

The Bioeconomy Consultants

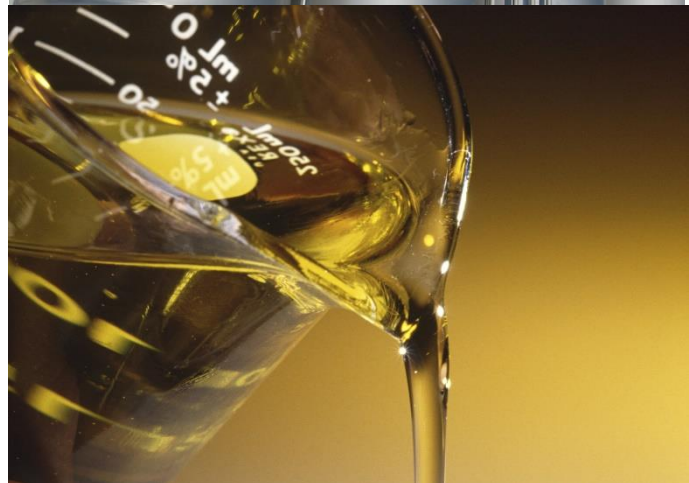
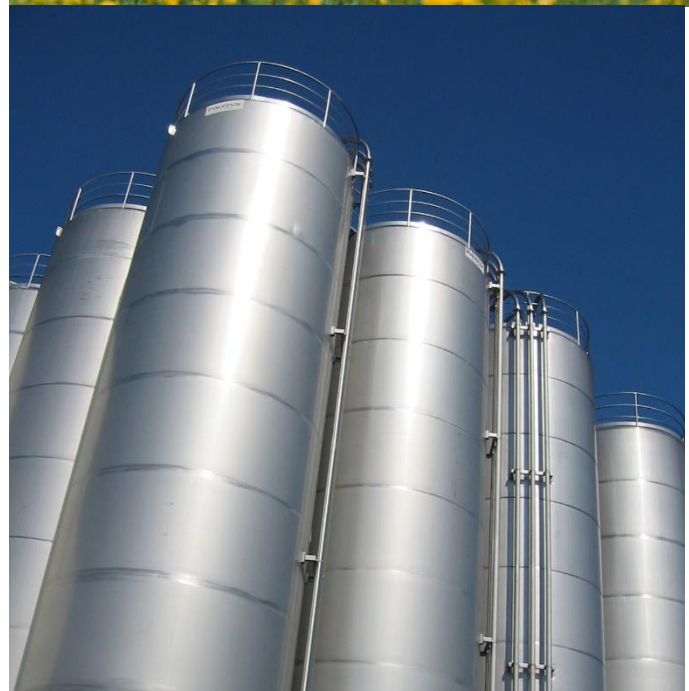


## News Review

Issue Fifty-Nine

February 2017

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



# Contents

Policy.....	4
Markets.....	4
Research & Development.....	6
Bioethanol.....	9
Biodiesel.....	10
Aviation Fuel.....	11
Other Fuels.....	12
Price Information.....	14

# Foreword

A warm welcome to February's issue of NNFCC's Biofuels news review.

Firstly, congratulations need to go to Global Bioenergies, who have become the first company in the world to produce Ethyl tert-butyl ether from 100% sustainable resources. This is a landmark achievement for biofuels, as it could pave the way for greater biofuel content in gasoline, allowing manufacturers to bypass the "blend wall" that limits the amount of biofuel permitted in fuel mixtures, without needing to wait for changes in regulations.

