

The Bioeconomy Consultants



News Review

Issue Sixty-Eight

November 2017

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 November's Biofuels News Review.

This month's issue features several highly encouraging stories from the aviation sector. Aviation has been one of the tougher nuts for biofuels to crack, as the energetic demands of jet fuel are greater than those of conventional fuel as they must still operate at lower temperatures and pressures, but the problem remains that the aviation sector is one of the most significant contributors to carbon emissions worldwide. Biofuels currently offer the best decarbonisation option for commercial airlines, but in order to stimulate uptake there needs to be demonstration of the capabilities of aviation biofuels. There has been a steady rate of development in the biobased aviation fuels sector, with many small-scale trials, but there has been little policy support to aid the sector's growth. Fortunately, biobased jet fuel seems to be gaining traction, and this month has seen a couple of firsts for the sector.

Back in 2015, Hainan airlines completed China's first domestic biofuel powered flight, which was a major step for the sector, and this has now been followed up with China's first intercontinental flight, again by Hainan, from Beijing to Chicago. The biofuel was produced from waste cooking oil, and completed the 11,000km journey without any problems. It is not known what level of blend was used, but the pilots reported that the biofuel performed comparably to conventional jet fuel.

Chicago O'Hare airport has also been in the spotlight recently regarding biobased jet fuel, after eight airlines based at the airport celebrated "Fly Green Day" on 8th November, where biobased isobutanol-derived jet fuel was supplied to all of these airlines for all flights during the day. It is not usual for biobased jet fuel to be supplied directly from the airport's fuel pumps, but to mark the occasion this was done, again without issue. Both of these events go a long way to highlighting the potential of biobased jet fuel, and could stimulate more airlines to take up the technology,

In other news, scientists at Australia's University of Newcastle, have claimed a major breakthrough in the development of biofuels derived from crop waste. This has the potential to eliminate the land-use debate that still hangs heavy over the biofuels sector. The new "strong acid" technology will see crop and forestry wastes converted into ethanol for biofuels, allowing farmers to make more profit from what they grow, but also allow Australia to develop its biofuel industry, in a country where only 1% of the country's fuel consumption is ethanol biofuels.

Read on for the latest news.

Policy

EU ENVI committee votes to phase out crop-based biofuels



Pixabay

Reports by Biofuels News on proceedings of Policymakers in the European Parliament's environment committee (ENVI) indicate that they have voted in support of a proposal (by a small majority of 32 to 29 with 4 abstentions) for a total phase out of crop-based biofuels by 2030 while backing the use of biomass for electricity production. The ENVI vote on the revised Renewable Energy Directive, dubbed RED II, happened on the evening of 23rd October. RED establishes an overall policy for the production and promotion of energy from renewable sources in the EU. This proposition goes much further than the current REDII draft which the Commission proposed a cap on crop-based biofuels declining from 7% in 2021 to 3.8% by 2030.

The ENVI Committee voted to increase the EU's renewables target from 27% to 35% for the period 2021 to 2030, but did not impose tougher sustainability criteria on bioenergy, which NGOs had been calling for.

The committee's recommendation also sets stricter criteria for the use of municipal and industrial wastes for energy and excludes renewable energy support for refuse that is not separately collected. However, industry sources

point out that despite all efforts of source separation, there will always remain some polluted biodegradable part of the residual fraction of industrial, commercial and municipal waste, which is not suitable for quality recycling or composting, where the only alternative treatment would be landfill.

The next stage of the process is consideration by the Industry, Research and Energy (ITRE) Committee, which leads on the opinion and is due to adopt its position on 28 November. The decision of both Committees will be important in how the European Parliament positions itself when it makes its final decision, expected to be finalised in December, however, this could stretch into 2018.

Click [here](#) for more information.

Markets

E10 becomes best selling fuel in France

E10 fuel (a mixture of regular unleaded fuel and ethanol) has become the number one fuel in France after financial incentives made the biofuel more affordable and attractive, according to a report in Reuters.

France is the largest ethanol market in the European Union. According to statistics from trade group ePURE, France produced 2,375 million litres of ethanol in 2016, followed by Germany who produced 1,163 million litres and the UK who produced 985 million litres.

