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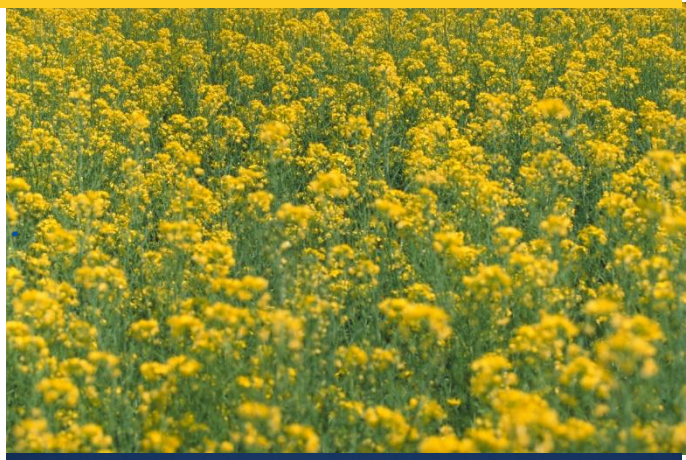
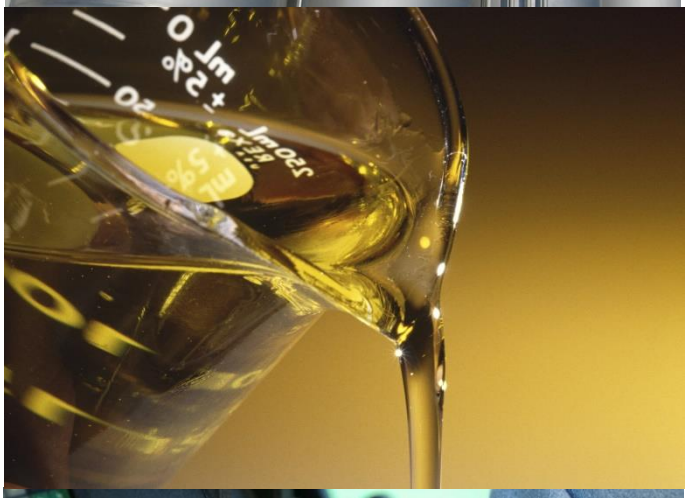


News Review

Issue Seventy

January 2018

Each month we review the latest news and select key announcements and commentary from across the biofuels sector.



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Foreword

Welcome to the first 2018 issue of NNFCC's Biofuels News Review.

The big news this month has been the European Parliament's vote to approve amendments to the Renewable Energy Directive (known as RED II). Where biofuels are concerned, the amendments are a mixed bag. Where advanced biofuels are concerned, there is unprecedented support, with crop residues now counted as feedstocks for this kind of biofuel, and allowing member states greater flexibility with regard to how they set their limits for each kind of feedstock. However, where crop-based biofuels are concerned, the legislation has gone in the other direction: due to the EU's fears around unsustainable palm oil use, the limits for crop-based biofuels have been maintained rather than increased, which may be seen as a backwards step. However, others view the eventual ban on palm oil (from 2021) as a positive development for the sector, allowing for other sources of biofuel to become more competitive, such as ethanol from fermentation. The debate has been raging for many months now, and will no doubt continue to rage, within the biofuels sector.

The fact remains, however, that RED II is soon to become legislation, which means member states' MEPs will now be able to negotiate their nations' renewables targets, and how they align with the EU-wide targets. Said EU-wide targets were initially proposed at 27% by the European Commission, but have been upped to 35% by MEPs in their vote. This marks the beginning of a transitionary period for EU renewables.

One particularly interesting development that may play nicely into biofuels' hands is the development of a "super yeast", with findings published this month of a strain of yeast capable of producing a greater yield of ethanol from fermentation than previously achievable. The "super yeast" can produce ethanol from a greater concentration of biomass residues than previously possible. The softwood feedstock still has to be pre-treated with heat and chemicals, but the level of solid biomass able to be used in the fermentation process has been increased to 17%, over double the previous maximum.

Elsewhere, another exciting development is taking place in the aviation biofuels sector. It is all well and good developing biofuels, but these fuels would be useless unless the engines they are used to fuel are adapted to run them, which is one of the significant hurdles for aviation biofuels – jet engines are much more complicated both to design and manufacture than other engines, making them harder to adapt for biofuel. Gevo are looking to counteract this by designing jet engine parts specifically for use with 100% biofuel (currently much lower blends are used), which could be an important step for aviation biofuel use, and may offer us a glimpse of the future of air travel.

