Commercializing Conventional and Advanced Liquid Biofuels from Biomass

Task 39
IEA Bioenergy

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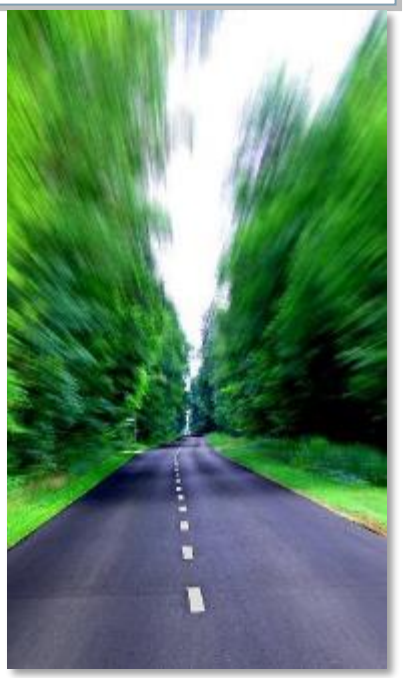

From the Task

By Susan van Dyk, Jack Saddler and Jim McMillan

Since the publication of our last Newsletter, IEA Bioenergy Task 39 has continued its work in promoting the commercialization of sustainable, low carbon liquid biofuels from biomass.

IEA Bioenergy Task 39 held its second business meeting of 2017 in Brussels 25-26 September (see photo of delegates below). This well-attended meeting was generously hosted by European Commission (EC) IEA Bioenergy ExCo member Kyriakos Maniatis at the EC's meeting rooms. Twenty-six attendees comprising Task 39 members and visiting guests took part in an interesting and valuable two days of presentations and discussions about liquid biofuels developments around the globe.

This meeting was significantly enhanced by the participation of a highly distinguished visitor/observer delegation, which included representatives from India and China as well as from the Renewable Energy Group (REG), a large North American-based FAME biodiesel and HVO/renewable diesel producer, and $(S\&T)^2$ Consultants, a Canadian life cycle analysis (LCA) modeling consultancy. Indian delegates included Mr. Sandeep Poundrik (Joint Secretary, Ministry of Petroleum and Natural Gas), Dr. Y.B. Ramakrishna (Chair, Biofuels Working Group, Ministry of Petroleum and Natural Gas) and Dr. Arvind Lali (DBT-ICT, Biofuels Advisor to Ministry of Science and Technology). Dr. Huili Zhang (Professor, Beijing University of Chemical Technology) represented China. Matt Herman (US) and Michael Fiedler-Panajotopoulos (Germany) represented REG, and Don O'Connor (Canada) attended on behalf of $(S\&T)^2$ Consultants.

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Image Source: esf.edu.com

The Brussels Task 39 business meeting especially benefited from the participation of REG and $(S\&T)^2$ Consultants representatives during discussions on scoping Phase 2 of the task's on-going LCA model comparison project (in which leading LCA models -- GHGenius for Canada, GREET for US, and BioGrace for EU – are being assessed and harmonized). One related topic discussed at length during the meeting is the accuracy and usefulness of biofuels' LCAs, which vary widely but remain the *de facto* standard for assessing biofuels sustainability as well as for categorizing biofuels from a policy standpoint. Greater harmonization among and confidence in/validation of LCA models is crucial and critically needed. Groups such as REG, $(S\&T)^2$ Consultants, the California Air Resources Board (CARB), as well as LCA expertise within Task 39 membership, are agreed that the public and policy makers need to be confident in the accuracy of LCA models being used to assess the sustainability attributes of conventional and advanced biofuels.

Brussels Task 39 meeting attendees (left to right): Jacopo Giuntoli, Johan van Doesum, Claus Felby, Timo Gerlagh, Arvind Lali, Shiro Saka, Sandeep Poundrik, Jin Suk Lee, Y.B. Ramakrishna, Don O'Connor, Jim McMillan, Ian Suckling, Thomas Ekbom, Dina Bacovsky, Leif Jönsson, Jack Saddler, Michael Persson, Huili Zhang, Antonio Bonomi, Steve Rogers, Satoshi Aramaki, Adam Brown, Matt Herman, Luc Pelkmans (not shown: Kyriakos Maniatis, Michael Fiedler-Panajotopoulos, Michael Seiffert and Caroline Verduin).

After the task meeting, many attendees also participated in the EC-organized 6th *International Conference on Lignocellulosic Ethanol* (6ICLE) held in Brussels 27-28 September. Thanks again to Kyriakos Maniatis and his EC colleagues for organizing another informative ICLE meeting.

Task 39 will hold its first business meeting of 2018 in Beijing, China on April 7-8.

