The Bioeconomy Consultants

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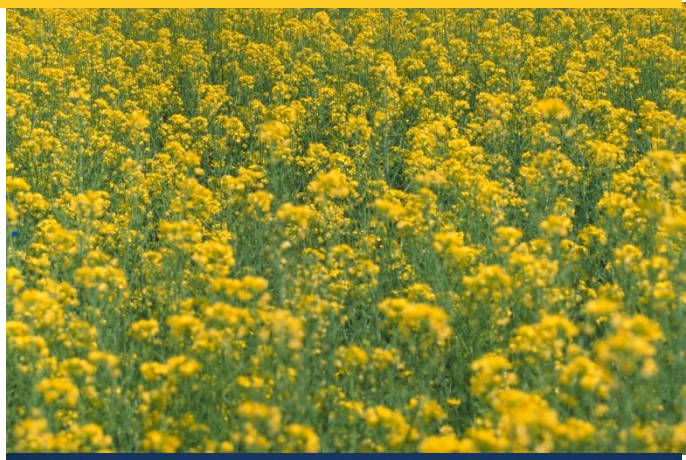
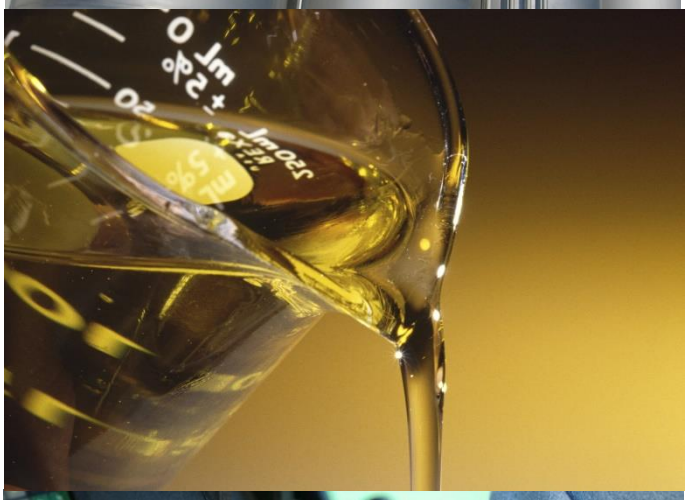




News Review

Issue Sixty-Nine

December 2017

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

Contents

Foreword

Welcome, subscribers, to 2017's final news review, and as always, the last of the month is Biofuels.

The biggest news here in the UK biofuels sector has been the shutdown of Vivergo's bioethanol plant in Hull. The plant is one of the most significant contributors to the UK's biofuel production, and a massive asset to the UK bioeconomy. Vivergo has raised concerns about the long-term certainty of the UK ethanol market and has stated that the plant shutdown is due to the lack of a roll-out framework for E10 fuel in the UK.. The company are taking the opportunity to use the shutdown to perform routine maintenance work on the plant. Vivergo may well re-open then plant in the future, but they insist they will wait for more favourable market conditions before they do so.

Another controversial issue over in continental Europe has been the Council of the EU's position on the Renewable Energy Directive's reforms concerning crop-based biofuels, which has prompted anger on both sides of the debate. The decision was made to maintain the current 7% cap on crop-based biofuels' contribution to renewable transport. Ethanol producers are arguing that this denies the sector the opportunity to expand, and that this concedes market space back to fossil fuels, whereas environmentalist NGOs are concerned that the cap is too high, and that this will lead to deforestation and a reduction in available food crops. However, the 7% cap is not fully fixed, as individual member states are allowed to lower their own individual caps below 7%, which is incentivised by allowing them to lower their overall renewable transport targets. This is a significant blow for crop-based biofuels, and it remains to be seen how this will affect the markets moving forwards.

In other, more positive news, we often cover the aviation sector in this news review, as it is considered a great frontier for biofuels development. However, it is rare that we report on maritime biofuels, which is another enormous sector that biofuels have yet to significantly establish in, with similar technical challenges facing maritime biofuel development as aviation biofuels. It is encouraging, then, that global shipping company DHL is now offering biofuel powered shipping as an option to its customers. By putting the onus onto the customer, this goes further towards raising awareness of what biofuels can achieve, but it remains to be seen what uptake will be like, and how the customers will respond to being given this choice.