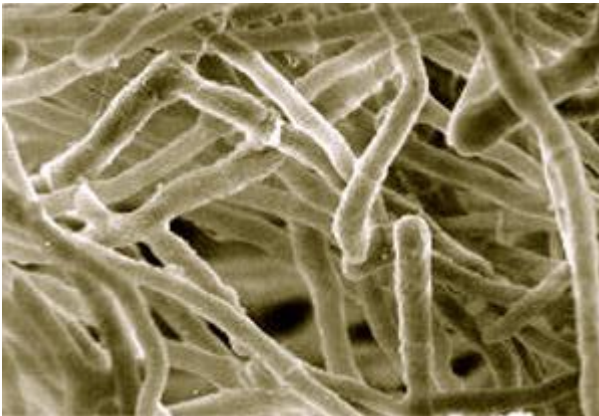
Elsewhere we find advanced biofuels dictating the news. A report by Lux research has indicated that future growth in the biofuels sector is going to be driven by a sharp increase in demand for advanced biofuels; with several possible sources found in this month's news. Here in the UK we have seen Bio-bean enter a partnership with Caffè Nero to produce biodiesel from waste coffee beans, while across the North Sea in Finland, Neste spent their Christmas collecting waste ham fat from people's Christmas dinners to produce biodiesel and UPM continues its pioneering work in producing drop in biodiesel from waste products in the paper industry. The former case is doubly good, as Neste have donated all of their profits from the ham-fat-based biofuels to charity.

Lastly, after we have had the meat of the news there is an interesting development in algal biofuels, as researchers at Syracuse University in New York have developed a gel in which to grow algae. This gel removes all of the common problems of growing algae, including the algae themselves limiting light access, and the need for continual stirring. The remarkable gel also facilitates the algae to grow to increased levels of biomass thanks to the clusters they grow in, and through only small changes in temperature, can be reduced to a solution in order to make harvesting the algae easy. It will be interesting to follow this material's development in order to see if it takes off in the algal biofuels industry.

Read on for the latest biofuels news.

# Policy

## Biofuel-producing fungus declared nontoxic



Wikimedia Commons

The Canadian Department of the Environment and the Department of Health has published in the Canada Gazette the draft screening assessment of the commercially relevant fungus, *Trichoderma reesei*, stating that the organism is nontoxic and does not require regulatory action under Section 77 of the Canadian Environmental Protection Act (CEPA). Following a screening assessment, *Trichoderma reesei*, which is used to convert biomass to biofuels and sugars and to produce food and health products, was found to not meet the criteria set out in CEPA Section 64 since the amount entering the environment does not pose a risk to human health. Options are being considered, however, for follow-up activities to track changes in the commercial use of and exposure to *Trichoderma reesei*.

Click [here](#) for more information.

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## UK Government announces RTFO Year 8 Statistics

The UK government has published the statistics for the 8th year of the Renewable Transport Fuel Obligation (RTFO). The key findings include:

aggregate GHG savings compared to fossil fuels of 74% (reduced to 68% if indirect land use change is taken into account), the most widely reported source for bioethanol (by feedstock and country of origin) was wheat from the UK (135 million litres, 9% of total fuel, 17% of bioethanol), no palm oil has been used for biodiesel made or sold in the UK during the reporting year and only 6 million litres of oilseed rape based biodiesel (0.01% of total fuel) and 1 million litres of soy based biodiesel (0.002)% of total fuel) have been sold in the UK (none has been made in the UK).

Click [here](#) for more information.

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# Markets

## Advanced biofuels to drive future market growth

Global biofuel capacity is projected to grow to 67.2 billion gallons per year (BGY) in 2022, with first-generation biofuels continuing to dominate – albeit at a much slower pace than before. In the next six years, a shift in technologies for new capacity expansion targeting non-food crop-based feedstocks and advanced biofuels will drive industry growth. Emerging thermochemical and catalytic technologies surpass bioconversion processes to make up over half of new capacity deployment for the first time in the biofuel industry's history. Technologies like hydrotreatment and gasification will drive long-term growth and outcompete others for feedstock supply and fuel market share. A new era of technology commercialization brings the global biofuels industry to the cusp of a tipping point set to alter the future biofuels landscape as new facilities target low-carbon and high-performance drop-in biofuels.

Click [here](#) for more information.

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## Gevo to supply isooctane to HCS

US advanced biofuels company Gevo Inc. has announced that it has entered into a Letter of Intent (LOI) with HCS Holding GmbH (HCS) to supply isooctane under a five-year offtake agreement. HCS is a manufacturer of specialty products and solutions in the hydrocarbons sector, operating under the brands Haltermann Carless, ETS Racing Fuels and EOS. HCS is owned by HIG Capital. Haltermann Carless, one of the oldest companies in the world of chemistry, is expected to be the direct customer with Gevo under the proposed offtake agreement.