Unleaded SP95-E10 accounted for 38.5% of the total fuel sales in France during the month of September, according to data from France-based trade association Bioethanol Collective.

Ethanol-based gasoline topped the market share of regular SP95 (36.8%) and the higher octane SP98 (23.6%).

The data for 2017 up until September also sees SP95-E10 placed as the best-selling fuel by 0.7%.

According to Reuters, government tax breaks have made SP95-E10 the cheapest fuel on the market, normally 4 to 5 cents a litre cheaper than SP95, boosting its demand in among the French public. Distrust towards diesel after the Volkswagen case has also aided the growth of the ethanol-based fuel.

Click [here](#) for more information.

Novozymes bioenergy division shows increased biofuel sales



Novozymes

Novozymes has released third quarter financial results, reporting a 4 percent revenue growth during the first nine months of the year. Revenue for the company's bioenergy division grew 10 percent over the same period.

According to Novozymes, its bioenergy sales grew by 10 percent both organically and in Danish krone (DKK) when compared to the first nine months of last year. During the third quarter, year-over-year organic growth for the segment stood at 16 percent and 10 percent in DKK.

The company noted that bioenergy sales during the period continued to build on the positive momentum seen during the first half of the year. Sales for U.S. conventional biofuels benefited from growth in the production of ethanol, which is estimated to have increased by approximately 2 percent during the first nine months of the year. Novozymes said other markets continue to show good growth, but represent a smaller part of

overall bioenergy sales. The company also noted sales of enzymes for biomass conversion continued to contribute to bioenergy sales growth during the first nine months of the year, but make up a small portion of bioenergy sales.

For the full year, Novozymes said it expects organic sales growth in the bioenergy sector to be driven mainly by new product launches and increased penetration from innovation. While the company expects U.S. ethanol production to be up slightly when compared to last year, it also noted that U.S. inventory levels are currently high.

Novozymes also reported sales for its household care division increased 2 percent during the first nine months of the year, while sales in the food and beverage division grew 9 percent, sales in the agriculture and feed division increased 2 percent and sales in the technical and pharma division were up 3 percent.

Click [here](#) for more information.

Lallemand Biofuels acquires Lactic Solutions

Lallemand Biofuels & Distilled Spirits (LBDS), a business unit of Lallemand Inc., is pleased to announce the acquisition of Lactic Solutions LLC.

Lactic Solutions LLC has been developing genetically modified lactic acid bacteria products specifically for the biofuels industry.

These new products will create value for fuel ethanol producers through higher ethanol production yields and reduced consumption of antibiotics.

The new products that will be developed from this technology will further establish LBDS as the leader in bringing game-changing new products and services to customers in this market.

Click [here](#) for more information.

DuPont to sell Iowa ethanol plant

Biofuels news reports DuPont Industrial Biosciences has said it plans to sell its cellulosic ethanol plant in Iowa, US. The move comes almost exactly two years after the company celebrated the grand opening of the facility in October 2015.

In a statement DuPont said "we have concluded it is in our long-term interest to find a strategic buyer for our technology, including the Nevada, Iowa, biorefinery. We will continue to participate in the overall biofuels market through specialty offerings, including biofuel enzymes and engineered yeast solutions that improve yield and productivity for biofuel producers".

DuPont spent about \$225 million (€192m) to build the facility, which used corn stalks and stems to make ethanol, which is blended into gasoline. The plant was designed to produce 30 million gallons a year.

The news comes as another blow for the second-generation biofuels industry, following recent reports that Beta Renewables had shut down its cellulosic ethanol plant in Crescentino, Italy.

According to local media reports, financial restructuring at US headquartered Group Mossi & Ghisolfi (M&G), who built and operated the facility, is behind the shutting down of the bioethanol plant. Essentially Beta Renewables biorefinery has just 60 days to present a restructuring plan to Italian authorities.

Click [here](#) for more information.

BCC Research reports on liquid biofuels market



Wikimedia Commons

The market for liquid biofuels outside of North America totalled \$48.8 billion in 2014 and \$41.7 billion in 2015. This market is expected to reach \$89.6 billion by 2020, with a compound annual growth rate (CAGR) of 16.5%.

The first-generation biofuels segment of this market should reach \$46.3 billion in 2015 and \$39.3 billion in 2020, with a CAGR of 16.6% through the forecast period.