Read on for the latest news.

Policy

Vivergo shuts down plant in response to RTFO reforms

Vivergo

Vivergo reluctantly welcomed the Government's Renewable Transport Fuel obligation proposals in September, but have remained extremely concerned that there is no roll-out framework for E10 in the UK, the absence of which could have serious consequences for the long-term future of the UK bioethanol industry.

Over the past six weeks they have seen bioethanol prices fall significantly impacting Vivergo profit margins further. Whilst there have been some supply increases this year, the bioethanol market in the UK remains constrained by the Government's inaction. As a result of these market conditions and legislative uncertainty, they have taken the decision to take their production facility offline for the foreseeable future. While the plant is offline, they are taking the opportunity to bring forward and extend their annual plant maintenance work in order to maintain employment levels. They will closely monitor the market ahead of any plant re-starting.

In the meantime, they will continue to work with all stakeholders and the Government to support the legislative process and the future roll-out of E10; the simplest, most readily available environmentally friendly option for consumers to help reduce the impact of road transport on our environment and providing stability and confidence in the future of the UK bioethanol industry and the jobs it supports.

Click here for more information.

EU ruling blow for first-generation biofuels

The Council of the EU has adopted its position on a directive promoting the use of renewable energy across the Union. The announcement could have significant ramifications for the continent's biofuels industry, and has already sparked controversy.

Environment and energy ministers in the Council have agreed renewable energy targets for 2030 ahead of negotiations in 2018 with the European Parliament. The announcement includes a commitment to reach a target of at least 27% renewable energy in the EU's overall energy consumption by 2030.

In the transport sector, the renewables target for 2030 is set at 14% for each member state, with a sub-target of 3% for advanced biofuels. Double-counting will be allowed for advanced biofuels, with an intermediate binding milestone of 1% in 2025 'to increase investment security and guarantee the availability of fuels throughout the period'.

The announcement seems a negative one for first-generation biofuels. The existing 7% cap will be maintained to provide certainty to investors. Most significantly, if a member state sets a lower first-generation cap, it will be 'rewarded' with the option of lowering its overall target for renewables in transport.

The trade association for the European renewable ethanol industry, ePURE, was quick to respond to the new announcement. In a statement, the association argues that as well as delivering 'artificial multipliers' for certain renewable energy sources, the Council's new position would leave more space for fossil fuels in the EU's post 2020 transport mix.

Click here for more information.

10th Anniversary of the US Renewable Fuel Standard

Dec. 19 marks the 10th anniversary of former President George W. Bush signing the Energy Independence and Security Act of 2007 into law, establishing the current version of the Renewable Fuel Standard.

The RFS program was first created by the Energy Policy Act of 2005, which was signed into law by Bush on Aug. 8, 2005. The original RFS program, often referred to as RFS1, required 4 billion gallons of ethanol to be blended into the U.S. fuel supply in 2006, increasing to 6.1 billion gallons in 2009 and 7.5 billion gallons by 2012. Two years after its original establishment, the RFS program was updated and expanded by EISA, and now requires 36 billion gallons of renewable fuels to be blended into the U.S. fuel supply by 2022. The updated program, sometimes referred to as the RFS2, created nested volume requirements for cellulosic biofuels, advanced biofuels, biomass-based diesel and conventional biofuel. The U.S. EPA issued a final rule implementing the updates to the RFS program in March 2010.

Data published by the Renewable Fuels Association illustrates the significant growth in ethanol production that has been achieved since EISA was signed into law. In 2007, the U.S. produced approximately 6.52 billion gallons of ethanol. By 2016, that volume had risen to 15.33 billion gallons.

Production of other biofuels has grown significantly as well. Renewable identification number (RIN) data published by the EPA shows that a net total of 7.12 billion RINs were generated under the RFS program in 2010. By 2016, the net volume of generated RINs had increased to 19.45 billion.

Click here for more information.

Markets

Vietnam prepares to transition to E5

The Vietnamese Government announced the move to E5 in June, with the current 92 RON (research octane number) gasoline coming off the market in the new year.