The LOI contemplates an offtake agreement that will have two phases. In the first phase, HCS will purchase isooctane produced at Gevo's demonstration hydrocarbons plant located in Silsbee, Texas. This first phase is expected to commence in 2017 and would continue until completion of Gevo's future, large-scale commercial hydrocarbon plant, which is likely to be built at Gevo's existing isobutanol production facility located in Luverne, Minnesota. Gevo expects revenue in the range of \$2-3 million per year from the first phase.

In the second phase, HCS will agree to purchase approximately 300,000 to 400,000 gallons of isooctane per year under a five-year offtake agreement. Gevo would supply this isooctane from its first large-scale commercial hydrocarbons facility, which is likely to be built at Gevo's existing isobutanol production facility located in Luverne, Minnesota. The LOI establishes a selling price that is expected to allow for an appropriate level of return on the capital required to build out Gevo's existing production facility in Luverne, Minnesota.

It is the intent of Gevo and HCS to establish further offtake arrangements for other products such as Gevo's alcohol-to-jet fuel (ATJ) and isobutanol. HCS is expected to market and distribute Gevo's products globally on a non-exclusive basis.

Click [here](#) for more information.

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## CropEnergies announces greater-than-expected profits



*CropEnergies*

CropEnergies AG, Mannheim, has once more increased its forecast for the current financial year 2016/17. The main reasons for the better earnings situation are the spot prices for bioethanol which continue to be significantly higher than the previously expected forward prices, as well as the high capacity utilization in all four production plants. With this, CropEnergies strengthens its position as the leading bioethanol producer in the EU. For the full financial year 2016/17, CropEnergies now expects revenues of EUR 800 to EUR 810 (previously expected: EUR 760 to EUR 790, previous year: EUR 723) million. Operating profit is to reach EUR 95 to EUR 100 (previously expected: EUR 70 to EUR 85, previous year: EUR 87) million. At the same time, CropEnergies expects a record EBITDA of approximately EUR 130 to EUR 135 (previous year: EUR 122) million.

The business performance in the coming financial year 2017/18 will again be largely dependent on the volatile developments of the prices on bioethanol markets. The forward prices for bioethanol in Europe currently show a significant reduction for the financial year 2017/18, though they have only limited significance. Against this background and on the basis of current grain prices, CropEnergies expects a normalization of the operating profit for the financial year 2017/18 to a range of EUR 40 to EUR 80 million. This corresponds to an EBITDA between EUR 80 and EUR 120 million. Consequently, CropEnergies should be completely debt-free for the first time in company history.

Click [here](#) for more information.



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# Research & Development

## 3D printed polymers converts methane to methanol

Scientists from Lawrence Livermore National Laboratory have combined biology and 3-D printing to create the first reactor that can continuously produce methanol from methane at room temperature and pressure. The team removed enzymes from methanotrophs — bacteria that metabolize methane — and mixed them with polymers that were printed or moulded into innovative reactors. Remarkably, the enzymes retain up to 100% activity in the polymer, according to Sarah Baker, LLNL chemist and project lead. The printed enzyme-embedded polymer is highly flexible for future development and should be useful in a wide range of applications, especially those involving gas-liquid reactions. The research, which could lead to more efficient conversion of methane-to-energy production, was described in a recent issue of Nature Communications.

Click [here](#) for more information.

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## POET-DSM to manufacture enzymes at bioethanol plant

POET-DSM Advanced Biofuels will build an on-site enzyme manufacturing (OSM) facility in Emmetsburg, Iowa, pending state and local approvals.

The facility will be integrated into the Project Liberty technology package, replicable in future facilities. For Project Liberty, the OSM will directly pipe enzymes into the Liberty production process without requiring downstream processing,

stabilizers and other chemicals required for enzyme transportation.

New enzymes developed by DSM are also expected to improve effectiveness of the enzyme mix, further reducing costs for the process. CRB has been awarded the contract for the design, engineering and construction management. Basic engineering is complete, and construction is expected to begin in late spring or early summer.