Read on for the latest news.

Policy

European Parliament backs RED II

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After much deliberation, the European Parliament has voted in favour of the revised Renewable Energy Directive (often dubbed RED II).

The plenary of the European Parliament adopted its first reading position on RED II on 17 January. It has been met with mixed responses within the biofuels industry. While some have commended the decision to allow crop-based biofuels to be included towards RED targets and lauded the support to advanced biofuels, others have questioned the distinctions RED II makes between different fuels.

Designed to boost renewable energy use in the EU, the renewable energy directive establishes an overall policy for the production and promotion of renewable energy. The original directive required the EU to fulfil at least 20% of its total energy needs with renewables by 2020.

In November 2016, the Commission published a proposal for a revised RED, aimed at ensuring the EU would reach its target of a 27% renewable energy mix by 2030.

A key decision made in the voting is to remove biodiesel made from palm oil from the list of biofuels counting towards EU renewables targets from 2021.

Another key outcome of the vote relates to biofuels produced from food and feed crops. This amounts to a cap on conventional biofuels used in transport to existing levels.

The plenary vote has also increased the target of renewable energy use in the EU economy to 35%, with a specific transport target of 12%. It also includes an increased incorporation obligation for fuel suppliers of up to 10%.

Click here for more information.

MEPs able to negotiate EU renewables targets

Members of the European Parliament (MEPs) are about to start discussions with EU ministers about setting binding targets tied to energy efficiency and renewables through 2030.

Negotiations with the Council can start immediately, an official announcement says.

MEPs voted for a minimum 35% share of energy from renewable sources in the EU's gross final consumption of energy in 2030. This is a more ambitious goal compared to the one proposed by the European Commission for a renewables share of at least 27%.

The legislation, which was adopted with 492 votes in favour, 88 against and 107 abstentions, also calls for national targets to be set, with member states being allowed to deviate by up to 10% under certain conditions.

MEPs are also paying special attention to the use of biomass for energy generation. They want the unsustainable use of biomass for that purpose to be discouraged by support schemes to avoid the release of carbon captured in wood when burned for heating. Instead, wood wastes and residues should be used.

The Parliament also seeks to eliminate existing barriers to consuming energy produced on the consumer's own premises. It wants to ensure that

own consumption and the use of energy storage would not be discouraged by any charges, fees or taxes.

Separately, MEPs voted in favour of a minimum 35% binding EU target and indicative national ones for energy efficiency. This draft law was cleared by 485 votes to 132, with 58 abstentions.

When it comes to transport, member states should make sure that in 2030 about 12% of the energy consumed for transportation purposes comes from renewables. The contribution of biofuels made from food and feed crops should be capped to 2017 levels and up to 7% in road and rail transport. At the same time, the use of palm oil is proposed to be disallowed from 2021. Advanced biofuels should account for at least 1.5% in 2021 and 10% in 2030.

Moreover, 90% of the fuel stations along the roads of the Trans-European Networks should have recharging points for electric vehicles (EVs) by 2022.

By January 1, 2019, and every ten years thereafter, every member state will be required to submit an integrated national energy and climate plan to the EC. They should start with one for the period from 2021 to 2030.

Click here for more information.

Biofuels policy enshrined in Brazilian law

Brazilian President Michel Temer has approved legislation creating RenovaBio, a new national biofuels policy.

RenovaBio aims to increase the use of all biofuels, including ethanol, biodiesel and biomethane, in Brazil with the aim of increasing energy security and reducing greenhouse gas emissions.

A statement released by the Brazilian Ministry of Mines and Energy explains that the RenovaBio law provides for the establishment of national emissions reduction targets for the nation's fuel supply. Targets will to be met annually by fuel distributors. The ministry said that the targets are fundamental to bring predictability to the national fuel supply and will provide better conditions and less uncertainty for private parties to carry out investment planning and analysis. In addition, the ministry indicated RenovaBio will allow the Brazilian fuel sector to comply with the Paris Agreement.