E5 is 5% ethanol blended with 95% gasoline. Businesses have complained that they are not prepared for the change to E5, according to a government statement, and some consumers fear how the blend will perform in their vehicles.

In a release on Thursday 7 December, the government reaffirmed that the transition would take place and that it was up to businesses to be prepared, emphasising that 1 January was the day to complete the transition, not the day to prepare. It has also tried to inform the public about the benefits of E5 and its safety. It will also provide guidance to local governments to assist the implementation.

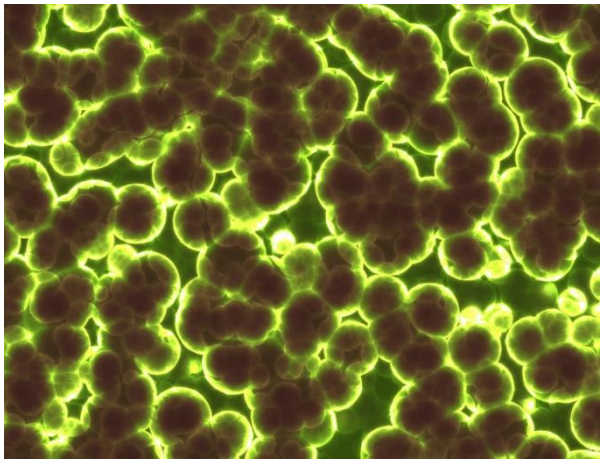
The Vietnamese government has previously tried to increase sales of ethanol, to limited success. Global Platts reported that the price difference between blended and unblended fuel was not big enough to encourage adoption of E5 at the time.

In a statement, the Ministry of Industry and Trade said that it would be working with the Ministry of Finance to make E5 prices more attractive this time around.

Click here for more information.

Research & Development

Learning from bacteria to break down lignin



Pixabay

The production of biofuels from plant biomass is a highly promising source of energy, but researchers are trying to find microbes that readily degrade recalcitrant lignin found in plant biomass. Recent comprehensive genomic and metabolomic analysis of a known lignin-degrading bacterium provides insight into how this degradation is accomplished.

Because the initial step of manufacturing biofuels from plant matter is the decomposition of complex lignocellulose into more manageable "building blocks," an understanding of how nature achieves this is critical. The findings from a new study reveal some of the basic tools used by a specific microbe to break down lignocellulose. The work provides insight into how industrial processes might achieve degradation during biofuel production, and how side processes such as hydrogen production might be harnessed as well.

Click here for more information.

New US grant to pursue microbial biofuels

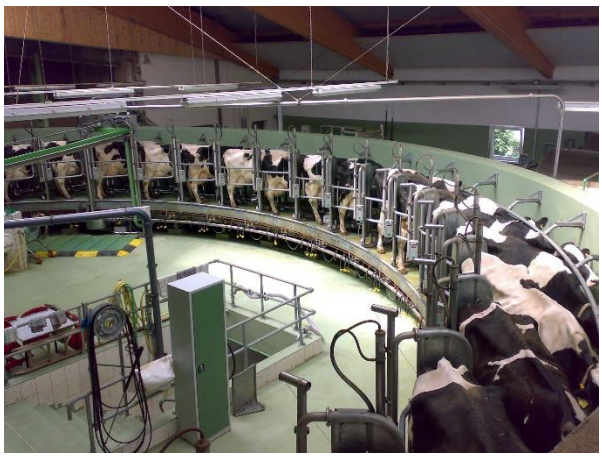
Researchers at Washington University in St. Louis have received a $3.9 million grant from the US Department of Energy (DOE) to develop bacteria that manufacture advanced, drop-in biofuels.

The researchers, representing a collaboration of investigators at the School of Medicine and the School of Engineering & Applied Science, seek to make biofuels whose production would not compete with the food supply.

The researchers are studying a type of bacteria called Rhodococcus opacus, originally discovered growing on toxic compounds outside a chemical plant. These bacteria thrive on these toxic compounds, using them as a source of food for the production of biofuels.

Click here for more information.