We welcome your feedback. Please direct your comments to Susan van Dyk

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The country reports made at the Brussels meeting included China and India and these presentations were one of the meeting highlights, as each of these countries has recently announced stepped up domestic biofuels programs. Besides discussing how best to scope Phase 2 of the LCA model comparison study, we also reviewed the status of Task 39 commissioned reports nearing completion, which included a final draft report describing the opportunities for biofuels in marine shipping applications and another earlier draft report surveying advanced fuels for advanced engines. The Biofuels for the Marine Shipping Sector report has since been finalized and is now posted on the Task 39 website. This report is timely as increasingly stringent sulfur regulations by the International Maritime Organisation (IMO) suggest that biofuels will need to play a key role in decarbonizing the shipping industry. (Read more). The report on Advanced Biofuels for Advanced Engines is under final review and is expected to become publicly available for download from the task's website in mid 2018.

Since the last Newsletter published, there have been a number of interesting biofuels developments around the world, both favorable and unfavorable, as summarized in the News section. Several new important reports have also been released, including:

- A summary of the IEA Bioenergy Sustainability Inter-Task workshop held in Gothenburg, Sweden in May 2017 has been published and is now available at the IEA Bioenergy website (*Sustainability of bioenergy supply chains* workshop summary).
- The International Energy Agency released its Technology Roadmap: Delivering Sustainable Bioenergy, which states that biofuels consumption in the transport sector must triple by 2030 to meet obligations to keep the global temperature rise below 2°C. While it calls for a massive increase in production of advanced or second generation biofuels, it also notes that production of conventional crop-based biofuels will also have to rise. It emphasizes that the desirability of biofuels should be "based on the actual GHG performance of specific routes from feedstock to energy, rather than a classification based on feedstocks or technologies."
- The International Energy Agency also published its World Energy Outlook 2017, which gives an overview of shifts occurring in the global energy system, including the rapid deployment and falling costs of clean energy technologies, the growing electrification of energy, the transition to more services-oriented economies and an ever-cleaner energy mix in China, and the resilience and global impact of shale gas and tight oil production in the United States. (Access the summary here.)

The task continues to actively follow and support the development of biofuels for aviation, an area where significant industry engagement is happening. The continued use of aviation biofuels (biojet) is tracked on the International Civil Aviation Organisation's (ICAO) Global Framework for Aviation Alternative Fuels website and impressively to date 100,000 commercial flights have used some proportion of biojet fuels. While only one commercial facility, AltAir, regularly produces biojet fuels, five pathways to biojet fuels have been certified under ASTM with more expected to be certified in the future. Gevo's isobutanol-to-jet fuel biojet product is now being used at Chicago O'Hare airport as part of the airport hydrant system, and this is likely to become more widely replicated as more biojet fuel projects make progress in breaking down the cost barriers to increased production and use of biojet fuels. The Chinese airline, Hainan Airways, announced its first flight using biojet produced from used cooking oil, while Qantas announced an investment in Agrisoma, a promising lipid feedstock for sustainable biojet fuel development.

This Newsletter's feature article gives some perspectives on opportunities for biofuels development in Sub-Saharan Africa, highlighting some of the considerations for biofuels development on the continent from a South African perspective. We thank Emile van Zyl of Stellenbosch University and Brett Pletschke of Rhodes University for their contributions to this article.

We always appreciate your input and feedback. Please send us by email any ideas or suggestions for increasing the value of this newsletter. Happy holidays, and thanks for reading and participating in the IEA Bioenergy Task 39 network.

Jim, Jack and Susan

Perspectives on Biofuels in Sub-Saharan Africa

Susan van Dyk, Emile van Zyl, Brett Pletschke

Introduction

This short contribution provides some perspectives on opportunities for biofuel production on the African continent. Africa has a large land base, with only 27% of its arable land currently utilised. High level assessments, such as by the International Renewable Energy Agency (IRENA) in 2017, carried out to estimate the potential for biofuel production based on lignocellulosic feedstocks, are favorable. IRENA's 2017 report, is entitled "Biofuels potential in Sub-Saharan Africa," and, to paraphrase, it estimates the amounts of feedstocks that could be grown, collected and converted to liquid biofuels across Africa. Its main focus is on lignocellulosic feedstocks that could be grown in an environmentally, socially and economically sustainable fashion, without conflicting with food supplies or causing land use change that could release carbon into the atmosphere and contribute to global warming. This report concludes that "*considerable sustainable resource potential exists for liquid biofuels in sub-Saharan Africa*." Three approaches to expanding biomass feedstocks hold particular promise. One is to collect more of the available residues from food crops and forest products. Another is to plant high-yielding trees and grasses on land made available through more intensive cultivation of farmland, achieving yields beyond those needed to supply projected food needs. A third approach is to plant bioenergy crops on land freed up by reduced waste and losses in the food chain, which can obviate the need to grow food no longer lost or wasted.