RenovaBio creates a system that allows for the certification of biofuels. The Ministry of Mines and Energy said the objective of the certification is to measure the exact contribution of each biofuel producer to greenhouse gas emissions reductions, in relation to their fossil substitute. The law also creates a decarbonization credit that combines the emissions reduction targets and the live cycle assessment of each biofuel producer. The credits are described as a financial asset that can be traded on a stock exchange. The credits are issued by the biofuel producer following the sale of product. Fuel distributors will meet required targets by acquiring these credits.

Brazil is currently the world's second largest producer and consumer of biofuels. In 2017, the country produced an estimated 27.7 billion litres (7.32 billion gallons) of ethanol and 4.2 billion litres of biodiesel. The Ministry of Mines and Energy said on a combined basis, biofuels and bioelectricity account for 18 percent of Brazil's energy mix.

Click here for more information.

US to classify sorghum oil as advanced biofuel

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The United States Environmental Protection Agency (EPA) is keen on framing a rule that would categorize grain sorghum as an "advanced biofuel," by the renewable fuel standard. Once approved, it would usher in a new method for transforming oil into fuel through a process of distillation.

The EPA assessed the lifecycle of greenhouse gas emissions in grain sorghum refinement and found that the grain once transformed into a biofuel, released about half the amount of greenhouse gases as compared to baseline petroleum fuels. This helps it qualify as an "advanced biofuels" under the metrics set by the Renewable Fuel Standard (RFS).

The document published by the EPA states that depending upon the evaluation conducted by EPA of the lifecycle, the biodiesel and heating oil manufactured from distilling of sorghum oil through a process called transesterification, and the jet fuel, renewable diesel, and heating oil produced from distilling sorghum oil through a process called hydrotreating, to bring down greenhouse gas emissions by half.

National Sorghum Producers strategic business director John Duff elaborated that the ruling was something the producers of sorghum and their friends and allies in the ethanol industry have been trying to win in their favour in the past four years.

Both oil refineries and importers, under RFS, are needed to buy RINS, short for renewable identification numbers, to provide proof of the fact that they are aligning themselves with mandates to cut down upon or supplant stipulated volumes of non-renewable fuels. Out of five RIN codes, "advanced biofuels" RINs cover four.

Click here for more information.

Markets

Velocys seeks D7 RIN credits for gas-to-liquid fuel

Velocys has submitted a fuel pathway petition to the US EPA to certify that it has met lifetime emissions targets for its Oklahoma City gas-to-liquids plant.

The company expects that the gas-to-liquid plant, which is run by a joint venture called ENVIA energy, will qualify for the most valuable renewable identification number (RIN): D7 cellulosic biofuel or biomass-based diesel. These numbers cover the most requirements set out by the EPA, and as such are the most in-demand from oil refiners and importers, who must buy the credits. At the time of writing the fuel pathway petition has not been released.

The OKC plant produces fungible fuels from renewable biogas produced from a landfill nearby the facility and pipeline natural gas.

Pending approval from the EPA, Velocys expects that the plant will begin to generate RIN credits in Q1 of 2018. The company emphasised that a 'significant contribution' of the plant's revenue could come from these credits, estimating that the OKC D7s would have traded above €1.96 per gallon in 2017. It went on to say that its biorefinery in development in Mississippi is

expected to generate RINs in excess of €3.27 per gallon, also citing 2017 prices.

The Mississippi facility will produce biodiesel and jet fuel from forestry waste. €20.69 million was raised for the facility 15 January with a discounted stock offering. The sale saw the company's share price fall by 63% to 10.22 pence per share, from 27.25 pence.

The CEO remained bullish about America's RIN market despite calls from oil-state legislators to reform the programme that manages the credit, the Renewable Fuel Standard (RFS).

Click here for more information.

Research & Development

Södra and Statkraft pursue "fossil-free" fuel

Södra and Statkraft have made a decision to invest in a new demo facility for fossil-free fuel. The investment will be made through the joint company Silva Green Fuel AS, in partnership with technology provider Steeper Energy Aps and Norwegian financing partner Enova. The total investment will be approximately SEK 500 million. The biofuel will be based on forest raw material and the demo facility is expected to be in operation by spring 2019.

