-amf.org/content/projects/map_projects/60

Low-emissions transport fuels: Technology and policy pathways to decarbonise shipping and aviation

This IEA workshop brought together participants to discuss the implications of policies at global, national

and subnational levels; business initiatives and market opportunities for low-emissions fuels; and the status of current and promising future technologies. All presentations are posted on the website.

<https://www.iea.org/events/low-emissions-transport-fuels-technology-and-policy-pathways-to-decarbonise-shipping-and-aviation>

Transport and Environment Report 2022

This European Energy Agency (EEA) report explores how and to what extent digitalisation can be instrumental in reducing the environmental impacts of passenger and freight transport in urban and non-urban settings. To do so, nine, digitally-enabled technologies are discussed that are currently central in mobility-related policymaking: teleworking and virtual mobility, autonomous passenger and freight transport, multimodal services, smart logistics, digital tools for demand management, air traffic management, and digital monitoring solutions for greenhouse gases and air pollution emissions.

Link: <https://www.eea.europa.eu/publications/transport-and-environment-report-2022>

Bioenergy in the European Union

This report presents an assessment of the state of the art of key technologies for bioenergy production. Several biomass technologies are available for heat and power production from biomass, namely combustion, anaerobic digestion, as well as intermediate energy carriers produced by torrefaction, pyrolysis, hydrothermal processing, and gasification. Anaerobic digestion is a relatively established, commercial technology, with minimal environmental impacts when using manure, food and agricultural waste or sewage sludge.

Link: <https://op.europa.eu/en/publication-detail/-/publication/f9cc62fa-7493-11ee-99ba-01aa75ed71a1/language-en/format-PDF/source-296409724>

European Biomass Puzzle

This European Energy Agency (EEA) report looks at how biomass can help us reach our climate and environmental objectives, and how climate change might affect the EU's biomass production in agriculture and forest sectors. It also discusses key synergies and trade-offs in the use of biomass for different policy objectives.

Link: <https://www.eea.europa.eu/publications/the-european-biomass-puzzle>

Trends and Projections in Europe 2023

This report from European Energy Agency (EEA) explores the historical trends, most recent progress and projected future progress on climate change mitigation through reduced GHG emissions, renewable energy gains and improved energy efficiency. It builds upon data reported by the EU-27 Member States, five EEA member countries and nine Contracting Parties of the Energy Community.

Link: <https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2023>

Biofuels in agricultural machinery

The German Union for the Promotion of Oil and Protein Crops (UFOP) has published a study on biofuels in agricultural machinery in Bavarian state farms. The aim of the research project is to investigate agricultural and forestry machinery with exhaust after treatment systems in terms of functionality, fuel consumption and exhaust behavior in the field and on the tractor test stand when using alternative drives.

The study includes 27 agricultural and forestry machines that run on rapeseed oil fuel, biodiesel or paraffinic diesel fuel from residual and waste materials. In addition, three working machines with electric drives are also part of the investigations. In total, these tractors and one harvester have run for more than 100,000 hours on the test farms, largely without any problems. More than 1 million liters of fossil diesel were saved in the process. In modern agricultural and forestry technology, alternative drives can already contribute to a significant reduction in GHG emissions and to less dependence on fossil fuels. However, Bavarian state farms would like to have a broader variety of type-approved machines for renewable fuels supplied by the agricultural machinery industry.

Link:

https://www.tfz.bayern.de/mam/cms08/publikationen/bericht_e/dateien/tfz-bericht_80_klimatrak.pdf (in German with English abstract)

Technologies and fuels to support climate ambitions

A number of different analyses have been published in recent years that explore the opportunities and challenges of global aviation deep decarbonisation. This study differs from others in several ways:

Transparent, integrated modelling of the global aviation system down to an individual flight itinerary level, considering regional differences and system feedbacks such as the (demand-related) rebound effect.

Transparent aircraft deployment pathways, considering emerging technologies and related time constants (described in detail in the appendices to this report), based on internally consistent assumptions:

- Detailed bottom-up analysis of sustainable aviation fuel production pathway capacities; and
- A focus on implications for the fuels/refining industry.

Link: <https://www.concawe.eu/publication/aviation-technologies-and-fuels-to-support-climate-ambitions-towards-2050/>

Case studies of advanced biofuel technologies

This IEA Bioenergy report was delivered in the frame of the project 'Assessment of successes and lessons learned for biofuels deployment'. In this task, case studies from Germany, Sweden and Canada were

accessed to illustrate examples of progress in developing and scaling up advanced/emerging biofuels production technologies. In addition, lessons learned in shortcomings or problems or other issues in the commercial development are also provided in the case studies. Examples of the technologies have been chosen based on the expertise of the members and the maturity of the technology.