However, most of the advanced technologies for biofuel production from lignocellulosic feedstocks have not reached commercial scale and many are still in relatively early stages of development. Although the report acknowledges "*limited technological readiness*" in the majority of African countries, South Africa is excluded from this concern as it already has implemented advanced technologies; presumably, this refers to the ability to use gasification and Fischer-Tropsch (FT) synthesis to produce liquid fuels from coal. Thus, the report seems to assume that gasification-FT technology used for coal feedstocks can easily be transferred to the making of biofuels from biomass feedstocks, notwithstanding the fact that it has not yet reached commercial scale based on lignocellulosic biomass due to the added complexity introduced by such feedstocks.

The report also posits that, "*African countries all have a fair amount of experience with refining conventional biofuels from starch- and sugar-based feedstocks. This should facilitate their adoption of lignocellulosic processes that are being demonstrated elsewhere. Meanwhile, they can develop lignocellulosic feedstocks to supply industrial process heat and power*." (IRENA, 2017). This is clearly an overly optimistic vision that indicates a lack of understanding of the difficulty of developing and proving out advanced technologies to the point they are mature as well as the challenge of raising the capital investment required to construct such production facilities. It also seems to ignore the large role played by traditional bioenergy (woodfired cooking) and the resulting competition for lignocellulosic feedstocks.

The ongoing difficulty experienced by the pioneer cellulosic ethanol producers, including recent closures of several facilities (Abengoa and DuPont in US and Beta Renewables in Italy), highlight the complexity of dealing with lignocellulosic feedstocks and the relatively high cost of infrastructure and conversion technologies (such as enzymes) and supply chains (Lynd et al. 2017) they require.

Occasionally, we read about the latest "miracle" feedstock from Africa that can be grown on marginal lands at high yields with few inputs that will transform biofuel production, e.g. jatropha (Von Maltitz et al., 2014) and more

recently, croton nuts[1]. Jatropha has yet to live up to the high expectations touted when it was the new miracle feedstock; worldwide many projects based on this feedstock have been terminated.

We believe Africa presents unique circumstances and considerations which have to be taken into account when discussing biofuel development opportunities on this continent. A "one-size-fits-all" approach, that may have worked in the USA or EU, is not guaranteed to be successful. Without trying to present a comprehensive analysis, we would like to provide some food for thought on this issue. (The reference list provides further reading material for those who would like to delve deeper into this.)

Some of the key points we to consider include:

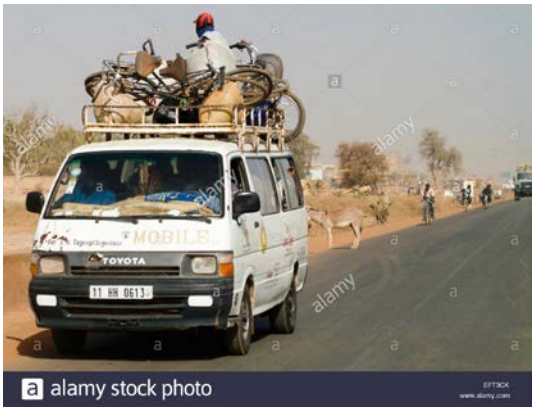
- Lignocellulosic based biofuels are not yet at commercial scale and many will still take years to develop in industrialised countries, let alone in developing countries. Several factors should be considered in the African context that will make biofuels development more complicated and more expensive – "*poor infrastructure, weak national agricultural research systems, high import costs on equipment and inputs, and an often unfavorable business environment"* (Mitchell, 2011). With the ongoing low price of petroleum, advanced technologies are finding it difficult to be economically competitive, even in countries with optimal conditions with respect to policies, investment, etc.
- Much of Africa still relies on traditional bioenergy, i.e., using lignocellulosic biomass for cooking and heating. Until there is a transition to modern bioenergy, e.g. more efficient cooking stoves, competition will exist between traditional bioenergy and advanced biofuels for lignocellulosic feedstock. According to the IEA, bioenergy will remain the biggest source of renewable energy to 2040, and even then it estimates there will still be 700 million people using inefficient cooking methods relying on lignocellulosic feedstocks (IEA, 2017).
- One of the key drivers for biofuel development in Africa is rural development and job creation. In this context, a food AND fuel approach could play a role in development of agriculture with potential waste products (such as molasses) useful as feedstocks for biofuel production. Agricultural feedstocks that could support rural energy needs (off-setting costs of importing fossil fuels), poverty alleviation and provide additional income to farmers, while producing food, can be a win-win situation.
- Sugarcane production is highly energy efficient and sugarcane ethanol can deliver significant emission reductions. Africa has a suitable climate for significant expansion of sugarcane production and many countries have prior experience in sugarcane-based sugar production. Brazilian ethanol diplomacy and South-South technology transfer could form the basis for an extensive biofuel industry in Africa, while at the same time diversifying the sugarcane industry (IRENA, 2016).
- Beyond transportation fuels, Africa needs cleaner and more efficient bioenergy solutions to reduce local pollution, which could include products such as ethanol gels for cooking purposes.
- Biofuel solutions that have worked in other developed countries are not necessarily suitable for direct transfer into the African context. Rather, the unique characteristics of the African context have to be considered.
- Africa might be a suitable place for producing feedstocks that can be exported for biofuel production elsewhere. But this is unlikely to be an efficient route to rural development, job creation, food and energy security and sustainability on the continent (Lynd and Woods, 2011).