Project Liberty is a cellulosic ethanol plant that uses corn cobs, leaves, husk and some stalk to produce renewable biofuel. Over the last 18 months, significant design improvements have been made to the plant and further investments to improve yields and make the process more consistent and reliable. The facility is producing at a rate of 70 gallons per bone-dry ton of biomass, near the target conversion rate, and is currently in a ramp-up phase.

Click [here](#) for more information.

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## Biodiesel from waste coffee beans



*Pixabay*

The London Evening Standard reports that Caffè Nero has become the first major high street coffee brand to devise a scheme where recycling vans pick up used beans to be converted into fuel for homes and cars.

The brand is working with bio-bean — a firm developing technology to turn used beans into biofuels. It says one tonne of waste coffee

grounds can create 245 litres of biodiesel, enough to fill four cars.

Caffè Nero is working with London-based recycling firm First Mile to deliver the scheme, launched last July.

Baristas load used coffee grounds into special sacks for First Mile, which runs 65 trucks across the capital, to collect every night.

Click [here](#) for more information.

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## Global Bioenergies produces Renewable ETBE

In a historic first, Global Bioenergies has announced the production of ETBE purely from renewable resources. The breakthrough heralds a new opportunity for increasing the proportion of biofuels in gasoline.

Current standards limit the inclusion of traditional biofuels because of their physical and chemical properties. For example, the French standard caps ethanol content at 5% in 95-octane and 98-octane unleaded gasoline, and at 10% in unleaded 95-E10 gasoline.

The majority of countries in the world impose this type of limit – commonly known as the "blend wall", but if biofuels are to become more widely used in the future, this limit will have to be addressed. Global Bioenergies offers a new method for getting beyond the blend wall: fully renewable ETBE.

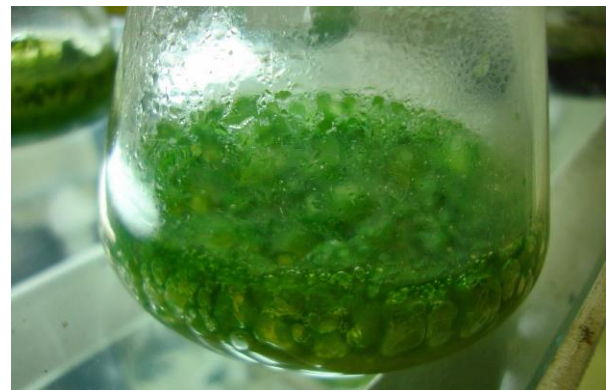
Historically, partially renewable ETBE (ethyl-tert-butyl ether) is obtained by combining a molecule of renewable ethanol with a molecule of fossil isobutene using a simple and proven process. It is used as an additive in vehicle fuel, up to a maximum of 23%. The global market for the product is currently valued at more than €2 billion, or more than 3 million tonnes annually. The innovation consists of using this same process to combine renewable ethanol with renewable isobutene obtained using Global Bioenergies' technology. This purely renewable ETBE holds the

potential for incorporating 2.7 times more renewable energy in gasoline than with traditional biofuels. It will also help to cut greenhouse gas emissions even further.

Click [here](#) for more information.

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## New gel improves effectiveness of growing algae



*Wikimedia Commons*

Microalgae represent a promising source of renewable biomass for the production of biofuels and valuable chemicals. However, energy efficient cultivation and harvesting technologies are necessary to improve economic viability. A Tris-Acetate-Phosphate-Pluronic (TAPP) medium that undergoes a thermoreversible sol-gel transition is developed to efficiently culture and harvest microalgae without affecting the productivity as compared to that in traditional culture in a well-mixed suspension. After seeding microalgae in the TAPP medium in a solution phase at 15 °C, the temperature is increased by 7 °C to induce gelation. Within the gel, microalgae are observed to grow in large clusters rather than as isolated cells. The settling velocity of the microalgal clusters is approximately ten times larger than that of individual cells cultured in typical solution media. Such clusters are easily harvested gravimetrically by decreasing the temperature to bring the medium to a solution phase.

Click [here](#) for more information.

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## UPM to ramp up biofuel production from paper waste



*UPM-Kymmene*

Finnish pulp and paper maker UPM-Kymmene is planning its next step in wood-based renewable fuel products after a successful ramp-up at its initial biofuels plant, the head of UPM's biofuels business said on Wednesday.