Conversion of dairy waste into biofuel



Wikimedia Commons

Scientists have developed a bioprocess that enables conversion of acid whey into aviation biofuel.

Every litre of milk that goes into milk products, such as quark and Greek yogurt, or into fresh cheeses, produces another two litres of wastewater in the dairy factory. This wastewater is called “acid whey” and cannot be fed to animals in large quantities due to its acidity. It is rich in

organic material like lactose and must be treated or transported to farms for use as a fertilizer by spreading it on land.

A research team kept a bacterial culture in two microbiomes under different temperatures and placed them in series. The first hot microbiome (50 degrees Celsius) converts all the sugars into an intermediate acid. The second warm microbiome (30 degrees Celsius) performs chain elongation until a product is formed with six to nine carbons in a row.

The new product could be fed back to the animal as an antimicrobial to prevent disease, or it can be further processed in a refinery into aviation fuel. Because the product from the bioreactor microbiome has six to nine carbons in a row, it becomes more oil-like and can be separated from the water it was produced in. After that it must still be purified and further refined.

Click here for more information.

Bioethanol

Celtic Renewables to build commercial-scale bio-butanol plant

A Scottish biofuel start-up, Celtic Renewables, plans to build a commercial demonstration plant in Grangemouth, which will produce over 500,000 litres (132,000 gallons) of biofuel annually

The company established a new public limited company—Celtic Renewables Grangemouth PLC—to assist in the construction of the plant and has launched a funding campaign seeking $7.25 million through an investment with Abundance Investment.

The plant, based on a two-acre site, will produce biobutanol, a biofuel produced from draff, the sugar-rich kernels of barley that are soaked in water to facilitate the fermentation process necessary for whisky production, and pot ale, the yeasty liquid left over following distillation.

Working closely with Tullibardine Distillery, Celtic plans to put residues of Scotland's Malt Whisky industry to good use by converting the industries annual production of 750,000 metric tons (827,000 tons) of draff and 2 billion litres of pot ale into biofuel and other low carbon products.

With planning permissions now in place, building of the commercial demonstrator plant is due to begin in early 2018.

Click here for more information.

New joint venture to operate Brazilian ethanol storage site

Copersucar

BP Biofuels and Copersucar have announced that they have agreed to form a joint venture to own and operate a major ethanol storage terminal in Brazil, better and flexibly connecting ethanol production with the country's main fuels markets.

Copersucar is the world's leading sugar and ethanol trader, with the largest sugar and ethanol storage capacity in Brazil. BP Biofuels, part of BP's Alternative Energy business, is a significant producer of ethanol from sugarcane in Brazil.

The 50/50 joint venture will own and operate the Terminal Copersucar de Etanol in Paulínia in the state of São Paulo, which is currently solely owned by Copersucar. Joint ownership of the terminal will support the strategies of both companies - connecting important ethanol production with flexible storage capacity close to the main ethanol consumer markets in Brazil.

In addition to the shareholders' business, the terminal will continue providing services to its current customers.

In operation since September 2014, the Paulínia terminal has ten tanks with a total storage capacity of 180 million litres of ethanol and moves around 2.3 billion litres per year, with the possibility of further expansion. The terminal is located in one of Brazil's main fuels hubs and operates in a multimodal way, connected to important transport networks, pipelines, and will soon be connected to the railway as well.

Click here for more information.

Biodiesel

New biodiesel demonstration plant in Norway

A (CDN) $76.8 million (€50.7 million) industrial scale advanced biofuel demonstration plant will be constructed at a former pulp mill in Tofte, Norway. The new facility is apparently a step towards the creation of a commercial scale project.

Danish-Canadian clean-fuel company Steeper Energy is partnering with Silva Green Fuel, a Norwegian-Swedish joint venture, on the project. Steeper will license its proprietary Hydrofaction technology to Silva, who will construct the facility over the next 18 months.

Feedstock for the plant will be woody residues which are converted to renewable crude oil before being upgraded to renewable diesel, jet or marine fuel. Silva selected Steeper's Hydrofaction system following a review of around 40 other technologies.

According to a statement, the partnership between Silva and Steeper aims to verify data and design protocols in order to de-risk future commercial scale facilities planned to be built by Silva. The technology will eventually be offered by Steeper to other biofuel project developers around the globe.