[1] http://edition.cnn.com/2016/12/28/africa/croton-nuts-biofuel-aes/index.html

Drivers for biofuel development

Energy security – a strong driver for biofuels development

Energy security historically has been a global driver for biofuels development, with the oil crisis in the 1970s playing a significant, catalyzing role. In many countries, such as the USA and Brazil, this provided the main impetus for biofuels development, as countries sought to become less reliant on oil supplied by OPEC countries. However, more recently, unconventional oil production and exploration have created a more distributed oil supply, with OPEC now having far less ability to control global supply and price.



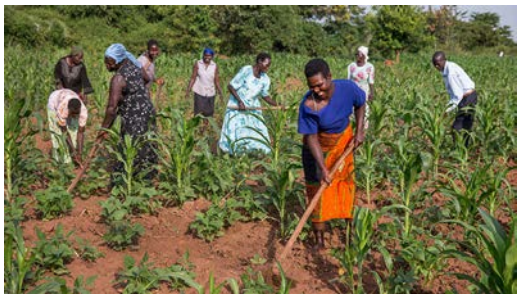
Energy security plays a big role in Africa, as many African countries are landlocked and/or have no oil reserves and therefore must rely on imports of crude oil and petroleum products to supply their transportation sector. Only a small number of African countries have domestic oil production, namely Angola, Algeria, Egypt, Libya and Nigeria.[2] Thus biofuel production can play an important role to relieve the burden on the balance of trade and domestic energy needs and to limit imports of oil and petroleum products. Development of biofuels in Africa before 2000 in countries such as Kenya, Malawi, Zimbabwe and South Africa was driven by energy security concerns (Gasparatos et al. 2015).

Climate change mitigation

Over the past few decades, mitigating climate change has become a more important driver for biofuels development. Recently, the world community has committed itself to drastic greenhouse gas emissions reductions in accordance with the COP21 Paris climate agreement. Bioenergy in general, and biofuels specifically, are recognized to play an important role in achieving these goals. In this context, life cycle assessment of biofuels feedstock/technology pathways have become more relevant to determine if actual emission reductions are taking place from the use of biofuels. Policies are framed with specific targets for reduction in carbon intensity of fuels, e.g. the low carbon fuel standard in California and British Columbia. Minimum emission requirements for certain biofuels are set in order to promote biofuels that offer the greatest reductions. Simple volumetric mandates for biofuels that are not linked to emission reductions have been the main type of policy used in the past, but future policy should link volumetric mandates with specific emission reduction requirements.

Rural development and job creation

While energy security and climate change mitigation have played big roles as drivers in developed countries, rural development and job creation are especially important in the African context and may lead to a different approach to biofuel development. According to Gasparatos et al. (2015), the most important driver for biofuel expansion in Sub-Saharan Africa has been and remains economic development.



Food security and sustainability

Food security has a high priority globally and this has generally translated into policies to avoid or reduce the expansion of biofuels based on food crops due to concerns over rising food prices, with recent discussions on phasing out of crop-based biofuels in the EU being a prime example. However, some studies have shown that biofuel production could also be beneficial to food security in Africa[3]. The Food and Agricultural Organisation (UN FAO) have directly stated that a food AND fuel approach is a workable solution (HLPE, 2013). Large scale cultivation of energy crops for biofuel production that displaces rural farmers from land may be harmful to food security.