UPM says the plant in Lappeenranta is the first in the world of its kind, making biofuel for vehicles and ships from crude tall oil, a residue of wood pulp production that produces significantly lower emissions than traditional fossil diesel.

The plant, which reached break-even late in 2015, improved profitability further in 2016, said Sari Mannonen, the head of UPM's biofuels business.

While biofuels at the moment represent only a small share of sales, UPM - the world's largest maker of graphic papers such as newsprint and magazine paper - is looking to expand the business.

Wood biofuels are one way in which Finland is reviving its forest sector, a major part of its economy long threatened by the shift from paper to digital publishing.

UPM's product is considered as "advanced biofuel" because it's made of the residue of the

pulp production, thus prolonging the lifecycle of raw materials sourced from the forest.

In November, Finland's government proposed to lift the share of biofuels blended in transport fuel to 53 percent by 2030, from the previous 40 percent, as calculated under the EU's "double-counting" method for products based on forest residues.

This means distributors could sell fuel in 2030 which is 70 percent diesel and only 30 percent product from tall oil, and yet still meet the 53 percent renewable target.

Click [here](#) for more information.

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### Enzyme shows potential in cellulose hydrolysis

Glycoside hydrolases (GHs) are key enzymes in the depolymerisation of plant-derived cellulose, a process central to the global carbon cycle and the conversion of plant biomass to fuels and chemicals. A limited number of GH families hydrolyse crystalline cellulose, often by a processive mechanism along the cellulose chain. During cultivation of thermophilic cellulolytic microbial communities, substantial differences were observed in the crystalline cellulose saccharification activities of supernatants recovered from divergent lineages. Comparative community proteomics identified a set of cellulases from a population closely related to actinobacterium *Thermobispora bispora* that were highly abundant in the most active consortium. Among the cellulases from *T. bispora*, the abundance of a GH family 12 (GH12) protein correlated most closely with the changes in crystalline cellulose hydrolysis activity. This result was surprising since GH12 proteins have been predominantly characterized as enzymes active on soluble polysaccharide substrates. Heterologous expression and biochemical characterization of the suite of *T. bispora* hydrolytic cellulases



confirmed that the GH12 protein possessed the highest activity on multiple crystalline cellulose substrates and demonstrated that it hydrolyses cellulose chains by a predominantly random mechanism. This work suggests that the role of GH12 proteins in crystalline cellulose hydrolysis by cellulolytic microbes should be reconsidered.

Click [here](#) for more information.

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# Bioethanol

## Bioethanol helps UK wheat use hit record high



*Pixabay*

The UK's AHDB reports that wheat used by the GB milling industry (including starch and bioethanol) over the first half of the season (Jul-Dec), totalled 3.65Mt, according to latest data published by Defra. This is 10% higher than the same period last season and the highest amount of wheat milled at this point on records going back to 1997. In part this is due to lower quality which means more wheat has to be processed to deliver the same amount of flour, but a more significant reason is the rise in use for bioethanol production.

The start of the season saw the re-opening of Ensus, one of the country's major bioethanol plants, which has boosted demand for wheat in GB.

Breaking down the latest usage information, the amount of 'other flour' produced, which includes starch and bioethanol demand, from July-December 2016 was 949Kt. This is 37% higher compared to the same period last season (691Kt Jul-Dec 2015), and is also the highest amount used during this period on record. In total, human and industrial usage of wheat is forecast to rise by 7% on the year this season to 7.9Mt.

Click [here](#) for more information.

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## Clariant's Cellulosic Ethanol tested by Mercedes Benz

Clariant, a leading global specialty chemicals company, together with Mercedes-Benz and Haltermann Carless, a well-established HCS Group brand, tested the use of sustainable cellulosic ethanol from agricultural residues in a fleet test with Mercedes-Benz series vehicles over a period of 12 months for the first time in Germany. sunliquid® 20 was used for the test – a fuel produced by Haltermann Carless with a cellulosic ethanol content of 20 percent by volume (E20) from Clariant's sunliquid plant in Straubing. The cellulosic ethanol allows greenhouse gas emission savings of up to 95% across the entire value chain without competing with food production or tying up agricultural land.