The other fuels market is projected to increase from \$2.4 billion in 2015 to \$5.0 billion in 2020, with a CAGR of 16.2%.

The primary drivers for the industry are government mandates that have established specific levels of biofuel blends with fossil fuels. In this study, the biofuels market is analysed by feedstock type, production capacity, and by producer. Market values are calculated from historical per litre sales prices and forecast prices according to potential future markets. Conclusions are illustrated with statistical information on markets, applications, industry structure and dynamics, along with technological developments.

While biofuels account for just 1% of world fuel consumption, they are the subject of considerable global interest. Conventional energy resources, mainly fossil fuels, are becoming limited due to a rapid worldwide increase in demand.

A growing imbalance in energy demand and supply affects consumer prices as well as the environment, prompting a search for new sustainable energy resources. Biomass is one such environmentally sound renewable resource from which various fuels can be manufactured. Fuels produced from plant materials also have the potential to invigorate lagging agricultural sectors in emerging countries, such as those in Eastern Europe and parts of Asia.

Click [here](#) for more information.

Research & Development

POET-DSM cracks ethanol pretreatment conundrum

POET-DSM Advanced Biofuels has achieved a major breakthrough in cellulosic biofuels production at its Project LIBERTY plant in Emmetsburg, Iowa. The company has solved the critical challenge in pre-treatment, overcoming what has been the No. 1 hurdle to commercialization for producers around the world. Project LIBERTY is now running pre-treatment at 80 percent uptime.

Pre-treatment is the first stage in cellulosic biofuels production, where the feedstock (corn cobs, leaves, husk) is processed so that enzymes and yeast can access the cellulosic sugars and ferment them into biofuel. POET-DSM and other producers have identified this stage in the past as the major chokepoint in commercial production.

With a newly installed pre-treatment system, designed by POET engineers, POET-DSM is now able to direct its attention to fine-tuning downstream processes and prepare for future licensing efforts that will spread this technology around the world.

Consistent policy is needed to enable this facility to be replicated in other locations. With biofuel volumes increasing in the future through rapidly rising demand for cleaner-burning, homegrown biofuels, such as E15, this technology is sorely needed.

Click [here](#) for more information.

Australian scientists develop biofuels from crop waste



Pixabay

Australia's \$63 billion agriculture sector stands to benefit from a revolutionary fuel technology that will convert multiple agricultural waste streams into valuable biofuel and green chemical products for the first time.

In addition to ARENA funding, the \$48 million project will be funded by \$11.9 million from industry partners as well as contributions from Muswellbrook Shire Council and the University.

The project will develop an environmentally sustainable process to produce biofuels and other renewable chemicals from crop and forestry wastes.

Currently farmers need to decide whether their crops are used for food or fuel production, as ethanol is produced from the valuable food portion, known as 'first generation technology'.

Ethtec technology will eliminate the food versus fuel tension as the process will use the waste

streams left behind once the food portion has been harvested from crops, known as 'second generation technology', which will also give farmers a second source of income.

The project will help create a commercially viable process for the country to tap into a \$130 billion ethanol industry that currently only makes up approximately one per cent of Australia's fuel consumption**, and will provide a pathway to a sustainable export market for Australian produced ethanol.

Ethtec's novel 'strong acid' technology will use feedstock waste streams such as wheat straw, cotton stubble, sugar cane bagasse and forest material left behind after the valuable food and fibre components have been harvested from crops and timber plantations.

Not only will this technology reduce the environmental impact of ethanol production, but it also has the potential to reduce the cost of biofuel and could be used to produce renewable plastics, industrial lubricants and even pharmaceuticals.

Click [here](#) for more information.

More stable enzymes discovered for biofuel production

Newly published research has demonstrated the importance of microbial communities as a source of stable enzymes that could be used to convert plants to biofuels.

The research was carried out by scientists from the Department of Energy's Joint BioEnergy Institute (JBEI) based at Lawrence Berkley National Laboratory. The findings have been published in the journal Nature Microbiology, and report on the discovery of new types of cellulases - enzymes that help break down plants into ingredients that can be used to make biofuels and bioproducts, according to a JBEI statement.

Unlike traditional methods, the cellulases were cultured from a microbial community or

microbiome. Usually, isolated organisms are used to obtain enzymes.

