FUELS OF THE FUTURE

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Conference Report 2018

REPORT ON THE 15TH INTERNATIONAL CONFERENCE ON RENEWABLE MOBILITY ON 22ND – 23RD JANUARY 2018 IN BERLIN

Organiser BBE Bundesverband Bioenergie e.V. ufop BDBe Bundesverband der deutschen Bioethanolwirtschaft e. V. Fachverband BIOGAS VDB

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FUELS OF THE FUTURE

15TH INTERNATIONAL CONGRESS CONFERENCE REPORT

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THE CONFERENCE

The 15th "Fuels of the Future" conference was held in January 2018. This conference has now become established as one of the most important events in Europe addressing biofuels and alternative drive systems, covering the widest range of topics of any such event. In 2017, the conference was extended to include the topic of „renewable mobility" for the first time. In In incorporating this additional content, the conference organisers - the German Bioenergy Association (BBE), the Union for the Promotion of Oil and Protein Plants (UFOP), the German Bioethanol Industry Association (BDBe), the German Biofuels Industry Association (VDB) and the German Biogas Association (FvB) - underline the fundamental importance of all renewable options for decarbonisation of transport. Referring to the ambitious objective of the Paris Climate Agreement, the conference organisers emphasise that decarbonisation of transport cannot be achieved by 2050 unless all these options are deployed. The transport sector especially poses a particular global challenge for signatories of the Paris Agreement, due to constant increases in traffic and the particular challenges that changing models or drives, along with the need for additional nationwide infrastructure, poses for national economies. These challenges also encompass consumer acceptance, as consumers' willingness to change models or drives also determines the pace of this transformation process.

All options are subject to compliance with the requirements of and fields of action covered by effective and transparent sustainability assessment and/or certification. The general framework was established in 2009 by the Renewable Energies Directive (RED), which enshrined these requirements in legislation; pursuant to EU law, these provisions are also applicable in third countries. In addition, the international certification systems officially recognised by the European Commission define and monitor compliance with these provisions through authorisation by qualified certification bodies. These controls focus in particular on biofuels from cultivated biomass introduced into the market, which are also the focus of criticism underscoring the need for improvement. However, the proposals and respective positions of the European Commission, the European Parliament and the EU Council of Ministers on recast of the Renewable Energies Directive (REDII) call into question the future prospects for first-generation biofuels, and thus at the same time also call into question the success and pioneering role played by these EU provisions in creating a level-playing field for sustainable biomass production.

Sustainability certification based on the statutory requirements does not necessarily signify that the biomass feedstock must be used as fuel. As a result of RED implementation in Germany, all rapeseed cultivation is certified as sustainable irrespective of its end use and falls within the category of agricultural trade. Consequently, the entire product range is certified as sustainable, for instance glycerine made during biodiesel production or non-genetically-engineered rapeseed meal produced as a by-product of rapeseed processing. Rather than taking this certification level as the yardstick for developing global and fair competition rules, European environmental policy overlooks the fact that signatory states to the Paris Agreement outside the European Union are dramatically expanding production and support for precisely these biofuels, inter alia by increasing levels in legal provisions on blending requirements. At the same time these states are continuing to expand the areas under cultivation to produce the requisite raw materials, as well as triggering distortions of competition through export practices that de facto undermine sustainable cultivation of feedstocks elsewhere, thus posing a threat to existing investments in the European Union. The European biofuels industry is concerned that the European Union will increasingly become a mere „spectator“, looking on as a global development process for biofuels unfolds that will be reflected in future in the National Action Plans to be drawn up by parties to the Paris Agreement by 2019/2020.