[2] https://www.investopedia.com/articles/investing/101515/biggest-oil-producers-africa.asp

[3] http://www.ethanolproducer.com/articles/13918/food-security-benefits-found-in-african-biofuels-production

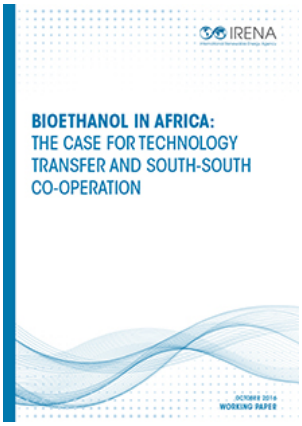
Competition between bioenergy and biofuels for feedstocks

Many millions of people still rely on biomass ("traditional bioenergy") to cook food. As already discussed, the IEA estimates that even by 2040, over 700 million people in Africa will still rely on inefficient, traditional bioenergy for cooking (IEA, 2017). This has to be an important consideration when estimates for lignocellulosic biofuels are made in an African context. Currently, traditional low efficiency bioenergy is used and transitioning to much more efficient cook stoves or renewable electricity would be required to ensure availability of lignocellulosic biomass for biofuel applications.

According to Lane, [if current practices continue] "*By 2050, Africa will need 2.9 billion tons of wood per year to provide cooking fuel for its population, and according to the FAO it will require 771 million hectares of woody biomass cultivation to support that demand, and Africa only has 649 million hectares of forest if no one cuts any down in the next 35 years, say for urbanization or food production*."[4]

Brazil and ethanol diplomacy

"Brazil has a long tradition in biofuels, based on the production of first generation ethanol using sugarcane [sugar juice] as feedstock. Consequently, over time, Brazil has developed substantial technological and scientific expertise for this specific crop and production technology, which it has explicitly sought to diffuse abroad [in cane growing regions] through technical knowledge transfer, exchange of best practices, and private sector investment, otherwise known as "ethanol diplomacy."(Afionis et al., 2016)



A 2016 report published by IRENA entitled, "Bioethanol in Africa: The case for technology transfer and South-South co-operation" (IRENA, 2016) examines the potential to expand Brazilian style sugarcane and ethanol production in Africa. The high crop yields and efficient processing gives sugarcane ethanol excellent emission reductions potential (80% or higher), which is better than many "advanced" biofuel technologies. The role model for sugarcane biorefining has been Brazil, and ethanol diplomacy with cooperation and technology transfer from Brazil to Africa could play an important role in future biofuels expansion on the continent. Several studies have been published showing favorable economics and conditions for expanding sugarcane production (Souza et al. 2016; Kubota et al. 2017; Leal et al. 2016; Leite et al. 2017). However, Mitchell (2011) indicates that biofuel production in Africa is unlikely to be as low cost as Brazilian ethanol production due to "*poor infrastructure, weak national agricultural research systems, high import costs on equipment and inputs, and an often unfavorable business environment.*"

Status of biofuels and policies in Africa

Several African countries have used ethanol blends in transportation fuels, including Kenya, Malawi and Zimbabwe. Ethanol is mainly produced from molasses in these countries (Amigun & Von Blottnitz, 2009). Malawi has been producing ethanol and using it in gasoline blends since the early 1980s (Mitchell 2011). However, large scale biofuel production has not yet taken place.

Several countries have developed biofuel strategies to promote biofuel production and blending, namely Angola, Ethiopia, Kenya, Mozambique, Nigeria, South Africa, Tanzania, Zambia and Zimbabwe (IRENA, 2016). Annex VIII of IRENA's report gives a short summary of biofuel strategies in these countries (IRENA, 2016). In some cases, specific blending mandates were introduced into policy (such as in Mozambique). In South Africa, a volumetric target of 2% was set and mandatory blending was set to commence in October 2015 (SA DoE 2013). However, the draft Position

[4] http://www.biofuelsdigest.com/bdigest/2017/05/31/burn-better-cook-better-breathe-better-the-quest-for-an-efficient-african-cookstove/

Paper on the South African Biofuels Regulatory Framework published 15 Jan 2014 (SA DoE 2014) was not endorsed by the cabinet, with the result that biofuel development has stalled to a great extent (Pradhan & Mbohwa, 2014).

Historically, biofuel production and expansion worldwide has been driven by policies setting required blending mandates and providing incentives and other policy mechanisms to promote the development of biofuels. Without such policies, it is unlikely that significant expansion of biofuels will occur in African countries. However, to ensure real climate benefits, policies need to be progressive by setting emission reduction targets, in conjunction with blending mandates, in order to promote sustainable biofuels.

Conclusions

The African continent has the potential to supply significant volumes of lignocellulosic feedstocks, but the slow development of the requisite conversion technologies elsewhere and the significant capital investment required for construction of large-scale infrastructure and commercial facilities make this challenging, particularly in a low oil / energy price environment. At the same time, reliance on traditional bioenergy for cooking and heating creates competition for feedstocks and unless modern bioenergy cook stoves are adopted, feedstock availability assessments reported to date appear highly optimistic.