It was revealed that the bacterial population *Candidatus Reconcilibacillus cellulovorans* yielded cellulases that were arranged in 'remarkably robust carbohydrate-protein complexes', a structure never before observed in isolates.

This stability makes the new cellulose complexes attractive for applications in biofuels production, the authors say. In particular, it gives the cellulases an advantage over alternatives that degrade more rapidly at high temperature.

JBEI scientists collaborated with researchers from the Advanced Biofuels and Bioproducts Process Demonstration Unit (ABPDU) at Berkeley Lab, a scale-up facility established by DOE to help accelerate the commercialisation of biofuels research discoveries, to determine whether the enzyme production could be scaled up for industrial applications.

While the JBEI scientists were able to produce 50 millilitre samples at the DOE Bioenergy Research Centre, in just six weeks the scientists at ABPDU scaled the cultures to a volume 6,000 times larger, 300 litres, in industrial bioreactors.

Click [here](#) for more information.

***E. coli* employed to produce branched long-chain alcohols**



Wikimedia Commons

The intrinsic structural properties of branched long-chain fatty alcohols (BLFLs) in the range of C12 to C18 make them more suitable as diesel fuel replacements and for other industrial applications than their straight-chain counterparts. While microbial production of straight long-chain fatty alcohols has been achieved, biosynthesis of BLFLs has never been reported. In this work, we engineered four different biosynthetic pathways in *Escherichia coli* to produce BLFLs. We then employed a modular engineering approach to optimize the supply of α -keto acid precursors and produced either odd-chain or even-chain BLFLs with high selectivity, reaching 70 and 75% of total fatty alcohols, respectively. The acyl-ACP and alcohol-producing modules were also extensively optimized to balance enzyme expression level and ratio, resulting in a 6.5-fold improvement in BLFL titers. The best performing strain overexpressed 14 genes from 6 engineered operons and produced 350 mg/L of BLFLs in fed-batch fermenter. The modular engineering strategy successfully facilitated microbial production of BLFLs and allowed us to quickly optimize new BLFL pathway with high titers and product specificity. More generally, this work provides pathways and knowledge for the production of BLFLs and BLFL-related, industry-relevant chemicals in high titers and yields.

Click [here](#) for more information.

Abengoa to build USA's first plant for biofuels from municipal waste

Biomass magazine reports that Abengoa has received notice to proceed on what will be the first plant that will produce biofuels from municipal solid waste (MSW) in the United States with gasification technology. Prior to this, Fulcrum BioEnergy Inc., who Abengoa is constructing the plant for, successfully reached financial closure for the project, this being a prerequisite for the commencement of works.

Abengoa will be responsible for the engineering, design, construction and commissioning of the project. The plant will be located in the State of Nevada and will have the capacity to produce 10 million gallons of biofuels per year, to be used in the aviation sector.

Abengoa has spent over a year working on the preliminary engineering and procurement works in order to minimize possible risks during construction. The engineering, procurement and construction works are expected to begin immediately and are expected to take over two years.

Click [here](#) for more information.

Bioethanol

Bio-butanol plant set for 2018 opening

GS Caltex has been pushing a project to produce biobutanol from sugar, starch, straw and wood, as it is one of three major bioenergies along with biodiesel and bioethanol.

The oil company has been building a demo plant for the biobutanol on a 15,000-square meter plot of land in its Yeosu Oil Refinery Complex in South Jeolla Province.

The oil refiner invested 50 billion won in the project, which is slated for completion at the end of this year, and will have a capacity to turn out 4

million tons of biobutanol when it goes on stream early next year.

The bio energy product can replace butanol used in paints, adhesives and inks, and also can be mixed with gasoline to fuel engines to power cars, and the usual gasoline-burning engines don't need to be touched up to burn the gasoline mixed with biobutanol. The new petrochemical product can be stored in the existing storages for gasoline and transported in regular gasoline tanks without being touched up as it doesn't easily dissolve in water and doesn't get corroded easily.

Biobutanol is an alternative fuel produced from biomass such as sugar, starch, straw or wood. It can be used as a transportation fuel in vehicles with internal combustion engines without any additional modifications.