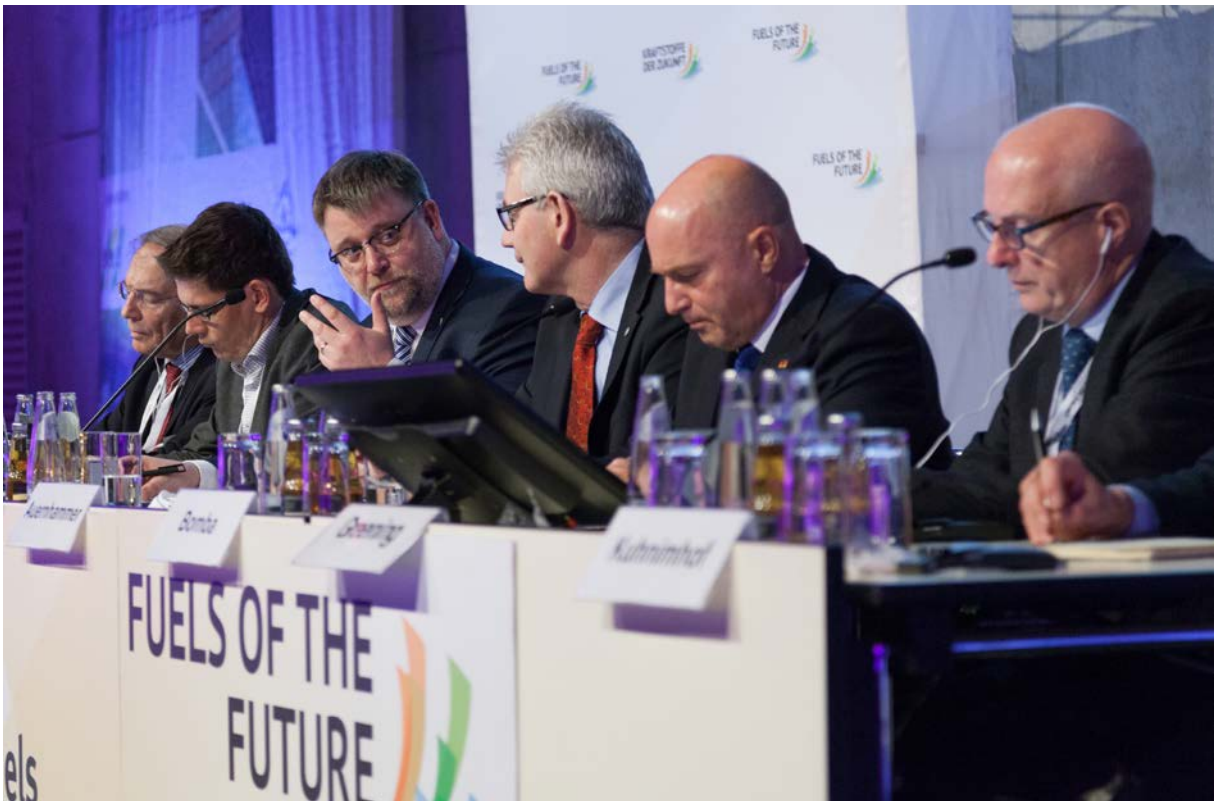
Against this backdrop, the organisers devised a conference programme including many distinguished speakers and linking current political (REDII, CO2 legislation for vehicles) and technical developments in order to spark as broad a dialogue as possible with the worlds of politics, business and science. At the same time, the conference organisers offered scope in the programme to enter into discussion with participants on unresolved questions and unbiased appraisal of the technological options for decarbonising transport. These more technical topics were addressed in 64 presentations in the 14 forums. The conference thus offers an interdisciplinary communication platform for exchanges of information among participants from a wide variety of economic sectors. All the economic sectors involved face the common challenge of discussing the increasingly complex legal and technical issues presented in the plenary sessions and specialised forums.

The 2018 Conference was dominated by discussions on the recast of the European Union’s Renewable Energies Directive (RED II) and the forthcoming coordination procedure between the European Parliament, the Council of Ministers and the Commission (trilogue procedure).

More than 580 participants from 26 countries took advantage of the networking opportunities afforded by the conference, which was attended by representatives from the world of politics, the European Commission, international organisations, NGOs, experts from business and industry and leading researchers and scientists, as well as seizing the chance to play their part in shaping development of sustainable and renewable mobility in Europe through their contributions to the discussions.

This year‘s conference was organised under the patronage of the Federal Ministry of Transport and Digital Infrastructure (BMVI) with support from numerous sponsors. The organizers would like to thank the sponsors (see page 16), who were available to the participants for discussions via the exhibition organised in conjunction with the conference.

THE PLENARY – DAY 1



Caption: Plenary composition with high-ranking speakers – from left to right: Kyriakos Maniatis (European Commission), Bas Eickhout (European Parliament), Stephan Arens (UFOP), Artur Auernhammer (BBE Chairman and Member of the German Bundestag), Rainer Bomba (State Secretary, BMVI), Paul Greening (ACEA)

The conference opening plenary session is traditionally dedicated to the current political context. Representatives from German and European Union politics, the European Commission and the biofuel, automotive and petroleum industries exchanged views and visions, as well as examining medium-term prospects for renewable biofuels and renewable energy sources already on the market and in the development pipeline during a subsequent panel discussion with conference participants. How can development and market prospects for these new renewable fuels (e-fuels) and drive technologies be realistically assessed in terms of market access and the contribution such fuels and technologies can make to attaining climate protection goals? The scale of the challenge becomes apparent in the example of Germany in its role as „automobile country“. In 2014, greenhouse gas (GHG) emissions from transport amounted to 163 million tons CO^2. The „2050 Climate Protection Plan“ adopted by the German government provides for a reduction of approximately 40 percent to 97 million tons CO^2 by 2030. The automotive and mineral oil industries are under great time pressure to reduce consumption of specific fuels, as well as to develop new engines and new GHG-efficient fuels and make these more appealing to customers. With GHG emissions of 163 million tons CO^2 in 2014, the transport sector has de facto made virtually no contribution to climate protection to date. The situation at EU level is no different. On the contrary, global traffic is growing steadily. In view of the very short time horizon up to 2030, this state of affairs makes clear that all options to reduce GHG emissions from transport must be deployed, provided they have been produced sustainably.

In the light of these considerations, the Council of Ministers and the European Parliament (EP) have adopted their respective positions on the Commission's proposals. The following table summarises the main proposals and decisions of the EP and the Council, which were explored in the presentations and plenary discussion.