Link: <https://www.ieabioenergy.com/blog/publications/case-studies-of-advanced-biofuel-technologies/>

Sustainable aviation fuel study 2023

The study by PWC takes a closer look on how the market dynamics are evolving, the roadblocks that are emerging along the supply chain, how the various stakeholders are tackling and overcoming these barriers to sustainable aviation fuel (SAF) supply and adoption, and the potential business models that might give rise to an optimal industry ecosystem. According to the study, current supply is inadequate and heavy investment will be required to address growing demand and fulfil regulatory targets. With a potential future demand of about 325 million tons of SAF to achieve net zero by 2050, roughly €1,000 billion in capital expenditure will be needed simply to establish SAF refineries - offering in return attractive profits to active players given the rising supply-demand gap.

Link: <https://www.strategyand.pwc.com/de/en/sustainable-aviation-fuel.html>

Roadmap to decarbonize freight transportation

This study analyses the barriers that the freight transportation sector faces and the opportunities that the region offers to overcome them, detailing a recommended roadmap for the decarbonisation throughout Latin America. One of the key challenges for the decarbonisation of transportation in Latin America lies in freight transportation, which contributes 47% of the total carbon dioxide (CO₂) emissions from the transportation sector. To ensure a sustainable process towards the decarbonisation of cargo fleets, it is necessary to promote the economic development of countries while reducing the adverse impacts of freight transport. To do this, the roadmap focuses on five main policies: sales goals for new zero-emission vehicles, environmental and operational regulations, tax incentives, charging infrastructure, and demand promotion.

Link: <https://theicct.org/publication/hoja-de-ruta-para-descarbonizar-el-transporte-de-carga-en-america-latina-aug23/>

Measures to increase U.S. SAF production capacity

The U.S. Sustainable Aviation Fuel (SAF) Grand Challenge outlines ambitious objectives for domestic SAF production, with a target of 3 billion gallons by 2030 and 35 billion gallons by 2050. This study examines the feasibility of achieving these targets and finds that the U.S. possesses the theoretical capacity to produce up to 21.7 billion gallons of SAF derived

from biomass. However, we find that sustainable production, which avoids adverse market and environmental consequences, is limited to 12.2 billion gallons. While these resources are sufficient in principle to meet the 2030 SAF production target, they fall short of the 2050 goal. Technology and facility deployment delays are likely to restrict near-term increases in SAF production, while meeting the 2050 targets will necessitate going beyond the sustainable availability of existing biomass, such as through the production of synthetic or e-fuels.

Link: <https://theicct.org/publication/us-saf-production-capacity-nov23/>

GHG emissions of BEV an ICEV in Brazil

This study evaluates which combustion engine and electric powertrain types provides the largest reduction of GHG emissions from passenger cars. The life-cycle assessment includes the emissions of vehicle and battery manufacturing, as well as fuel combustion, fuel and electricity production, and maintenance. The study compares flex-fuel internal combustion engine vehicles (ICEVs) and battery electric vehicles (BEVs) using average new vehicles across the compact, medium, and compact SUV segments. The study finds that the life-cycle emissions of flex-fuel ICEVs vary largely when operated on gasoline, ethanol, or on a mix of the two fuels. Using the average electricity mix, current BEVs emit about one third of the life-cycle emissions of gasoline-ethanol flex-fuel ICEVs and future models can approach zero emissions. Based on these findings, this study also presents a series of policy recommendations for decarbonizing the transport sector. In particular, ambitious targets in the CO₂ emission standards of the upcoming Green Mobility and Innovation Program – PROMOVI. Further, including land use change emissions in the RenovaBio biofuels program would help to improve the sustainability of ethanol.

Link: <https://theicct.org/publication/comparison-of-life-cycle-ghg-emissions-of-combustion-engines-and-electric-pv-brazil-oct23/>

Green hydrogen production in Brunei Darussalam

While Brunei Darussalam has long been renowned for its oil and gas production and export, it is now embracing a shift towards carbon neutrality by 2050. To achieve this goal a study by ERIA illustrates that Brunei must transition from oil and gas to clean fuels, such as hydrogen, for both production and export.

Link: <https://www.eria.org/publications/study-on-green-hydrogen-production-in-brunei-darussalam/>

Energy Outlook & Energy Saving Potential in East Asia

Decarbonisation pathways must consider various socio-economic and political circumstances that can facilitate countries in reaching carbon neutrality. To address this, the study explores a scenario called 'Low Carbon Energy Transition (LCET),' a carbon-

neutral scenario that analyses the impacts of Net-Zero Emission (NZE) technologies to help countries achieve carbon neutrality by 2050 or beyond.