In the fleet test with Mercedes-Benz vehicles, sunliquid 20 exhibited very good combustion properties with a high degree of efficiency and identical consumption compared to today's standard E10 fuel. Due to the slightly lower energy density of E20 compared to E10, slightly higher fuel consumption was expected under the same operating conditions. The tests performed under laboratory conditions demonstrated variability in the consumption analysis in which additional consumption between 0 and 3 percent was observed.

In addition to the proven performance, an improvement in particle count emissions by around 50 percent was measured for sunliquid 20

versus the EU reference fuel Euro 5. The tests have confirmed the positive properties of the sunliquid 20 fuel.

The 20 percent cellulosic ethanol by volume has another decisive advantage. In addition to the higher CO<sub>2</sub> savings and reduced emissions, it gives the fuel a significantly higher octane number (RON) of over 100. With a widespread introduction of E20, engines could be adapted in the future so that the quality advantage of the fuel could be used to improve engine efficiency and thus further reduce fuel consumption and CO<sub>2</sub> emissions.

The cellulosic ethanol portion comes from Clariant's sunliquid precommercial plant in Straubing, where approximately 4,500 tons of agricultural residues such as cereal straw or corn stover are converted into cellulosic ethanol each year. At the Haltermann Carless production site in Hamburg, the bioethanol is mixed with selected components to form the innovative fuel whose specifications represent the potential for the quality of E20 fuel in Europe.

Click [here](#) for more information.

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## Biodiesel

### **Velocys enters partnership with ThermoChem for BTL**

Velocys plc (VLS.L), the company at the forefront of smaller scale gas-to-liquids (GTL), is pleased to announce that it has signed a memorandum of understanding (MoU) with ThermoChem Recovery International, Inc. (TRI), establishing a strategic alliance. TRI will be Velocys' preferred supplier of gasification systems for its biomass-to-liquids (BTL) plants. The agreement will see the alliance partners rapidly deploy an integrated biorefinery offering that combines Velocys' Fischer-Tropsch (FT) technology with TRI's proven gasification technology.

TRI is a leading provider of steam reforming gasification systems suitable for woody biomass and other waste feedstocks. TRI's multi-feedstock demonstration plant in Durham, North Carolina has run for over 10,000 hours, and has successfully shown that the syngas it produces is well-suited to the FT process and upgrading to ASTM-certified fuels. Moreover, its systems have been selected for and deployed on various commercial North American projects including to Norampac, a division of Cascades Paper, at its Trenton facility in Ontario.

The partners have already started a joint development of the engineering design for a 1,400 barrel per day BTL plant to produce renewable diesel and jet fuels from woody biomass. TRI will support Velocys and its partners to further optimise overall plant cost and the financing of BTL plants through, for example, accessing governmental loan guarantee processes and securing independent engineering reviews.

A key next step will be an integrated technology demonstration; Velocys will relocate its skid-mounted pilot plant from Ohio to the TRI facility in North Carolina. The joint demonstration has been selected for support as part of a competitive award granted by the US Department of Energy for the development of smaller scale integrated biorefineries.

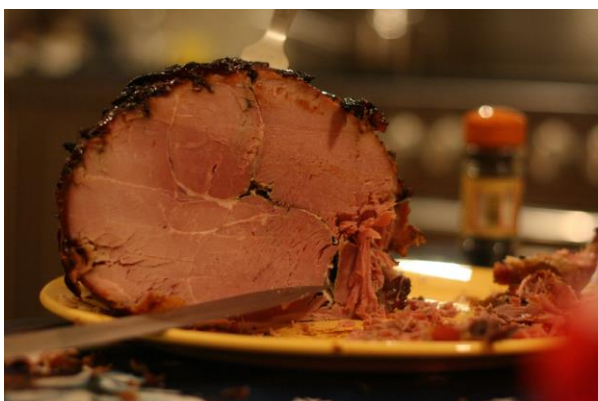
The agreement is not exclusive on either party. The Company expects the terms of the MoU to be reflected in legally-binding documentation within the coming months.