Positions on RED II (Commission proposal /Council of Energy Ministers / European Parliament) 2021 – 2030

	Target: total RES	Target: Transport sector	Ceiling for cultivated biomass	Maintenance of level of total biofuels	Of which Annex IX Part A residues	Of which Annex IX Part B (Waste oils/ fats)
Comm	27 %	-	Max. 3.8 %	6.8 %	Max. 3.6 %	
EP	35 %	12 %	MS: Baseline consumption in 2017, max. 7 % (CAP, MS <2 % ▸ CAP2 % 2021 exclusion of palm oil	10 %	Min. 3.6 %	
Council	27 %	14 %	7 % (authorisation MS reduction	3 % (double crediting ▸ physical volume 1.5 %	Stipulation: MS authorisation	Stipulation: Ermächtigung MS authorisation

The trilogue procedure is shaped by at times widely diverging positions and conflicting stances. The European biofuels industry called for enormous corrections aimed in particular at securing existing investments. The sector advocates simply maintaining the existing turnover volume on the basis of a 7 % cap for biofuels from cultivated biomass. That entails continuing with the current status quo to ensure that reliable policy parameters for support can ultimately form a basis for new investments in production of advanced biofuels produced from residues.

THE POLITICAL FRAMEWORK

In his opening speech **ARTUR AUERNHAMMER**, Member of the German Bundestag and Chairman of the Board of the German Bioenergy Association (BBE), addressed the challenges arising from the commitments to climate change mitigation enshrined in the Paris Agreement. The consequences of climate change are unmistakable and have a particularly pronounced impact on the agricultural sector in its role of producing feedstocks. Globally, biomass, a multi-talent for producing renewable energies in an extremely diverse range of formats, makes a significant contribution to achieving climate protection targets. Ratification by some 180 states of the Paris Climate Agreement, which is binding under international law, confirms that climate protection is now firmly on the international political agenda. The litmus test will be signatory states' submission by 2020 of National Action Plans, which likewise are legally binding. As the BBE Chairman underscored, this will demonstrate the strategic importance of biomass. Biofuels from cultivated biomass play a pioneering role in decarbonisation of transport globally, particularly in the light of the increasing diversification of the spectrum of products available, including biofuels from residues and fuels from renewable electricity, despite the slow pace of such diversification.

Artur Auernhammer, BBE Chairman and Member of the German Bundestag

Rainer Bomba, State Secretary, Federal Ministry of Transport and Digital Infrastructure (BMVI)

RAINER BOMBA,
State Secretary at the Federal Ministry of Transport and Digital Infrastructure (BMVI), emphasised that Germany is capable of meeting the challenges. Mobility must be secured both for passengers and goods while at the same time ensuring climate protection. 270 billion Euro infrastructure investment is planned by 2030. Despite increasing transport volumes, greenhouse gas emissions must be slashed by 40–42%. To achieve that goal, it will be vital to deploy alternative technologies in all areas of mobility. In the foreseeable future, there is no viable alternative to the diesel engine, and thus also to biodiesel, for heavy goods traffic. Natural gas offers a short-term option; sustainably produced biofuels from residues and waste materials and, in the long term, fuels from renewable electricity can also play a part in meeting demand.

BAS EICKHOUT,
Member of the European Parliament, Environment Committee Rapporteur on REDII, explained the European Parliament's stance and the position adopted on 16.01.2018. The effects of indirect land use changes (iLUC), caused by biomass cultivation for biofuel production, which have been known since 2008 and confirmed by various studies, justified phasing-out of production of biofuels from food crops., After lengthy discussions the European Parliament is proposing a compromise in form of a cap on traditional biofuels; this compromise should ensure clarity concerning future development prospects for biofuels from biomass. Liquid biofuels should be restricted to the maritime transport and aviation sectors.

Bas Eickhout, European Parliament – Environment Committee Rapporteur on REDII

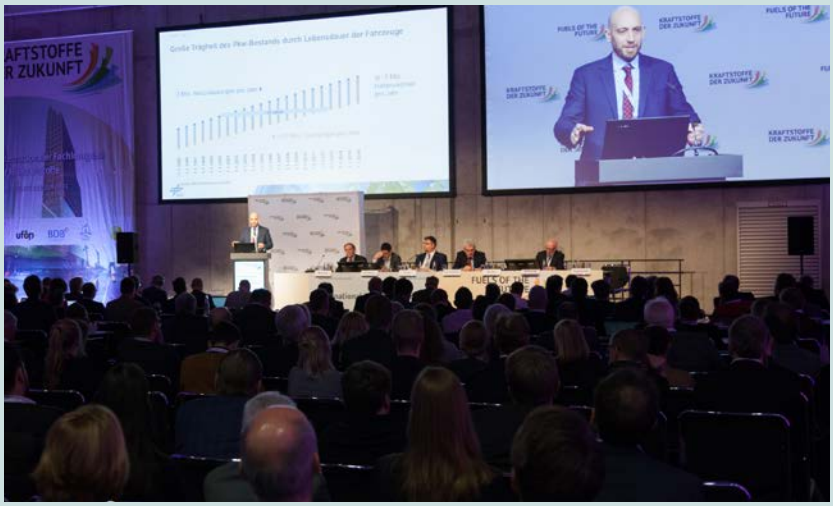
Kyriakos Maniatis, European Commission, Directorate-General for Energy