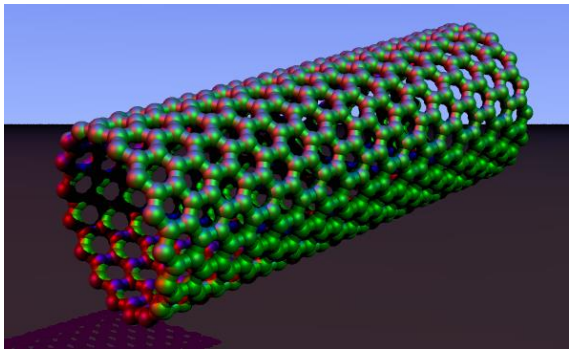
The demo facility will be located in Tofte, Norway, and project planning will commence in the winter. Start-up is planned for spring 2019, with a capacity of about 4,000 litres per day. The raw material will consist of residual products from the forest industry.

The demo facility is a first step towards a full-scale facility. It will be used to develop both the process and the technology for producing the new biofuel. In the next stage, the plan is to establish a full-scale facility, with biofuel production for various types of transport, including road and air.

Södra and Statkraft formed the joint venture Silva Green Fuel AS in 2015, with the aim of establishing future production of biofuels based on forest raw material. Statkraft owns 51 percent, and Södra 49 percent, of the company.

Click here for more information.

Carbon nanotubes catalyse biofuel production



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Recent research published in a report in NANO showed biofuels were obtained from Jatropha Oil using carbon nanotube (CNT) catalyst, which showed efficient cracking activity. The performance was activated by the high stability, metal sites, acid sites, electroconductivity, and coking tolerance of CNT. Two cracking circulations were found in the hydroprocessing. The sulphur-free process was also eco-friendly.

Hydroprocessing of vegetable oil is widely used to produce biodiesel. The catalyst is very significant for the performance of the process. As an electric charge carrier, the researchers found that the velocity of electron reaches the speed of light 1/ 300 in graphene, far more than the normal conductor. Carbon nanotubes (CNT) are constructed of rolled up graphene sheets with one dimensional extended ¦Đ conjugated structures.

A team of researchers from the Beihang University in China, Beijing has demonstrated that CNT catalysts showed efficient cracking activity. The

electroconductivity of the CNT support was especially beneficial for the improvement of catalyst activity. The nickel (Ni) and phosphotungstic acid (HPW) supported on CNT were prepared by the team as catalyst for hydroprocessing of Jatropha oil. Their report appears in the December issue of the journal NANO.

The alkanes yield of C15-C18 was 88.5 wt%, Iso/n ratio was 0.8 and conversion was 97.7% at 320 ¡ãC, 3.0 MPa and 1.0/h over the Ni-HPW(40)/CNT catalyst, while the yield of < C15 alkanes reached 51.9 wt% at 400 ¡ãC. The distribution of products could be adjusted by reaction temperature. The activity of metal sites was affected by the transformation of oxidation/ reduction of Ni species, which required high electroconductivity of the support. The activity of acids sites was also closely related to the electroconductivity of the support. Thus, the cracking performance was elevated by the addition of Ni or HPW and the electroconductivity of the support. The cracking activity was enhanced by the increased acidity of the catalyst, which resulted in more carbenium ions formed, and the carbenium ion stimulated the isomerization reaction. The transfer of hydrogen electron was accelerated by the electroconductivity of the catalyst, which enhanced the cracking activity of the catalyst, and the results coincided with the formation mechanism of catalyst acidity. The formation of carbenium ion promoted the ¦Â-elimination process, which then launched the two circulations for further cracking. The ability of coking tolerance may be related to the morphology of the catalyst and the repulsive force between carbon atoms. Meanwhile, the catalyst was used without sulfurization and the cracking process was green.

Click here for more information.

Repressing stiffness gene could increase sugar feedstock for biorefineries

A new study suggests that by suppressing a gene that stiffens cell walls, biorefineries would have access to 60% more sugar than they would otherwise from the same amount of feedstock.

The researchers from the UK, Brazil and the US announced the discovery in New Phytologist. Cell wall stiffening evolved in grass as a method to impede digestion by grazers. By reducing the effect of the gene both growers and refiners of bioethanol feedstock could see big gains in efficiency. So far, the researchers have been able to reduce feruloylation by about 20% in their genetically modified plants.

Click here for more information.

Bioethanol

New yeast could produce high ethanol levels from pine residues

US researchers have developed a 'super strain' of yeast that can efficiently ferment ethanol from pre-treated pine – one of the most common tree species in the US. The scientists from the University of Georgia (UGA) claim that their research could help biofuels replace gasoline as a transportation fuel.