Expansion of conventional biofuels production holds significant potential for rural development, job creation and energy security. A food AND fuel integrated biorefinery approach that ensures food security and sustainability is also possible. Using the Brazilian sugarcane and ethanol industry as an example, maximum optimization can provide multiple products including sugar for food, molasses for liquid fuel ethanol and bagasse for heat and electricity. Sugarcane is an existing feedstock with potential for significant expansion in Africa and can be used to produce ethanol with significant emission reductions compared to petroleum-based fuels, and it can also serve as a stepping stone for future development of lignocellulosic ethanol from bagasse or other agricultural or forestry residues. Based on a gradual upgrading of sugarcane mills, molasses could be diverted to ethanol production and bagasse to electricity. This is specifically attractive in Africa as there is a shortage of electricity in the southern region (SADC), particularly in countries with great potential for sugarcane, such as Angola, Malawi, Mozambique, Zambia and Zimbabwe. This can also have an important impact on climate change mitigation in countries where coal is the main feedstock for electricity production (e.g. South Africa).

Although the main focus in biofuels development has been to replace fossil-based transportation fuels, consideration should also be given in Africa to develop green household fuels such as bioethanol gels that can be used as replacements for firewood and kerosene.

There is significant opportunity for the development of “bolt-on” second generation bioproducts and biofuels based on waste product streams from both the sugarcane industry, as well as the pulp and paper industry (using black liquor). The key is to integrate biofuels production with existing bio-based industries, gradually upgrading existing industries with modern energy options, rather than pursuing much more expensive (new) greenfield construction.

Finally, if biofuel solutions do not consider the unique features of the African continent, there is a risk that it may merely become a land base for the production of feedstocks, which will not provide the greatest possible socio-economic benefit for African countries.

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In the News

Reports and Research

Dec 11 – Lloyd's Register and University Maritime Advisory Services (UMAS) have released 'Zero Emission Vessels 2030', a new study that aims to demonstrate the viability of zero emission vessels (ZEVs) in shipping – identifying what needs to be in place to make them a competitive solution for decarbonisation. (Download report)

Nov 24 – IEA Bioenergy launch new Bioenergy Technology Roadmap (Download report here)

Nov 14 – IEA released World Energy Outlook. The summary of the report can be accessed here

Oct-Nov - The US Department of Agriculture published two GAIN reports on biofuels in the Phillipines and Malaysia.

Oct –The UK Department of Transport published a report (by E4Tech) showing that advanced biofuels can play a key role in decarbonizing transportation by 2030. The report identifies gasification combined with Fischer Tropsch as the rising start of technology to achieve those goals, followed by fast pyrolysis and upgrading, but also states that project finance and stable policy to create long-term markets are needed in order for the estimates to become reality. The report says greater clarity beyond 2030 as well as a policy framework that specifically provides space in the market for drop-in advanced biofuels are required.

Policy and Regulatory Developments

Nov 30 - The U.S. EPA has released final 2018 renewable volume obligations (RVOs) under the Renewable Fuel Standard, setting the RVO for total renewable fuel at 19.29 billion gallons, including 288 million gallons of cellulosic biofuel, 2.1 billion gallons of biomass-based diesel, and 4.29 billion gallons of advanced biofuel. In addition, the agency has set the 2019 RVO for biomass-based diesel at 2.1 billion gallons. (Read more)

Nov 30 - In Canada, the government of Ontario announced new initiatives to strengthen the biofuels sector in the province, improve the environmental performance of fuels, and encourage the production of emerging advanced biofuels. Proposed changes to biofuels regulations include increasing the current 5% ethanol mandate to 10% starting in 2020, requiring ethanol sold for compliance to be 35% lower in greenhouse gases than gasoline, and enabling a wider range of advanced biofuels to meet both the Ethanol in Gasoline and the Greener Diesel regulations.

Nov 27 – In the EU, the biofuels industry has hit out at the European Commission's proposal to reduce the cap on crop-based biofuels in the EU's transport fuel mix, saying it would undermine the EU executive's renewable energy policy and slash investment in advanced biofuels. (Read more)

Nov - In Germany, the United Nations Climate Conference (COP23) wrapped up on Friday in Bonn, with 19 Member countries of the 'Biofuture Platform,' including Brazil, China, Egypt, France, India, Morocco, Mozambique, announcing a formal agreement on the development of targets for biofuels and to construct an action plan to achieve them. The U.S. is no longer part of the platform since withdrawing from the Paris Agreement.