KYRIAKOS MANIATIS
from the European Commission's Directorate-General for Energy reported on the results of a study conducted with support from the Sub-Group Alternative Biofuels (SGAB). The SGAB notes that phasing-out biofuels from biomass would send the wrong signal for future investments. The International Energy Agency (IEA) concludes that the global trend is for these biofuels to assume greater importance. SGAB also proposes maintaining an appropriate cap until 2030 to ensure further parallel development of advanced biofuels from residues. 13.2 % of the EU's transport energy needs could be met by renewable fuels from biomass. Conventional biofuels should account for the largest share (6 %), followed by innovative biofuels from waste fats and oils and from lignocellulosic feedstocks (3 % each). The rest of the mix should be made up of e-fuels and low-carbon fossil fuels. Setting up the requisite structures will take years. To secure investments, these plants would have to run economically for 15 to 20 years. A stable and reliable regulatory framework until 2030 is therefore indispensable for investors. Industry is ready to develop plans and mechanisms for expansion. Sustainable biofuels are particularly important for aviation.

Paul Greening, European Automotive Manufacturers Association (ACEA)

PAUL GREENING,
of the European Automobile Industry Association (ACEA) presented the automotive industry's stance. The challenge of cutting vehicle CO^2 emissions by 42 % by 2021 is further heightened by new measurement methods (Real Drive Emission – RDE). Liquid low-carbon fuels will be required beyond 2030, and clean diesel vehicles will continue to play an important role. Coordinated policy that distinguishes between old and new vehicles is crucial in order to reduce local emissions. While the industry has invested in hybrid and e-vehicles, the market impact so far been unsatisfactory. It is up to governments both to support construction of infrastructure development (including charging stations), creating a reliable framework that will have an impact in the long-term, and to provide sufficient funding to accelerate the process of switching to new drive technology.

TOBIAS KUHNIMHOF of the German Aerospace Center (DLR) noted that 33,000 of the 44 million vehicles in Germany were equipped with battery-electric drives and 22,000 with plug-in hybrid technologies in 2017 With a service life of approx. 15 years for passenger cars, market penetration of new drives will be a lengthy process. Widely accepted analyses show that the stipulated drop in CO^2 emissions from the transport sector to 97 million tons will not be achieved. All means available must be used to ensure a turnaround. Multimodality is a viable option in this context, along with alternative fuels for the existing vehicle fleet, switching to alternative drives, renewable energy generation and preparation for traffic automation. His conclusion: the energy transition will be very difficult to achieve for road transport.


Tobias Kuhnimhof, German Aerospace Center (DLR)

PANEL DISCUSSION

Caption: Participants in the panel discussion at the „Fuels of the Future 2018“ Conference on 22.01.2018 in Berlin.

Kyriakos Maniatis, DG Energy, European Commission views the amendment proposed by the European Parliament as a compromise. Overcoming the „valley of death“ in development requires a sound grasp of technological hurdles; introducing alternative diesel and jet fuels is a major challenge. The goal of ten-percent biofuels from residues etc. in 2030 is optimistic; even a three-percent share of advanced biofuels seems virtually unattainable due to the high level of investment required.

Helge Pols from the **BMVI's Climate-Friendly Mobility Unit** pointed out the need for decarbonisation of transport. Biofuels are one of several options; advanced biofuels are important. It is feasible to achieve ten percent biofuels; the phase-out of conventional biofuels takes time.

Paul Greening, ACEA, expressed approval for the approach adopted by the European Parliament. The 2030 targets for passenger cars are ambitious, clear provisions are essential. The automotive industry seeks uniform goals; adopting individual national measures would be detrimental. Diesel engines are indispensable in heavy goods traffic. The new EURO VI targets require expensive developments for exhaust after-treatment and lead to a preference for petrol engines. Municipal administrations should contribute to finding solutions for conurbations.

Bas Eickhout, MdEP, stated that 35 % renewable energy is feasible across all sectors in 2030. Strong growth can be anticipated in the light of falling prices for electricity from wind power and photovoltaics. It is unclear whether a goal for renewable energy in the transport sector makes sense; 12 % seems possible. Conventional biofuels should not be completely abolished but should become more sustainable. Advanced biofuels are not better per se but offer potential. The EP's adoption of a ban on palm oil sends out an important, strong political signal.

Marijana Petir, MEP, Committee on Agriculture Rapporteur, underscored the importance of sustainable conventional biofuels; 7% is a feasible figure. Combined production of oil and protein from GMO-free plants secures around 200,000 jobs in Europe, creating a win-win situation. What is missing is a clear definition of sustainability for highly sustainable crop-based biofuels (HSCB). Industry needs a strong policy commitment from the world of politics to ensure development and market introduction of advanced biofuels.

