

# Commercializing Conventional and Advanced Liquid Biofuels from Biomass

**Task 39**  
IEA Bioenergy

## Inside This Issue

From the Task	1
South Africa Feature	4
Reports & Research	11
In the News	12
Meetings/Conferences	16



## From the Task

*By Jack Saddler, Jim McMillan and Sergios Karatzos*

It has been a busy time for IEA Bioenergy Task 39 members since the last issue of this newsletter was published. A recent highlight that will be described in more detail below was several Task 39 network members participating in the 20<sup>th</sup> International Symposium on Alcohol Fuels (ISAF) held at the Spier winery and conference center facilities in Stellenbosch, South Africa (25-27 March). Task 39 held its business meeting immediately before the main ISAF conference. The full day business meeting covered country updates on the status of biofuels in the majority of Task 39 member countries and reviewed progress on the various completed and planned reports for the Task during the 2013-2015 triennium. Plans were also updated for upcoming workshops, symposia and meetings that the Task 39 network will organise or participate in during this new triennium.

The 20<sup>th</sup> ISAF conference was attended by close to 200 participants from around the world and included two dedicated half-day sessions organized by IEA Bioenergy Task 39. In total, Task 39 members presented a total of 10 talks at this meeting, including 2 plenary talks. Plenary speakers described progress in Africa and South Africa in particular, as well in Brazil, the US and Italy. As noted below and described in more detail in this newsletter's special feature, South Africa is the world's biggest producer of oil derived from coal. The presentation from Sasol described the many challenges that had to be overcome to make their Fischer-Tropsch based technology a reality and by analogy provided many useful lessons to consider when trying to commercialize biomass derived biofuels!

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Image Source: esf.edu.com

As will be covered in more detail in the “future meetings” part of this newsletter, Task members will be organizing/participating in several symposia in the coming year. As this newsletter goes to press, many Task 39 network members are on their way to the 35<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals (SBFC) being held in Portland, Oregon, USA (29 April - 2 May). IEA Bioenergy Task 39 has organised an evening session focused on biofuels developments entitled, “International Demonstrations and Commercialization Updates”. This session will include presentations from representatives of many of the companies leading development and deployment of advanced biofuels technologies (and that have been part of the Task’s network) such as Borregaard, Catchlight, Chemtex, DuPont and Lignol. A similar Task 39-organized session held two years ago at the 33<sup>rd</sup> SBFC in Seattle attracted an overflow audience and ran very late (due to extended insightful and animated discussions). We anticipate another successful session stimulating active discussion this year!

Looking forward, colleagues in China have invited Task 39 to participate in a Bioenergy/Biofuels symposium that will be held in Nanjing, China, prior to the International Academy of Wood Science (IAWS) conference being held 17-21 October, 2013. More details will be communicated via the [Task 39 website](#) as plans for this meeting are finalised. Task 39’s next formal business meeting will be held in conjunction with the 11th BBE/UFOP International Congress on Biofuels taking place in Berlin, Germany, 20-23 January, 2014

Two Task 39 reports have been completed since the last newsletter. The first is a report comparing the energy and greenhouse gas (GHG) balances of biochemical, thermochemical and hybrid routes to advanced biofuels production. This report was finalized to incorporate reviewer comments from Task 39 country representatives (and their designees) and is now posted on the [Task 39 website](#). The second report is an update on the website and interactive map and report describing many of the worlds advanced biofuels pilot, demonstration and commercial scale production facilities”. This update was authored by Task 39’s Austrian members at Bioenergy 2020+ and is also available at the [Task 39 website](#).



We welcome your feedback. Please direct your comments to Sergios Karatzos, editor of the Newsletter  
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As is described in this newsletter's *news section*, a variety of positive developments have occurred in the Biofuels area since the publication of the last newsletter (December 2012 issue #32). For example, both the 20 MGPY Chemtex (Beta Renewables) cellulosic ethanol and power facility as well as the 3-5 MGPY KiOR pyrolysis facility have produced their first cellulosic fuels while Abengoa (25 MGPY) and POET-DSM (20 MGPY) are completing construction and are on schedule to begin advanced cellulosic biofuels production by the end of 2013. In addition, Dupont (30 MGPY) and Zechem (25 MGPY) and several other cellulosic fuel facilities have either started or announced they soon will start construction (as described in more detail in the Iowa State University and EIA report updates listed in the *news section* of the newsletter). Other announced facilities include a 40 MGPY Mascoma plant in Kinross, MI, a new Beta Renewables facility in North Carolina (20 MGPY), two new gasification facilities by ClearFuels (20 MGPY) and by Sundrop Fuels (50 MGPY) and an extra 28 MGPY of pyrolysis capacity by KiOR. If all of these announced facilities are able to operate at full capacity, total US cellulosic biofuel production capacity will reach close to 200 MGPY by the end of 2014.