Scientists used direct evolution and adaption of Saccharomyces cerevisiae, a yeast species used for corn ethanol production, to generate the super yeast.

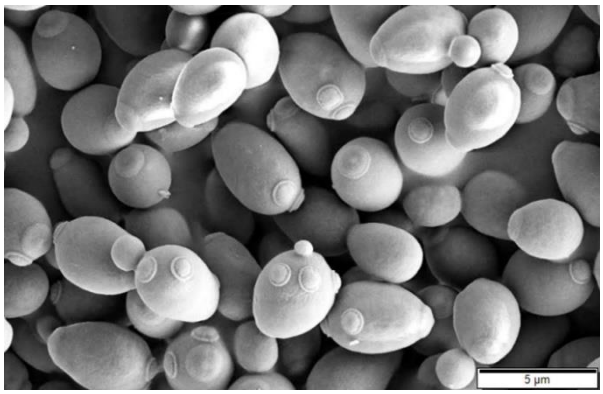
Published in the journal Biotechnology for Biofuels, the research shows that pine fermented with the new yeast can withstand toxic compounds, and produce ethanol from higher concentrations of pre-treated pine than previously possible.

The strain of yeast is capable of producing ethanol in fermentations of pre-treated wood containing as much 17.5% solid biomass. Until now, researchers were only able to produce ethanol in the presence of 5-8% solids. Previous studies of 12% solids demonstrated a marked decrease in ethanol production.

In the new process, the pinewood needs to be pre-treated with heat and chemicals prior to fermentation, then the yeast is applied. The pre-treatment helps enzymes break down the cellulose down into sugars.

The discovery could be hugely significant for the US biofuels industry. Pine plantations account for 50% of harvested timber in Georgia, and the loblolly pine used in the research is among the fastest growing trees in the US South.

Click here for more information.



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Biodiesel

Meridian develops more efficient biodiesel conversion technology

Meridian Waste Solutions, Inc., an integrated, non-hazardous solid waste services and innovative technology company, announced the execution by the Company's subsidiary, Attis Innovations, Inc., of a license agreement for proprietary biofuel process technology proven with initial testing to provide for significant improvements in conversion efficiency.

Biodiesel is one of the most abundant biofuels produced today, contributing more than 2 billion gallons in 2016 to the United States Renewable Fuel Standard. It is a renewable, clean-burning replacement for fossil fuels that is made from a diverse mix of virgin and waste feedstocks, including animal fats, vegetable oils, greases and other lipids. Existing biodiesel production methods require the use of multiple catalyst and purification steps that have innate inefficiencies that the Attis engineering team has targeted for reduction.

The new license involves technology designed to achieve that objective by eliminating process steps that reduce raw material consumption while increasing feedstock tolerances, and improving both product yield and quality. Subject to further verification and scale-up testing, the new approach is expected to reduce construction costs and improve profitability by an estimated $0.40 per gallon.

Importantly, the Company also expects to integrate the new technology into its growing ecosystem of biomass conversion and refining technologies, including Attis' patented and patent-pending AST-Organosolv process, which fractionates and converts cellulosic biomass into ethanol or butanol and a renewable alternative for petroleum-derived resins.

Click here for more information.

Neste biodiesel used in Finnish public works

The Public Works Department at the City of Espoo has chosen to use Neste MY Renewable Diesel in all of its diesel-powered machines. Neste MY Renewable Diesel is produced entirely from waste and residues.

The transition to renewable diesel is part of the Finnish city's plan to be carbon-neutral by 2030 in a staged approach.

In Finland, Neste MY Renewable Diesel has also been adopted by the City of Porvoo and by companies such as Lassila & Tikanoia and DB Schenker. Other users of Neste MY Renewable Diesel are the Finnish airport operator, Finavia, in its airport buses at Helsinki Airport, and the non-governmental aid organisation, UFF, in its logistics chain.

As part of Europe's largest coordinated advanced biofuels project, BioSata, Neste provides Helsinki City Construction Services, Stara, with premium-quality, entirely waste and residue based Neste MY Renewable Diesel to be used in Stara's working machines and trucks.

Click here for more information.