Norbert Schindler, Chairman of the German Bioethanol Industry Association (BDBe),) views classic biofuels as the backbone for future development in order to produce sufficient quantities for the time being. So-called „advanced biofuels“ are just at the start of the development pipeline, are expensive and will not gain a strong market foothold in the next few years. The EP's proposed ban on palm oil improves the image of biofuels, as palm oil is the dominant issue in political and public debate. This critical discussion is also increasingly impacting 2.5 million tons of palm oil for other uses (margarine, cosmetics, detergents...). This could be regulated by means of WTO Agreements. German agriculture is strong enough to compensate for the shortfall arising from exclusion of palm oil. Crop rotation constrains rapeseed cultivation, but 6 – 7 % of German diesel demand can nonetheless be met from sustainable sources. Progress in classic biofuels enables CO^2 savings of 65 – 70 % compared with fossil fuels. Emissions trading is not an appropriate instrument. Schindler criticized virtual crediting arising from „multiple crediting“ of biofuels from residues and e-mobility.

THE FUTURE OF THE INTERNAL COMBUSTION ENGINE

Participants at the 15th International Conference „Fuels of the Future 2018“ from 22-23.01.2018 in Berlin

The afternoon focused on the fundamental issue of future prospects for the internal combustion engine, to a large extent also in the light of intensive and critical public debate on the diesel and exhaust gas scandal. The combustion engine competes with new drive technologies (hybridization/e-mobility), as well as with innovative concepts for modal shift and traffic avoidance. Should the Dieselgate scandal, along with the problem of driving bans for diesel vehicles, debated intensively in Germany and beyond, be allowed to lead to adoption of legislation on phasing-out not only diesel technology but also powered drive systems more generally? Sectors in the vehicle industry that play a significant part in the German and European economy, securing jobs and consequently tax revenues, also depend on a well-founded response to this question, which must come in part from the vehicle industry, but especially from the world of politics. The plenary session, chaired by **Prof. (apl.) Dr. Uwe Lahl, Ministerial Director at the Ministry of Transport in Baden-Württemberg,** addressed this nexus of issues.

In his introductory lecture **Prof. Dr. Lahl** presented key elements for an expanded GHG quota. The EU-oriented strategy for meeting climate protection goals by 2030 is market-based (compliance options are in competition with each other) and is guided by existing statutory provisions on mandatory greenhouse gas reductions in Germany. Over and above biofuels, all the options for attaining the goals (e.g. e-mobility, power-to-x...) are taken into account. These legal provisions apply to all those who market fossil fuels (= stakeholders obliged to comply) and makes long-term planning possible. The introduction of tradable GHG-reduction certificates is an important measure to ensure flexibility.

Prof. Dr. -Ing. Gennadi Zikoridse, University of Applied Sciences, Dresden took the view that the combustion engine will still have a future after 2050 in hybrid drives and with CO2-neutral fuels. Mobility of the future will be characterized by a variety of drives. The diesel engine’s efficiency is indispensable for implementation of CO^2 fleet limits. Strict emission limits can be met in real-life operation on the road with modern exhaust after-treatment technologies.

Michael Schäfer, WWF Germany, underscored that limiting global warming is a matter of survival. New registrations of vehicles with internal combustion engines should no longer be permitted after 2030. Biofuels from cultivated biomass are in competition with food supplies and, in the case of certain regional origins, are also harmful for the local population in countries cultivating this biomass. Waste and residues for biofuels could play a role where other alternatives do not exist. Further developing sustainable cultivated biomass, e.g. on grass verges and extensively cultivated grassland, would be advisable.

Dr. Jakob Seiler of the German Association of the Automotive Industry (VDA), explained that the automotive industry faces major challenges and tasks: climate protection, reduction of local emissions, improving resource efficiency and addressing exposure to and effects of pollutants on human health. CO^2 emissions from transport in Europe remained almost constant from 1990 to 2015. By 2030, a drastic reduction of 40 % (3.3% per year) will be necessary. By 2050 the reduction should be 90 – 95 % (4-12 %/yr). At the same time, growth in transport services is likely. Industry is focusing on increased efficiency, low-CO^2 energy sources and electrification. Biofuels, hybrid technologies and electrical range extenders are becoming increasingly important. Fuel cells for hydrogen and battery-electric drives could play a greater role in the drive mix in the longer term. However, electric drives only offer environmental benefits if the electricity utilized comes from renewable sources. Typical CO^2 emissions from vehicles running on petrol are 144 g/km, while the corresponding figure for diesel vehicles is 128 g/km. Electric vehicles emit 6 g/km with renewable electricity, 75 g/km using electricity that corresponds to the German electricity mix and 148 g/km with electricity generated from coal. CO^2 emissions of liquid fuels from renewable electricity are 3 g/km.

THE PARALLEL FORUMS – DAY 2

On the second day of the conference, a diverse range of current and future technologies and potential renewable mobility options were discussed in detail in 11 parallel forums. Summaries of a number of presentations are presented below, exemplifying the wide-ranging spectrum of topics and results from international research projects and corporate initiatives presented at the conference.

BIODIESEL

The high quality of biodiesel from German production plants is confirmed by evaluations of samples from members of the **Biodiesel Quality Management Working Group (AGQM)**. That high-quality is a prerequisite for smooth operation and compliance with the most stringent emission requirements. Scientists from the **University of Rostock** presented the results of a 1,000-hour endurance test with B100, inter alia to investigate exhaust emissions for compliance with exhaust gas category IV. In the light of the results, Deutz AG, the engine supplier for this project, approved use of B100. Research projects at the **University of Leipzig** on the effects of trace elements (ash-forming materials) in biodiesel on the service life of exhaust-gas catalytic converters show further progress. Research is being conducted at **RWTH Aachen University** on the interaction of fuels and fuel-carrying parts in plug-in hybrid vehicles. This is in response to hybridisation of diesel engines, which leads to longer residence times for the fuel mixture in vehicle tanks. Sensor systems for fuels containing biodiesel are being developed at the Technology Transfer Centre at **Coburg University of Applied Sciences**.