Link: <https://www.eria.org/research/energy-outlook-and-energy-saving-potential-in-east-asia-2023/>

Japan's Energy White Paper 2023

The Annual Report on Energy (also known as the "Energy White Paper") summarizes the measures on energy supply and demand that the Government of Japan conducted in the previous fiscal year. In the report the progress in the reconstruction of Fukushima, challenges and responses involving energy security and challenges and actions toward realizing green transformation (GX) are discussed. As a response to the U.S. Inflation Reduction Act (IRA), Japan is also making similar efforts. In February 2023, a Cabinet Decision was made on the Basic Policy for the Realization of GX to achieve both enhanced industrial competitiveness and decarbonisation with the basic premise of securing stable energy supply.

Link:

https://www.meti.go.jp/english/press/2023/0606_003.html

IEEJ Outlook 2024 for ASEAN

The report focuses on ASEAN's pathway towards energy transition. As ASEAN countries continue to achieve significant economic growth, the region will be the center of energy demand growth in the world. The main findings from the report are that cost efficiency of energy transition is essential, the optimal energy mix will vary depending on the total amount of demand, cost of renewable energy is expected to be low and gas will mainly play a role in reducing emissions and in dispatchable power generation.

Link: <https://eneken.ieej.or.jp/data/11413.pdf>

EVENTS

Transportation Research Board Annual Meeting

7-11 January 2024, Washington, D.C., USA

<https://www.trb.org/AnnualMeeting/AnnualMeeting.aspx>

Fuels for the Future

22-23 January 2024, Berlin, Germany

<https://www.fuels-of-the-future.com/en>

Clean Fuels Conference

5-8 February 2024, Fort Worth, Texas, USA

<https://www.cleanfuelsconference.org/>

Lignofuels 2024

7-8 February 2024, Helsinki, Finland

<https://www.wplgroup.com/aci/event/lignocellulosic-fuel-conference-europe/#tabs-2>

Renewable Fuels Association National Ethanol Conference

19-21 February 2024 San Diego, California, USA

<https://www.nationalethanolconference.com/>

International Biomass Conference & Expo

4-6 March 2024, Richmond, Virginia, USA

<http://www.biomassconference.com>

The Work Truck Show & Green Truck Summit

5-8 March 2024, Indianapolis, Indiana, USA

<https://www.worktruckweek.com/>

DATAGRO Opening Crop – Sugarcane, Sugar, and Ethanol

6-7 March 2024, São Paulo, Brazil and Virtual

<https://www.datagroconferences.com/en/eventos/datagro-opening-crop-sugarcane-sugar-ethanol-2024/>

2nd Annual Advanced Biofuels Forum

12-13 March 2024, Amsterdam, Netherlands

<https://www.leadventgrp.com/event/2nd-annual-advanced-biofuels-forum/register>

Gasification 2024

20-21 March 2024, Ghent, Belgium

<https://www.wplgroup.com/aci/event/gasification/>

WCX SAE World Congress Experience

16-18 April 2024, Detroit, Michigan, USA

<https://www.sae.org/highlights/wcx>

Advanced Clean Technology (ACT) Expo

20-23 May 2024, Las Vegas, Nevada, USA

<https://www.actexpo.com/>

International Fuel Ethanol Workshop & Expo and Biodiesel Summit

10-12 June 2024, Minneapolis, Minnesota, USA

<https://few.bbiconferences.com/ema>

North American SAF Conference & Expo

11-12 September 2024, St. Paul, Minnesota, USA

<https://saf.bbiconferences.com/ema>

IMPRINT

The Advanced Motor Fuels Technology Collaboration Programme (AMF TCP) is one of the International Energy Agency's (IEA) transportation related Technology Collaboration Programmes. These are multilateral technology initiatives that encourage technology-related activities that support energy security, economic growth and environmental protection.

AMF provides an international platform for co- operation to promote cleaner and more energy efficient fuels and vehicle technologies. This newsletter contains news articles on research, development and demonstration of advanced motor fuels, information about related policies, links to AMF projects, and an overview over publications and events.

The newsletter is prepared based on contributions from Robert ROSENITSCH, TU Vienna, Shinichi GOTO, AIST, and Andy BURNHAM, ANL. It is edited by Lena HUCK, FNR. The Newsletter is available online at: www.iea-amf.org.

AMF welcomes interested parties to make contact and to become members of the AMF family. If you wish to get in touch please contact the AMF Secretary, the AMF ExCo Chair or your national AMF Delegate.

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