Aviation Biofuel

Gevo testing engine components for 100% biobased jet fuel

Gevo, Inc., announced today that GE Aviation had commenced jet engine combustor component testing with a jet fuel comprised 100% of Gevo's renewable alcohol-to-jet fuel (ATJ). The testing is being performed as part of the Federal Aviation Authority's (FAA) Continuous Lower Energy, Emissions and Noise Program (CLEEN). CLEEN is the FAA's principal environmental effort to accelerate the development of new aircraft, engine technologies, and to advance sustainable alternative jet fuels, in conjunction with aviation industry leaders such as GE Aviation.

Specifically, this testing is designed to enable the greater displacement of petroleum-based jet fuel by bio-based alternative products. Bio-based hydrocarbon fuels have similar performance characteristics to the petroleum-based fuels used today, albeit with reductions in particulate matter and other air quality related emissions. Some bio-based jet fuels, such as Gevo's ATJ, have the potential to improve performance, such as providing greater energy density which translates into better mileage.

GE Aviation is a part of General Electric Company, and is a world-leading provider of jet engines, components and integrated systems for commercial and military aircraft.

Click here for more information.

Pixabay

Gevo continues work towards renewable jet fuel

Next generation biofuels company Gevo has reaffirmed its focus on the commercial development of renewable jet fuel, renewable isooctane, isobutanol and related products, in its corporate update for 2018. The commitment comes amid a range of cost saving measures at the company which have seen staff reductions and pay cuts.

According to the update, issued on the company's investor relations website, Gevo aims to

"aggregate enough confirmed commercial off-take to support the capital expense of expanding its Luverne, Minnesota facility." The company plans to expand its business development capabilities in 2018 to achieve this goal.

In the coming year, Gevo is expecting to improve cash flow out of the Luverne Facility by optimising the plant's ethanol production processes, developing value added products for ethanol and animal feed produced at the plant and further lowering the cost of the plant's carbohydrate feedstock. According to the update, these initiatives are also expected to improve the cost of producing Gevo's isobutanol.

Click here for more information.

Other Fuel

Pyrolysis oils as fuel from co-processing

Lignocellulosic biomass, i.e. non-edible dry plant matter such as wood, crop residues and energy crops, is an abundant and renewable energy source. Utilization of biomass for the production of second generation biofuels can facilitate the reduction of CO2 emissions from the transportation sector, reduce the dependency on petroleum-derived fuels and help establish a secure energy supply. Lignocellulosic biomass can be converted directly to liquid fuels via fast pyrolysis or catalytic fast pyrolysis. The liquid product from fast pyrolysis is known as bio-oil and is a low-quality fuel that has higher energy density and can be transported more efficiently than solid biomass. On the other hand, the liquid product from catalytic fast pyrolysis is known as Catalytic Pyrolysis Oil (CPO) and is a higher quality fuel with improved energy value and stability compared to bio-oil. Alternatively, bio-oil's energy value and stability can be improved via partial hydro-deoxygenation to produce Hydro-Deoxygenated Oil (HDO).

The biomass-derived oils described above contain oxygen and their properties differ significantly from conventional petroleum-derived fuels. Therefore, further processing is necessary to obtain transportation fuels. Co-processing bio-oil or CPO or HDO with petroleum streams in conventional refineries is a cost-effective way to facilitate the commercialization of second generation biofuels by utilizing already-existing refinery infrastructure. Among the refinery processes, Fluid Catalytic Cracking (FCC) can readily adjust to changes in feed composition and is therefore the most suitable process for the introduction of biomass-derived oils in the refinery.

Co-processing biomass-derived oils results in a liquid hydrocarbon product with increased aromatic content that contains only a very small amount of biomass oxygenates. Hydrogen donation reactions from the petroleum feed act synergistically to facilitate the conversion of the unstable and reactive biomass oxygenates into liquid hydrocarbons, although overall, co-processing results in slightly increased solid by-product yields from the FCC unit. These changes in product composition and product yields from the FCC unit are expected to be small because biomass-derived oils are blended in very low amounts, about 3-5 wt.%. Therefore, the co-processing of biomass-derived oils is not expected to disrupt the normal operation of the refinery and is a very promising and cost-effective way to bring second generation biofuels to the market.

Click here for more information.