This is the second strategic partnership that has been agreed since a review of Velocys' strategy was completed in 4Q 2016. A core theme of the new strategy is to deliver, jointly with partners such as TRI, a "one-stop-shop" offer to customers - a fully integrated and financed, cost effective and operations-ready plant solution.

Click [here](#) for more information.

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## Biodiesel from ham fat for charity



*Flickr*

Last Christmas, 40,000 Finnish households donated the waste fat from their Christmas hams to the charity campaign "Kinkkutemppu" which literally translates into Ham Trick. From this waste ham fat, Neste produced 10,000 litres of Neste MY Renewable Diesel at its Porvoo refinery for sale at Neste stations. Neste donates the value of the product to Hope, an association which helps low-income families, and to Icehearts, a sports club which aims to prevent social exclusion and promote well-being.

The idea for the campaign started from the Chemical Industry Federation of Finland and attracted a number of companies and associations. Fat recycling containers were placed all over Finland, mainly at recycling points of Finnish Packaging Recycling RINKI located in conjunction with selected K-food stores. Lassila & Tikanoja then transported the fat to Honkajoki Oy for treatment. Neste uses the collected ham fat to produce Neste MY Renewable Diesel at its Porvoo refinery. The Finnish Water Utilities Association took part in the campaign reminding us not to pour ham fat down the drain. The task of the Rural Women's Advisory Organisation was to communicate to households the possibility of recycling ham fat.

Compared to conventional fossil diesel, Neste MY Renewable Diesel has up to 90% lower greenhouse gas emissions during the life cycle of the fuel.

Click [here](#) for more information.

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# Aviation Fuel

## Waste plastic fuelled plane makes maiden flight

Jeremy Roswell, a UK-based pilot and environmentalist, has made history by flying a light aircraft more than 500 miles from Sydney to Melbourne, Australia, using fuel made from plastic waste.

Conventional fuel was blended with 10% of fuel made from end-of-life plastic waste. UK-headquartered firm Plastic Energy manufactures the fuel.

The main aim of the 'On Wings of Waste' (OWOW), Jet A1 flight was to raise awareness about end-of-life plastic waste in the world's oceans and to highlight its potential benefits as a new source of fuel.

Dubbed the "10% solution" the "On Wings of Waste" team's campaign to inspire people to recycle plastic waste has taken four years to get off the ground.

The four-stage proposition is: recycle – persuading the public to support for a recycling; re-use – transforming fuel from plastic waste to be blended with Jet A1; re-fuel – airlines adopting a 10% blend of fuel derived from plastic waste, and rescue – pollution of the world's oceans is slowed down and eventually halted.

Click [here](#) for more information.

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## Hong Kong's Cathay airlines to trial biofuels



# CATHAY PACIFIC

*Cathay Pacific*

Hong Kong flag carrier Cathay Pacific will switch to biofuels made from landfill rubbish on select long haul flights in an effort to cut harmful emissions.

Cathay flights to Hong Kong from the US, where the new fuel is produced, will use a combination of conventional jet fuel and biofuels starting in 2019, the South China Morning Post reported.

The airline hopes to cut emissions on those flights by 80 percent.

The carrier had invested in the US-based sustainable biofuel developer Fulcrum BioEnergy, which converts municipal solid waste into aviation fuel, in 2014.

Cathay and other airlines have also been facing volatile oil prices.

The company has suffered huge hedging losses in the first half of last year as the price of oil plunged from its peak.

Oil hedging is when an airline locks in price of fuel—a huge chunk of most airlines' outlay costs—at a pre-determined level for a certain amount of time.

In the first six months, Cathay recorded hedging losses at HK\$4.49 billion (\$578.8 million), and saw its net profit drop 82 percent from a year earlier to HK\$353 million.

Cathay shares plunged in October after it said it did not expect business to improve in the second half of 2016, citing competition and overcapacity.

In 2015, China's Hainan Airlines flew from Shanghai to Beijing in the country's first

commercial flight using biofuel made from cooking oil.

The Boeing 737 plane used a 50-50 mix of conventional jet fuel and biofuel made from waste cooking oil collected from restaurants in China.

Australia's Qantas and Air Canada have both tested biofuel on commercial flights.

Click [here](#) for more information.