BIOETHANOL

The **Technology and Support Centre** in Straubing (TFZ) has been investigating exhaust emissions from vehicles operated with varying proportions of ethanol in the fuel mix. Emissions decrease as the ethanol content increases. The effect was demonstrated both on the test bench and in road tests. The lowest emissions were measured with an 85 % share of ethanol. Similar results have been demonstrated at the **Vienna University of Technology** in conjunction with 5 % higher energy conversion efficiency. Successes in technology development for bioethanol production were also presented. **Global Bioenergies** has developed a new process for production of isobutene, an initial feedstock for ETBE manufacture. **Novozymes Bioenergy** is working successfully on processes to obtain ethanol from lignocellulosic biomass material such as straw. Through technological learning, the production volume of ethanol from one ton of straw could be increased from 260 to 330 litres. One point of criticism raised addressed the need for political action to introduce support measures for construction of such plants.

„POWER TO X" – TRANSPORT FUELS FROM RENEWABLE ELECTRICITY

Siemens takes the view that liquid fuels can be produced economically from renewable electricity such as methanol, Fischer-Tropsch fuels and DME. The starting materials for the syntheses are hydrogen from electrolysis of water and CO^2, e. g. from exhaust gases. Supplies of solar and wind-generated electricity at prices already obtained today in countries such as Chile, Morocco and Australia are the prerequisite for economical CO^2-free operation. Due to their high energy density, the products can easily be transported to centres of consumption.

The company **Chemieanlagenbau Chemnit**z presented market-ready technologies. In Norway, for example, 120 MW of electricity from hydropower could generate 61 MW of petrol and LPG. With an investment volume of € 285 million, the plant could produce a total of 42,000 tons of petrol and LPG per year, the company announced.

Sunfire AG is working on solid oxide electrolyzer cells, an innovative and highly efficient technology for hydrogen production and has been operating a demonstration plant producing synthetic diesel and petrol in conjunction with Audi since 2014; a plant in Norway with production capacity of 8,000 t/a is currently being developed.

The **German Biomass Research Centre (DBFZ)** gave good marks to both synthetic fuels from biomass (BtX) and fuels from renewable electricity. Reducing CO^2 by 80 % by 2050 is a huge challenge in the transport sector and other sectors alike. The flanking measures necessary to achieve this should set objectives but should not stipulate the technologies to be used to attain these goals.

Studies by the **Institute for Energy and Environmental Research (ifeu)** in Heidelberg have shown that all the renewable systems investigated contribute to reducing GHG emissions. PtX and e-mobility using sustainably generated electricity are most effective. While there is still room for improvement in biofuels, their GHG efficiency is rapidly catching up with these most efficient technologies. Although battery technology plays a role in GHG accounting, it is not a „knockout argument" against all-electric drives.

BIOMETHANE FOR ROAD TRANSPORT

In December 2017 the share of biogas in the Danish gas network was 6 %, and an increase to 8 – 10 % is expected for the current year. Those were the figures presented by the **European Renewable Gas Registry**, which is active throughout Europe. Both gas volumes and sustainability are documented as a prerequisite for Europe-wide distribution. **OrangeGas** in the Netherlands operates 32 filling stations for „green gas". The main customers are taxi companies, waste disposal companies and the Dutch Post Office, which has replaced 400 diesel vehicles with gas vehicles. With a „green investor", the company plans to expand to 1,000 filling stations.

According to **Ecofys**, one quarter of Europe's demand for gas could be met with renewable gas. The existing network is ideally suited to balancing changing loads and volatile production. Politicians are advised to make better use of the advantages of biogas. Germany is at the top of the league table in Europe for biogas production, but only 4 % of this is utilized in the road transport sector. By contrast, Sweden, which ranks third in Europe, deploys 80 % biogas in road transport. There are particularly good prospects for biogas to play an important role for heavy commercial vehicles and ships.

Landwärme GmbH in Munich is one of Europe's largest biomethane traders. The company operates five plants in Germany, aggregates biogas from more than 80 suppliers throughout Europe and supplies more than 150 customers such as municipal utilities, energy suppliers, traders, CHP operators and natural-gas filling stations. However, cross-border trade remains difficult.

The **Institute for Biogas, Environmental Services and Energy** considers that biomethane can significantly reduce CO^2-, NOX and particulate emissions, as well as vehicle noise. Biomethane is part of the circular economy and can be adapted to regional structures. The institute criticised slowing of development due to e-mobility hype, bioenergy's poor image and insufficient political support. **Arcanum Energy Management GmbH** took a similar stance. Biomethane is indispensable as a supplement to e-mobility in order to achieve the ambitious 2050 goals.