Biobutanol or Biobased Butanol Fuel is second generation alcoholic fuel with a higher energy density and lower volatility vs. ethanol. Over a dozen companies are focused on developing biobutanol on commercial scale. This is a true biofuel for masses with potential of little or no impact on food supply and ability to compete favourably with \$80 bbl oil. Effort is focused on both fermentation of sugars, starch and other biomass and through pyrolysis and reformulation of biomass. The secondary appeal of biobutanol is its variety of commercial uses in an existing market worth over \$5 billion.

Click [here](#) for more information.

Biodiesel

Coffee oil used to power London buses



Public Domain Pictures

Waste coffee grounds will be used to help power some of London's buses.

Biofuel made by blending oil from coffee waste and diesel will now be added to the fuel supply for the capital's public transport.

Bio-bean, a technology company that recycles ground coffee, said it has produced enough coffee oil to run one bus in the capital for a year.

Transport for London recently turned to using biofuels to reduce emissions from vehicles. Biofuels made using waste products are already used to power many of London's buses.

But coffee-derived biofuel will be officially added to the capital's public transport vehicles for the first time on Monday.

According to research from Bio-bean and Shell, Londoners create 200,000 tonnes of waste from coffee every year.

The firm processes a B20 biofuel from used grounds it collects from coffee shops and factories.

Some 6,000 litres of coffee oil have been produced so far, the company said.

It would take just over 2.55 million cups of coffee – blended with diesel - to run one of London's buses for a year, Bio-bean estimates.

Click [here](#) for more information.

Aviation Fuel

Fly Green Day sees 8 airlines run on Gevo's biobased jet fuel



Pixabay

Gevo, Inc., announced that its alcohol-to-jet fuel (ATJ) derived from renewable isobutanol was used by eight commercial airlines for Fly Green Day, sponsored by the O'Hare Fuel Committee, at Chicago O'Hare International Airport. The event was the first time renewable jet fuel had been supplied at Chicago O'Hare using the existing airport fuelling infrastructure, such as pipelines, terminals and tankage.

To date, airlines and airports have generally relied on alternative means of supplying renewable jet fuel to the wing, usually trucking jet fuel on site for blending and fuelling. For Fly Green Day, Air BP blended Gevo's ATJ with regular fossil-based Jet A fuel, certified its quality and then supplied its customers through the airport's main fuel hydrant system.

Click [here](#) for more information.

KLM's Costa Rica flights to be biofuel-powered

KLM and the government of Costa Rica have agreed to determine whether the airline can operate its new twice-weekly service to San Jose using biofuel.

KLM's first demonstration flight was in 2009 with biofuel provided by its development partner SkyNRG. Since then it has operated over 1,000 flights using jet fuel produced from sustainable sources including waste streams and non-food energy crops.

The company said the joint effort with Costa Rica is aimed at increasing the production of biofuels in order to lower the price and encourage other airlines and governments to take similar steps.

The only European carrier to operate long haul flights using biofuels, all KLM flights from Los Angeles have been partially powered with sustainable biofuel since 2012.

KLM said it could reduce its CO2 emissions by as much as 80 percent using biofuel derived from used cooking oil rather than fossil fuels. However, the price is still three times that of regular jet fuel because of low demand.

Click [here](#) for more information.

China's first intercontinental biofuel flight

China's Hainan Airlines has completed the country's 'first' cross-ocean biofuels powered flight.

Flight 497 took off from Beijing on 21 November. It landed at Chicago's O'Hare airport at 12:05pm local time. The Boeing 787 Dreamliner completed the more than 11,000km journey with biological aviation fuel produced from waste cooking oil, according to Xinhua.

It was the first demonstration flight from China to the US to use aviation biofuel.

The flight comes as part of Hainan's long running drive to reduce its environmental footprint. In 2015, the airline made China's first domestic biofuels powered flight.

Click [here](#) for more information.

Events

BBI JU Stakeholder Forum Brussels, 7th December 2017

The inaugural Stakeholder Forum is a one-day public event dedicated to engaging directly in dialogue with BBI JU's stakeholders. Save the date and make sure you are part of the day. The event will include plenary keynote speeches, high-level discussions with expert panels, thematic breakout sessions, with plenty of networking possibilities.