Germany set for world's largest hydrogen plant

Shell and ITM Power will partner to build the world's largest hydrogen electrolysis plant at Rhineland refinery, Germany. With a peak capacity of 10 MW the hydrogen will be used for the processing and upgrading of products at the refinery's Wesseling site as well as testing the technology and exploring application in other sectors.

The European partner consortium of Shell, ITM Power, SINTEF, thinkstep and Element Energy has now secured €10 million ($12.2 million) in funding from the European "Fuel Cell Hydrogen Joint Undertaking".

The next step will be detailed technical planning and the approval. The plant, named "Refhyne" is scheduled to be in operation in 2020 and will be the first industrial scale test of the polymer electrolyte membrane technology process.

Currently the Rheinland refinery, Germany's largest, requires approximately 180,000 tons of hydrogen annually, which is produced by steam reforming from natural gas. The new facility will be able to produce an additional 1,300 tonnes of hydrogen per year, which can be fully integrated into the refinery processes, such as for the desulphurisation of conventional fuels.

Hydrogen can potentially play an important role in the energy transition. Hydrogen is already being used in transport by fuel cell vehicles, as well as in industrial applications. Shell is taking part in several initiatives to build up a hydrogen refuelling network for transport in a number of markets, including Germany.

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 779579. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe Industry and Hydrogen Europe Research.

Click here for more information.

Events

Eco-Bio 2018
Dublin, 4th-7th March 2018

ECO-BIO 2018 will highlight the latest research and innovation towards developing industrially viable, safe and ecologically friendly biobased solutions to build a sustainable society.

A topical and comprehensive programme will include plenary and invited speakers, forum discussions, contributed oral presentations, a large poster session and exhibition.

The conference will bring together all concerned with the biobased economy to review industrial, academic, environment and societal approaches, discuss the latest research and progress, and encourage new research partnerships to enable new cascaded biobased value chains.

Click here for more information.

World Bio Markets
Amsterdam, 20th-22nd March 2018

With governments committed to reducing emissions and consumers becoming more educated about where their products come from, there are opportunities for the bio-based sector to become a true contender to fossil oil. Yet long development times, lack of investment, and challenges in attaining a secure and sustainable supply chain have made it difficult for the bio-economy to achieve commercial success.

This event provides a platform for the entire global value chain, from feedstock producers to consumer brands, to work together to overcome these challenges.

Click here for more information.

Global Bioeconomy Summit 2018
Berlin, 19th-20th April 2018

The first Global Bioeconomy Summit was held in 2015 and brought together more than 700 bioeconomy stakeholders from over 80 countries. Since then, Bioeconomy has taken a steep and exciting way forward. Many notable initiatives and collaborative efforts have been initiated by the bioeconomy community in order to drive the development of sustainable bioeconomies in their countries and regions.

The 2nd GBS will focus on emerging concepts and future trends in bioeconomy, the latest on challenges and opportunities related to ecosystems, climate action and sustainable development along with the bioeconomy innovation agendas and global governance initiatives to manage them.

Click here for more information.

EUBCE
Copenhagen, 14th-18th May 2018

We look forward to the 26th EUBCE in 2018 in Denmark and to the many vibrant topics that will be included in the agenda. The core of the traditional EUBCE conference will be held over 4 days.

Members of the national organising committee will organise special technical visits to sites in the centre of the country where biomass is the key renewable feedstock into processes producing renewable energy, biofuels, biochemicals and biomaterials as well as integrating bioproducts into traditional established fossil-based systems.

Click here for more information.

RRB 14
Ghent, 30th May - 1st June 2018

The 14th edition of the International Conference on Renewable Resources & Biorefineries will take place in Ghent, Belgium from Wednesday 30 May until Friday 1 June 2018. Based on the previous RRB conferences, this conference is expected to welcome about 350 international participants from over 30 countries.

Delegates from university, industry, governmental and non-governmental organizations and venture capital providers will present their views on industrial biotechnology, sustainable (green) chemistry and agricultural policy related to the use of renewable raw materials for non-food applications and energy supply. The conference further aims at providing an overview of the scientific, technical, economic, environmental and social issues of renewable resources and biorefineries in order to give an impetus to the biobased economy and to present new developments in this area.