Currently, Steeper is actively entertaining partnerships with biomass aggregators or energy producers to develop commercial-scale projects. According to the company, as well as low value forestry by-products such as forest residues, its technology can utilise other feedstocks such as urban organic wastes, agricultural residues, animal manure and algae.

Click here for more information.

Neste to expand production capacity in Singapore

Neste's board of directors has decided that Neste's additional production capacity for renewable diesel, renewable aviation fuel and raw materials for various biochemical uses will be located in Singapore. The decision initiates technical design of the new production line, with the aim of a final investment decision by the end of 2018. If the project proceeds as planned, production at the new production line will begin by 2022.

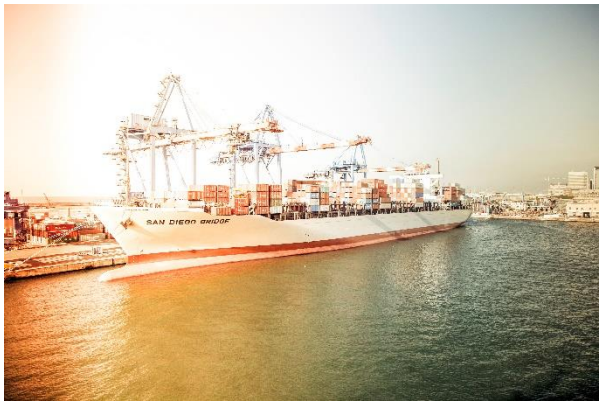
The new production line will extend Neste's current capacity in the Singapore refinery by 1 million tons. The growth project includes an enhanced pre-treatment unit in preparation for the use of increasingly poor-quality waste materials.

Neste currently has a renewable diesel production capacity of 2.6 million tons. Of this total, over 1 million is produced in Singapore, the same amount in Rotterdam and the rest in Porvoo, Finland. By eliminating bottlenecks, this total capacity will be increased to 3 million tons by 2020. In addition to producing renewable diesel, the refineries are able to produce renewable aviation fuel and raw materials for various biochemical uses.

Click here for more information.

Other Fuel

DHL to offer biofuel shipping option



Pexels

As part of its efforts to green its supply chain and reduce emissions, DHL Global Forwarding is offering its customers the opportunity to select next generation marine biofuels rather than fossil fuels for their transports by sea.

DHL Global Forwarding has teamed up with the GoodShipping Program, a global initiative which is looking to "decarbonize" the container shipping industry by changing the marine fuel mix.

The new service will be available to DHL Global Forwarding's customers in early 2018.

Click here for more information.

Aviation only viable sector for "E-Fuels"

Pixabay

Liquid E-fuels made from renewable power, the latest buzzword among proponents of alternative fuels, are not the answer to Europe's quest to decarbonise transport because their production is still inefficient and costly, according to a new study being published.

However, the study by consultancy Cerulogy, suggests that liquid E-fuels, although not really suitable to power Europe's road fleet, could supply part of aviation's fuel needs.

As the European Union seeks to reduce global warming emissions following the Paris Agreement, decarbonising the transport sector, which generates a quarter of Europe's greenhouse gas emissions, will continue to be particularly challenging.

E-fuel involves taking electrons from electricity and putting them into a liquid form that can then be used in an internal combustion engine. The idea is that by using renewable electricity in the process, the end result can be much cleaner than fossil fuel.

Biofuels, another alternative, have become controversial because emissions from land use change are not adequately accounted for in the current legal framework.

In this context, there is now renewed interest in 'renewable electrofuels', produced when electricity is used to break down water into oxygen and hydrogen. The latter is then synthesised with

carbon from CO2 to produce more complex hydrocarbons that can be used as a drop-in replacement for diesel or petrol in existing car engines.

However, the study points out that the full process from electricity to synthetic fuel has never been demonstrated at commercial scale, although many of the technological steps are already widely used. Furthermore, drop-in electrofuel production is not as energy efficient as direct supply of electricity for electric drive vehicles, it said.

Therefore, despite its low environmental risk, the cost of production remains prohibitive, as it is higher than the price of fossil alternatives.