The agenda includes opening and closing keynote speeches from champions of the bio-based economy. In the plenary sessions key contributors will present their views on defining the roadmap for a bio-based Europe, the strategic context of the BBI initiative & achievements, lessons learned & sector development and rapporteur feedback.

Click [here](#) for more information.

Bioeconomy Investment Summit Helsinki, 14th-15th December 2017

Join us on 14-15 December 2017 in Helsinki, Finland for the 2017 Bioeconomy Investment Summit.

Over 30 speakers from across the globe will share their views on how we can bring together the economy and the environment.

New advances in technology mean that everything that can be made out of oil can be made from renewable, biological resources. There are huge environmental and business opportunities for a wide range of industries: construction, chemicals, textiles, energy, plastics.

The bioeconomy gives us a unique opportunity for building a sustainable future. Our speakers will focus on what investment steps we need to take to make it happen.

Click [here](#) for more information.

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.

It is now time to come together again and to re-visit the strategies for future international cooperation in a next Global Bioeconomy Summit!

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.

There will however be an extension to the core conference and exhibition in order to showcase the many achievements in the field of full scale biomass utilisation in Denmark that are an integral and major part of the country becoming fossil-free by 2050. 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.

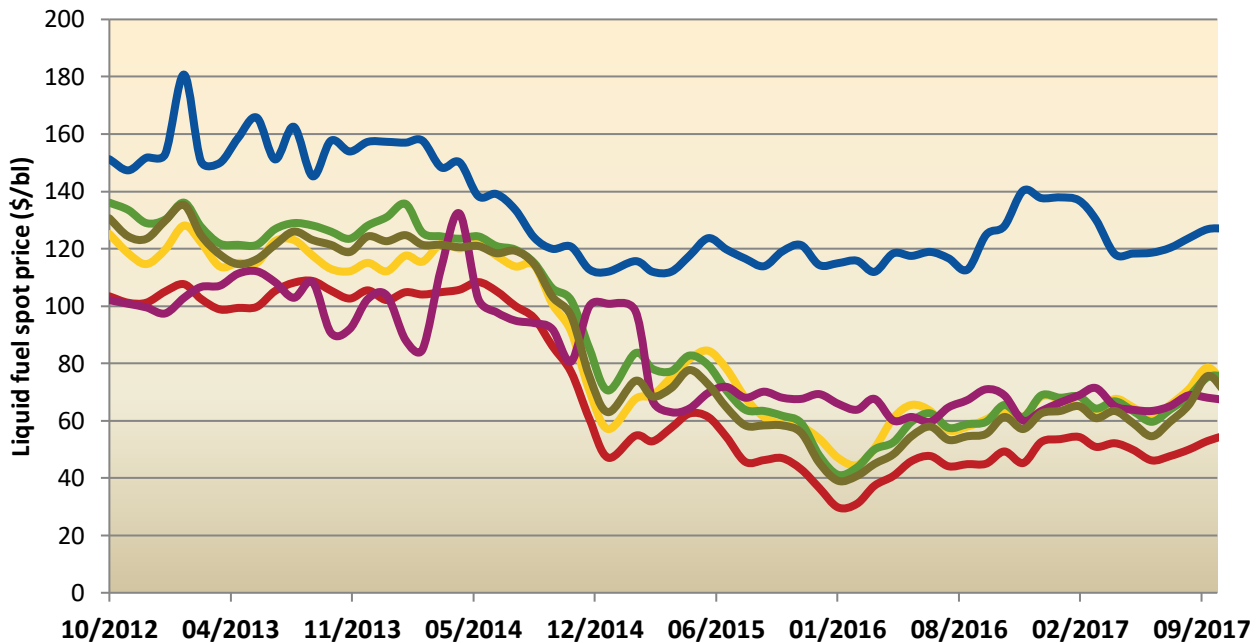
The conference will provide a forum for leading political, corporate, academic and financial people to discuss recent developments and set up collaborations.

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 October 2017 are given in \$ per barrel.



- Crude Oil (petroleum), simple average of three spot price
- Gulf Coast Gasoline
- Diesel - New York Harbor Ultra-Low Sulfur No 2 Diesel Spot Price
- Ethanol Average Rack Prices F.O.B. Omaha, Nebraska
- Jet Fuel Spot Price FOB - U.S. Gulf Coast Kerosene
- FAME 0° FOB ARA

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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