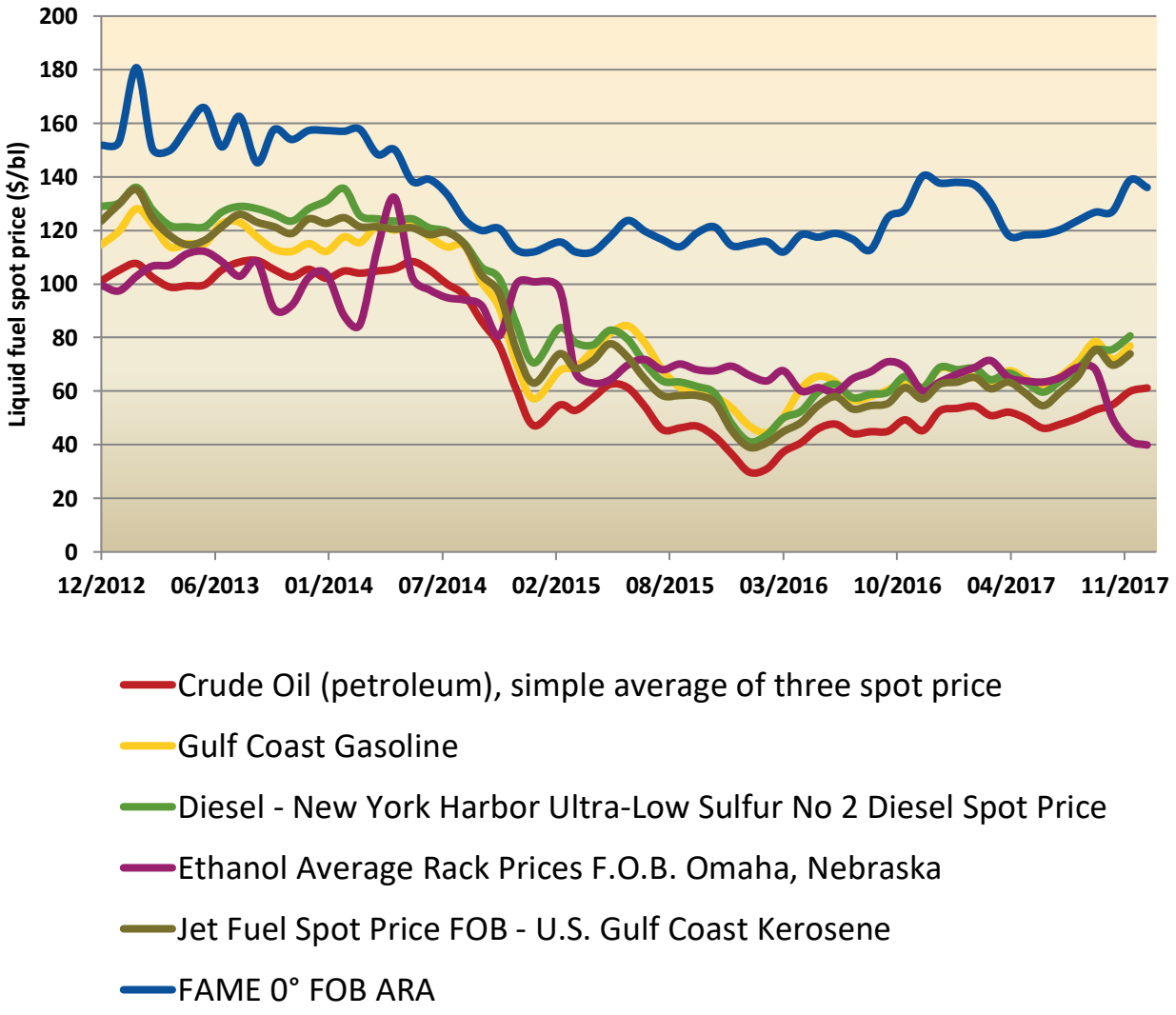
The conference will provide a forum for leading political, corporate, academic and financial people to discuss recent developments and set up collaborations.

The three-day international conference will consist of plenary lectures, oral presentations, poster sessions and an exhibition. Companies and research organizations are offered the opportunity to organize a satellite symposium.

Click here for more information.

Price Information

Historical spot prices of liquid fossil fuels and liquid biofuels. Five years prices and up to November/December 2017 are given in $ per barrel.



Prices of Crude oil, diesel, gasoline, and jet fuel are recorded from www.indexmundi.com; Price of ethanol from www.neo.ne.gov; Biodiesel spot prices from http://www.kingsman.com

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