The Dutch Government has announced its intention to address aviation's environmental impact through taxation, envisaging a Europe-wide tax on aviation in the context of planned negotiations in 2019 on the 'Paris climate objectives'. A tax on purported "noisy and polluting" aircraft is also under consideration and, if both measures are determined to be insufficient, an aviation passenger tax may be introduced in the Netherlands from 2021. In a joint letter to the Dutch Minister of Finance, the **European Regions Airline Association** (ERA) and other leading industry associations urge the Dutch Government not to proceed with its planned taxation policy, (Read more)

Oct 24 – The role of policy in California is driving renewable diesel consumption as demand for renewable diesel in the state makes up for about half of the country's consumption, the vast majority of which is supplied by Neste's

refineries in Singapore and Europe. California's credits generated by renewable diesel reached $91.74 per metric ton earlier this month with some analysts believing its could rise to $215 per ton by 2019. Nearly 628,000 tons of credits were generated in Q4 last year compared to around 6,000 in 2011. (Read more)

Sustainability

IEA Bioenergy held an intertask workshop in May on "*Sustainability of bioenergy supply chains*" and the workshop is available for download from the IEA website.

Nov 10 - A Brazilian scientist developed a method that reduces greenhouse gas emissions from sugarcane cultivation . The fertilizers used in agriculture play a significant role in reducing the release of nitrous oxide. The scientist created a method where urease inhibitors are used during the cultivation of cane to prevent the transformation of urea — the most used fertilizer in Brazilian agriculture — into carbon dioxide. Nitrification inhibitors are also used to block the transformation of ammonia into nitrate. This is an important step in reducing nitrous oxide emissions, because bacteria in the soil convert nitrate to nitrous oxide and other gases. The researchers calculated a reduction rate of 85-95 per cent for soils with urea and inhibitors, compared with soil with urea or soil without fertilisers. (Read more)

Industry News

Dec 15 - Steeper Energy, a Danish-Canadian clean-fuel company, is partnering with Silva Green Fuel, a Norwegian-Swedish joint venture, to construct a EUR 50.6 M (DKK 377M) industrial scale demonstration plant at a former pulp mill located in Tofte, Norway leading to a future commercial scale project. Steeper will license its proprietary Hydrofaction™ technology to Silva, who will build the facility over the next 18 months. The demonstration plant will use woody residues as feedstock that are converted to renewable crude oil and, in turn, will be upgraded to renewable diesel, jet or marine fuel.

Dec 5 - In the UK, Vivergo Fuels has mothballed its wheat-based ethanol facility in Hull indefinitely due to the lack of government policy that would drive the biofuel sector. The government released a policy in September for E10 but no plans have been made to implement it. (Read more)

Nov 30 - The Australian Renewable Energy Agency recently announced $11.9 million in funding for Australian biofuel company Ethanol Technologies Ltd. to complete the development and demonstration of its cellulosic ethanol technology using waste and residue (Read more).

Nov 21 - In China, a Hainan Airways flight departed from Beijing en route to Chicago flying on a blend of waste cooking oil-based aviation biofuel produced by Sinopec as part of a international cooperation project between China and the US. The fuel is made at Sinopec's Zhenhai Refining and Chemical Company in Ningbo, East China's Zhejiang province using UCO collected from restaurants. (Read more)

Nov – Amyris sold its 40 million liter capacity Brotas production plant to DSM for $96 million.

Nov 20 - The Australian Renewable Energy Agency (ARENA) today announced $4.03 million in funding for Australian yeast developer Microbiogen to make production of bioethanol from plant waste cheaper and more efficient. (Read more)

Nov – Qantas' signed an agreement with Agrisoma Biosciences, the Canadian based agricultural-technology company who developed the carinata seed. The two organizations will work with Australian farmers to grow the country's first commercial aviation biofuel seed crop by 2020. (Read more)

Nov 15 – Brazilians are making ethanol using soybean molasses, an example of a multi-product refinery making biodiesel, lecithin and ethanol amongst other products such as glycerin (Read more)

Nov 8 – Nine airlines fly with Gevo's isobutanol-to-jet fuel at Chicago O'Hare airport – Lufthansa, United Airlines, Etihad, Cathay Pacific Airways, Emirates, Japan Airlines, Korean Air, Atlas Air. Biojet was supplied through the airport hydrant system. (Read more)

Nov 7 - Valero Energy Corporation and Darling Ingredients Inc. announced today that in anticipation of growing demand for renewable diesel due to the Renewable Fuel Standard (RFS) and global low carbon markets, the companies will initiate an engineering and construction cost review to analyze an additional project that would grow annual production capacity to 550 million gallons at the Diamond Green Diesel (DGD) facility in Norco, Louisiana. (Read more)

Nov 7 - Enerkem Inc. (**www.enerkem.com**), a world leading waste-to-biofuels and renewable chemicals producer, announced it has received approval from the United States Environmental Protection Agency (EPA) to sell cellulosic ethanol produced at its Edmonton, AB, Canada facility under the U.S. Renewable Fuels Standard (RFS). (Read more)