Click here for more information.

UPS increases biogas fuel use

US-headquartered package delivery company UPS announced an agreement with Big Ox Energy (a wholly- owned subsidiary of Environmental Energy Capital) to purchase 10 million-gallon equivalents of biomethane, also known as renewable natural gas (RNG) per year.

This is the largest investment in RNG to date for the company, and the agreement runs through 2024.

Use of RNG yields up to a 90% reduction in lifecycle greenhouse gas emissions when compared to conventional diesel.

In addition to the agreement with Big Ox, UPS signed a five-year agreement earlier this year with AMP energy for 1.5 million-gallon equivalents of RNG per year from the Fair Oaks dairy farm in Indiana.

The RNG agreements will help UPS reach a key sustainability goal: 40% of all ground transportation fleet fuel from sources other than conventional gasoline and diesel by 2025.

Click here for more information.

ETI reports on emissions of biogas vehicles

ETI has published a report that presents the results of a comprehensive modelling exercise of natural gas Well-to-Motion (WTM) pathways relevant for heavy duty vehicles, to understand the impact on Green House Gas (GHG) emissions of natural gas vehicles forming part of the HDV fleet in the UK. The findings of the report can be found here.

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.

We hope you will consider participating and join us at the GBS2018 in Berlin.

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.

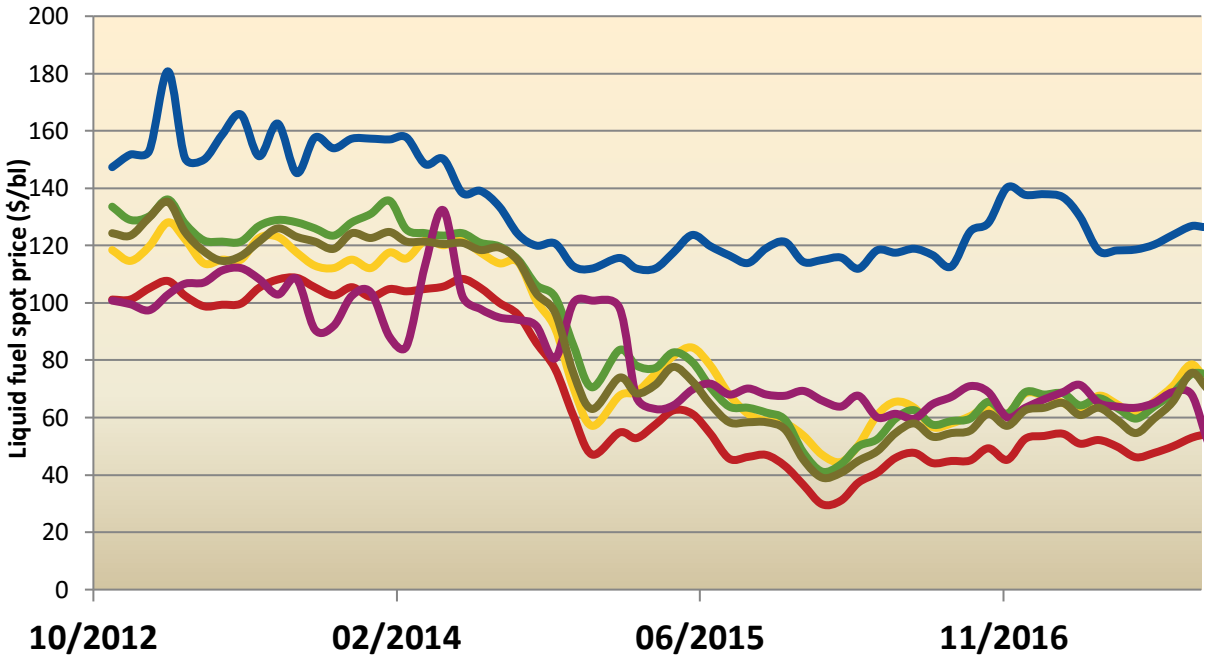
The conference will provide a forum for leading political, corporate, academic and financial people to discuss recent developments and set up collaborations.

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 November 2014 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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