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## Other Fuels

### Kroger to retail Green Biologics' newly acquired GreenFlame

US' largest grocery retailer by revenue signs on to offer Green Biologics' first high performance, bio-based product for consumers

Green Biologics, Inc., the U.S. subsidiary of Green Biologics Ltd., a U.K. industrial biotechnology and renewable chemicals company, has announced the acquisition of the GreenFlame™ brand and the associated intellectual property. GreenFlame™ is a USDA BioPreferred® certified, natural, clean burning fuel with a range of potential end uses, from charcoal lighter fluid to torch & camping fuels, and food warming products. Kroger, the largest grocery retailer by revenue in the United States, will serve as Green Biologics' first retail partner for the GreenFlame™ charcoal lighter fluid.

Kroger, which has stores in 35 states, has set a number of commendable sustainability and responsible sourcing goals. Kroger's decision to offer the GreenFlame™ charcoal lighter fluid to shoppers is yet another proof point of the retailer's commitment to its mantra of "improving today to protect tomorrow."

GreenFlame™ combines a natural formula with equivalent performance to traditional petroleum-based products. The acquisition of this patented technology supports Green Biologics' strategy to utilize its 100 percent bio-based specialty

chemicals platform to develop performance-based formulated products for high-value consumer applications.

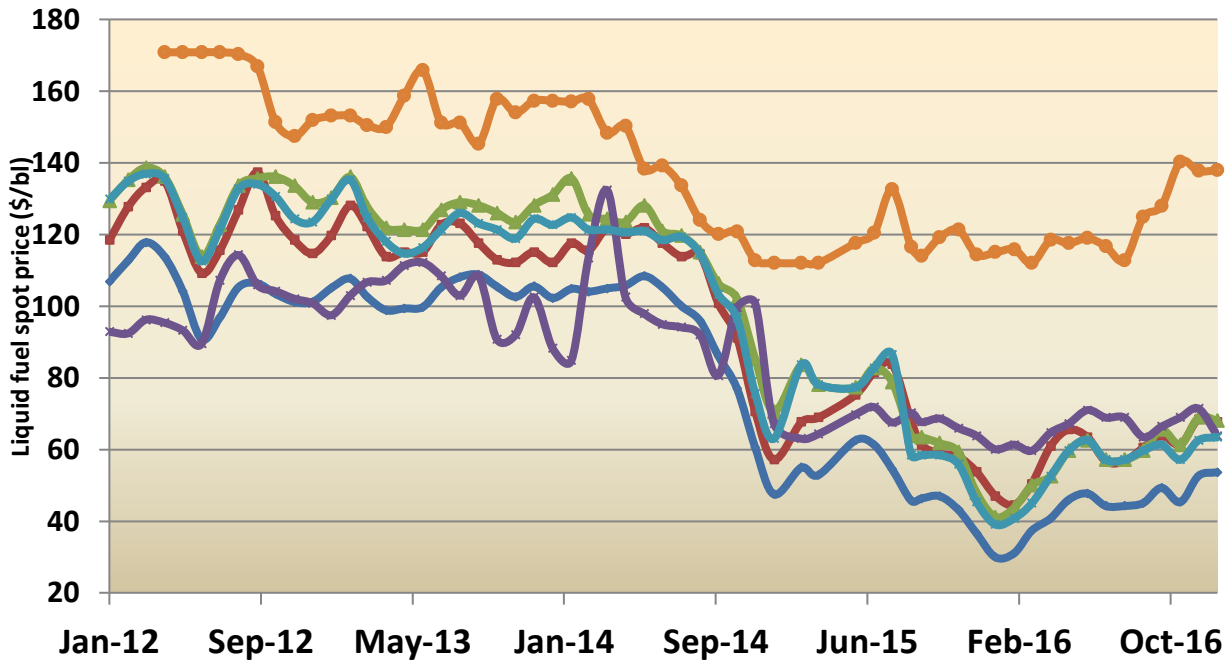
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# Price Information

Historical spot prices of liquid fossil fuels and liquid biofuels. Five years prices 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](http://www.indexmundi.com); Price of ethanol from [www.neo.ne.gov](http://www.neo.ne.gov); Biodiesel spot prices from <http://www.kingsman.com>

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