Nov 2 - In Delaware, DowDuPont announced that it intends to sell its cellulosic biofuels business and its first commercial project, a 30 million gallon per year cellulosic ethanol plant in Nevada, Iowa. (Read more)

Nov 2 - In Nigeria, the Nigerian National Petroleum Corp. will build a 65 million liter per year cassava-based ethanol plant on 15,000ha provided by the government of Ondo State. (Read more)

Oct 31 - In Germany, Clariant's board has approved investment in a new full-scale commercial plant for the production of cellulosic ethanol from agricultural residues using its sunliquid technology. The new plant, with an annual production capacity of 50.000 tons, will be built in the southwestern part of Romania. (Read more)

October 31 – The Beta Renewables plant in Crescentino, the pioneer in cellulosic ethanol, closed. (Read more)

October 13 - Qantas has today announced its Los Angeles based aircraft will be powered by biofuel from 2020, reducing the airline's carbon emissions on its services operating between the US and Australia.
Over the next ten years, the airline will purchase eight million gallons (30 million litres) of renewable jet fuel each year from US based bio-energy company, SG Preston. The fuel will be used by Qantas' aircraft operating from Los Angeles Airport (LAX) to Australia. The fuel consists of 50 percent renewable jet fuel produced from non-food plant oils, blended with 50 percent traditional jet fuel. (Read more)

Upcoming Meetings & Conferences

2018

January

- ICBBBB 2018: 20th International Conference on Biomass, Bioenergy, Biofuels and Bioproducts — January 8-9, 2018 — Singapore
- 2018 Value of Biogas West — January 16-17, 2018 — Abbotsford, British Columbia, Canada
- 15th International Conference on Renewable Mobility — January 22-23, 2018 — Berlin, Germany
- Hydrogen & Fuel Cells Energy Summit — January 24-25, 2018 — Brussels, Belgium
- Conference of the European Biogas Association — January 24-26, 2018 — Antwerp, Belgium
- 2018 Iowa Renewable Fuels Summit — January 30, 2018 — Altoona, IA

February

- Lignofuels 2018 —Advanced Biofuels & Materials — February 7-8, 2018 — Amsterdam, The Netherlands
- RFA National Ethanol Conference 2018 — February 13 - 14, 2018 — San Antonio, TX
- The European Biopolymer Summit 2018 — February 14-15, 2018 — Dusseldorf, Germany

- 2018 IrBEA National Conference – Bioenergy Future Ireland — February 21, 2018 — Dublin, Ireland
- Advanced Bioeconomy Leadership Conference (ABLC) — February 28-March 2, 2018 — Washington, DC

March

- ECO-BIO 2018 — March 4-7, 2018 — Dublin, Ireland
- 3rd International Conference on Enzymology & Molecular Biology — March 5-6, 2018 — London, UK
- BIOKET — March 6-8, 2018 — Strasbourg, France
- 6th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers — March 15-16, 2018 — Cologne, Germany
- ACS National Meeting & Expo — March 18-22, 2018 — New Orleans, LA
- World Bio Markets — March 20-22, 2018 — Amsterdam, The Netherlands
- 2018 Value of Biogas East — March 22-23, 2018 — Gatineau, QC, Canada
- BioCycle West Coast 18: Accelerating Organics Recycling — March 26-29, 2018 — San Diego, CA
- Argus Ethanol China 2018 — March 27-28, 2018 — Beijing, China
- Gasification 2018 — March 28-29, 2018 — Frankfurt, Germany
- 9th Edition of International Conference on Biofuels and Bioenergy — March 29-30, 2018, Edinburgh, Scotland

April

- BBC Brazil 2018 — April 10-13, 2018 — Sorocaba, Brazil
- 9th Annual Congress and Expo on Biofuels and Bioenergy — April 16-17, 2018 — Dubai, UAE
- 40th Symposium on Biotechnology for Fuels and Chemicals — April 29-May 2, 2018 — Clearwater Beach, FL

May

- 26th European Biomass Conference and Exhibition (EUBCE) — May 14-17, 2018 — Copenhagen, Denmark
- International Conference on Negative CO2 Emissions — May 22-24-17, 2018 — Gothenburg, Sweden
- 14th International Conference on Renewable Resources and Biorefineries (RRB-14) — May 30- June 1, 2018 — Ghent, Belgium

IEA Bioenergy Task 39 Meetings

The following is an abbreviated schedule of Task 39 events and meetings planned over the next 9 months. Please contact us for more detailed information:

- The Task will hold its first business meeting of 2018 in Beijing, China, over the weekend of April 7-8.