Stadtwerke Augsburg presented success stories. The 1995 decision to switch local public transport to biogas finally made it possible to begin operating all buses of the municipal utilities with biogas in 2011, against the backdrop of rising passenger figures. Biogas is positive in image terms, is CO^2-neutral and economical. However, details of this success need to be compiled and above all marketed (public relations).

STATE OF PLAY IN DEVELOPMENT OF ALTERNATIVE FUELS

The **Sustainable Transport Forum** advises the European Commission on issues relating to decarbonisation of transport by means of advanced biofuels. Biomethane from waste is currently the cheapest option. Hydrogenated vegetable oil costs between 50 and 90 €/MWh, fuels based on esters and fatty acids for aviation 80 – 90 €/MWh, ethanol from lignocellulosic biomass 90 – 110 €/MWh. The costs depend on feedstock and investment costs for the production facilities. If the external costs of fossil resource use are not factored in, biofuels remain more expensive than fossil fuels.

The **position paper of the ProcessNet working committee „Alternative liquid and gaseous fuels"** (ProcessNet is a joint initiative of DECHEMA Society for Chemical Engineering and Biotechnology e. V. and the VDI Association for Process and Chemical Engineering (VDI-GVC)) was presented, addressing the topic: „Advanced alternative liquid fuels". The paper calls for rapid action in all sectors. According to this position paper, liquid (energy density!) alternative fuels must bear the brunt of responding to the challenge of CO^2 reduction in the transport sector. (https://www.ufop.de/medien/downloads/biodiesel-and-co/forschung).Politicians are therefore expected to adopt ambitious, reliable and technology-neutral provisions.
The **Karlsruhe Institute of Technology (KIT)** reported major scientific successes in development of the bioliq process. The scientific benefits are enormous, as illustrated by a number of dissertations and participation in international projects. The portfolio of **Air Liquide**, a global player with 65,000 employees, includes technologies for production of „green methanol".

BIOFUELS FOR THE AVIATION AND MARITIME TRANSPORT SECTORS

Unless decarbonisation measures are introduced, European aviation's CO^2 emissions will increase from 150 million tons to 375 million tons in 2050. With increasing efficiency and fuels with low CO^2 emissions, this figure could be reduced to 75 million tons. Development of advanced jet fuels and sustainable production of biomass should be supported. Studies at the Belgian **University of Hasselt** indicate that alternative jet fuels can help to reduce CO^2 emissions, but such fuels will remain more expensive than fossil kerosene in the short to medium term. To produce the quantities needed by 2050, investments on the same high level as for biofuels for road transport are required. The higher costs are justified if external benefits compensate for the costs.

The most important factors for reducing CO2 emissions from maritime transport are vessel size, sailing speed and use of biofuels. To fulfil the 2050 goals, the EU needs 60 million tons of low-carbon maritime fuels that comply with international standards. The challenges of drop-in biofuels for shipping are being investigated at the **University of Copenhagen**. Biofuels offer considerable potential; the issue of implementation remains unresolved. Vegetable-oil-based biofuels offer limited volume potential. Biogas is technically feasible, but expensive; engines would also need to be adapted for bioethanol. Developing advanced biofuels takes time and requires cooperation and/or acceptance on the part of producers and consumers.

ELECTROMOBILITY

Ready access to charging stations is a prerequisite to make battery-powered electric cars a success. Germany currently has 11,000 normal charging points and 530 rapid charging points. Plans are afoot to expand this by 2020 to 36,000 normal charging points and 7,000 rapid charging points; up to 60 % of the costs will be subsidized. €33 million was allocated in response to the first call for proposals. The Federal Ministry for Economic Affairs and Energy (BMWi) aims to achieve clean air, a 42 % reduced GHG emissions, and lower NOX levels. In the longer term, Germany is to be developed as a production location for e-mobility, i. e. for the entire value chain including battery production.

Digital Energy Solutions GmbH is working on the best possible combination of electricity, heat generation and mobility. BMW expects the share of new registrations of electric and plug-in hybrid vehicles to rise to 15 – 25 % by 2025. As a consequence, demand for innovative infrastructures such as charging stations, billing systems and load management will also increase.

Volkswagen AG's e-mobility strategy focuses on battery-powered vehicles, networking and autonomous driving. Robotaxis, car sharing and „mobility on demand" will become increasingly important. As a first step, Volkswagen is developing an electric parallel model to the Golf. Battery-powered vehicles are expected to capture 10 – 15 % market share by 2025, and one-third to half of the market by 2030. The challenges include charging technologies and easy access to energy supply at home, in the city and on motorways.

IMPLEMENTING RENEWABLE MOBILITY

The **Fraunhofer Institute for Systems and Innovation Research (ISI)** examined the economic consequences of electromobility. Battery manufacture generates high added-value in producer countries. Lithium for the batteries is sourced mainly from Latin America. Japan and China are forging ahead when it comes to battery cells. In the case of vehicles, China, Europe and the USA are the dominant players. Economic sectors that are „threatened" as a result include classic energy suppliers and automotive workshops. The impact of e-mobility on employment has been investigated in a number of international studies, which have produced diverging results. There is a dearth of transparent studies examining the economic impact of new mobility concepts and new jobs.

The „2017 ARAL Study" commissioned by **British Petroleum (BP)** examined trends in car purchases in Germany. Potential buyers are looking for powerful cars at the same price ratio and are opposed to speed limits. There is interest in electric vehicles, but also concerns about range, charging time and purchasing costs. Price, comfort and safety are important; only 25 % of those surveyed viewed sustainability criteria as an argument for these vehicles. Electric vehicles' range should exceed 400 km. 60 % of respondents would not accept charging time longer than 30 minutes.

Neste Corporation noted that oil is available in abundance. It is rational to conclude that Earth has reached the limits of its resilience. All options are needed to ensure rapid decarbonisation of all mobility sectors: as much e-mobility as possible, low-carbon fuels and technology-neutral, attractive and reliable regulations governing investments. With a production volume of 3 million tons of HVO per year, Neste is the market leader among suppliers of renewable diesel. Plans envisage increasing total capacity by one million tons by 2022. Availability of sustainable feedstocks constitutes a challenge.

BIOENERGY AND FUEL TRADING

According to the recently published **OECD-FAO Agricultural Outlook**, the share of biofuels in the energy mix has grown rapidly from 2006 to 2011, with growth set to continue. Energy policy determines demand. Higher prices compared to petroleum products hinder further expansion. Political measures (quota policy) in some countries afford scope for growth there. The future of classic biofuels is uncertain. The reasons for this lie in politics and the enhanced technological maturity of advanced biofuels.

The **„RENEWABLES 2017" analysis from the International Energy Agency (IEA)** shows that conventional biofuels can contribute up to 92 % to renewable mobility in 2022. Under favourable conditions, global production will grow to 180 million m^3, with Asia and Brazil leading the way. By contrast, the outlook in the EU is poor due to the uncertain political environment. China will remain the leader in electricity consumption for electric vehicles, ahead of the EU and the US. The share of renewable energy used in the transport sector lags far behind the electricity and heating sectors. Increasing this share to over 5 % of consumption will not be possible by 2022. To attain the two-degree scenario, the volume of renewable fuels utilised would have to triple by 2030 and increase tenfold by 2060, according to the IEA.

REDcert GmbH takes the view that the recast RED Directive (REDII) will lead to substantial changes in certification requirements (documentation requirements) for all parties involved. System operators must adapt or expand existing system requirements accordingly. In addition to established biofuels, new energy sources such as biogas and advanced biofuels are emerging, along with additional, more stringent documentation requirements. (databases).

BIOFUELS IN AGRICULTURE AND FORESTRY

The **Straubing Technology and Production Centre (TFZ)** has conducted extensive studies on operational safety of vegetable-oil-powered agricultural machinery, including exhaust gas after-treatment. Modern tractor engines that run on vegetable oil can be operated practically without incident. Reliable compliance with category IV exhaust-emission limits is assured. The injection behaviour of modern common rail injection systems with vegetable oil was investigated in a project financed by the Federal Ministry of Food and Agriculture (BMEL) at the **Technical University of Regensburg**. The results provide a valuable basis for further improvements in engine adaptation. **CNH** tractors have been approved for biodiesel since 2006, a hydrogen concept for tractors was presented in 2009 and the energy-independent farm was presented. An endurance test for a methane-fuelled tractor with methane as fuel has been running since 2013. The prototype, with an output of 132 kW, has been successfully tested in situ and presented at agricultural shows.

The **Bergland Agricultural Cooperative** produces rapeseed oil fuel from the cooperative's rapeseed using its own rapeseed mill as „feed" for agricultural machinery. The rapeseed oil is used to power 5 John Deere tractors, a Case tractor, a Fendt tractor, a CLAAS combine harvester with 507 hp, a self-propelled 423-hp Krone mower and a block-type thermal power station. All machines have passed tests under actual operating conditions during an endurance test. Cultivation of rapeseed has positive effects on soil fertility, is particularly significant as a flowering plant and provides valuable protein feed, which is used by the cooperative to feed its cattle.

2019 CONFERENCE PROGRAMME OUTLOOK

The 16th International Conference on Renewable Mobility will be held from 21–22.01.2019 in the CityCube, Berlin. Once again, more than 500 international participants are anticipated. The organisers plan to include the following topics in the conference programme:

- Prospects for renewable mobility in Germany and Europe up to 2030
- Mobility in transition – technology development between innovation and regulation
- Environmental impact of vehicles with various drive technologies
- Commercially available biofuels and development of markets and technology for these biofuels: biodiesel, bioethanol
- Biofuel trading
- Feedstocks for biofuel production
- Decentralised renewable mobility – practical examples from local authorities
- Electric mobility
- Power-to-X; e-fuels
- Biomethane in the transport sector in Germany and worldwide
- Biofuels from waste and residues
- Biofuels in the aviation and maritime sectors
- Biofuels in heavy goods transport
- Biofuels in agriculture and forestry

2018 SPONSORS – A WORD OF THANKS

Our conference aims to offer an expertise-based platform for the various development paths of alternative fuels and drive technologies, as well as fostering intensive contacts and network consolidation. We would therefore like to take this opportunity to thank all partners of this year's conference once again:

Gold partners:

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