In the last month or so it was also announced that the three US DOE funded national bioenergy research centers (Joint BioEnergy Institute, Great Lakes Bioenergy Research Center and the BioEnergy Science Center) have been renewed for another 5 years at a funding level of US \$25 M/yr.

On the other hand, despite these positive developments there recently has been a sudden, unprecedented surge in the market price of US RFS's ethanol Renewable Identification Numbers (RINs) from under US \$0.10/gallon to over US \$1/gallon, and this has triggered increased tensions between RFS-obligated oil companies and the US Environmental Protection Agency (EPA). This issue has generated considerable press coverage such as a recent Economist article entitled, "Difference Engine: End the Ethanol Tax".

These developments coincided with the publication of several new reports by groups such as Bloomberg New Energy Finance, the US Energy Information Administration, the US Congressional Research Service, Massachusetts Institute of Technology and Iowa State University. Summaries and links related to these reports are provided in the *news section* of this newsletter.

Finally, we would like to thank and congratulate our South African colleagues for their hard work and tremendous success in organizing Task 39 and 20<sup>th</sup> ISAF activities in Stellenbosch! Professors Emile van Zyl and Bernard Prior were the main architects of these meetings and they are also the co-authors of this newsletter's feature article on biofuels developments in South Africa. Just like Australia (which was featured in the previous newsletter), South Africa derives three quarters of its primary energy from coal. Other similarities include a sizeable sugarcane industry, considerable amounts of arid land and some algae activity. However, South Africa is unique in that it is the world leader in producing coal-derived liquid fuels at full commercial scale using gasification followed by Fischer-Tropsch synthesis technology (Sasol).

Thanks for taking the time to read this newsletter to stay abreast of global liquid biofuels developments. We look forward to seeing many of you at future meetings and encourage you to let us know how we can continue to improve this IEA Bioenergy Task 39 newsletter to make it an ever more useful vehicle for communicating the progress being made to develop and commercialize conventional and advanced liquid biofuels!

*Jim, Jack and Sergios*

## “BIOFUEL DEVELOPMENTS IN SOUTH AFRICA”

WH (Emile) van Zyl & Bernard A Prior  
Stellenbosch University, South Africa

### Introduction

South African energy needs are highly dependent upon abundant coal supplies. Around 77% of South Africa's energy needs are directly derived from coal with the balance being derived from nuclear power and hydroelectric resources. 92% of coal consumed on the African continent is produced in South Africa. South Africa was 6<sup>th</sup> top hard coal producer in the world in 2009 and a significant amount of its coal production (28%) is exported. In 2010, South Africa produced 1889 TerraWatt/h of energy (Table 1). Energy production has not kept up with population growth recently in spite of a decline in the export of energy. South Africa is a major emitter of CO<sub>2</sub> and the highest in Africa. Biomass as a renewable energy source was estimated to provide about 5 % of the energy supply in 2000/2001 (Winkler, 2005).

**Table 1.** Energy in South Africa (IEA, 2006, 2009, 2010, 2011, 2012)

Year	Population	Primary energy	Production	Export	Electricity	CO <sub>2</sub> emissions
	Million	TerraWh	TWh	TWh	TWh	Mtons
2004	45.51	1,525	1,814	279	226.5	343.4
2007	47.59	1,562	1,856	254	238.6	345.8
2008	48.69	1,564	1,895	203	232.2	337.4
2009	49.32	1,675	1,868	158	224	369
2010	50.0	1,592	1,889	199	240.1	346.8
Change 2004-10	9.8 %	4.4 %	4.1 %	-29 %	6.0 %	1.0 %

### Liquid fuel use in South Africa

South Africa consumed approximately 11.3 billion litres of petrol and 9.1 billion litres of diesel during 2009, showing a 2.2% increase in petrol and a 6.6% decrease in diesel from the previous year (Figure 1). During 2008, there was a 4.2% decrease in petrol consumption and a 0.1% increase in diesel consumption from 2007. Petrol and diesel are mainly used for road transport of passengers and freight. In terms of primary energy supply, nearly 80% is from imported oil – crude oil represents the single largest import item in South Africa's import account. The balance is generated from coal to liquid fuels and from gas. Sasol, an integrated energy and chemical company, beneficiates coal, oil and gas into liquid fuels, fuel components and chemicals with the help of its proprietary Fischer-Tropsch processes. It is the largest coal-to-fuel and coal-to-chemicals producer in the world. The Petroleum, Oil and Gas Corporation of South Africa (PetroSA) manages the country's commercial assets in the petroleum industry, including the world's largest commercial gas-to-liquids plant at Mossel Bay in the Western Cape.

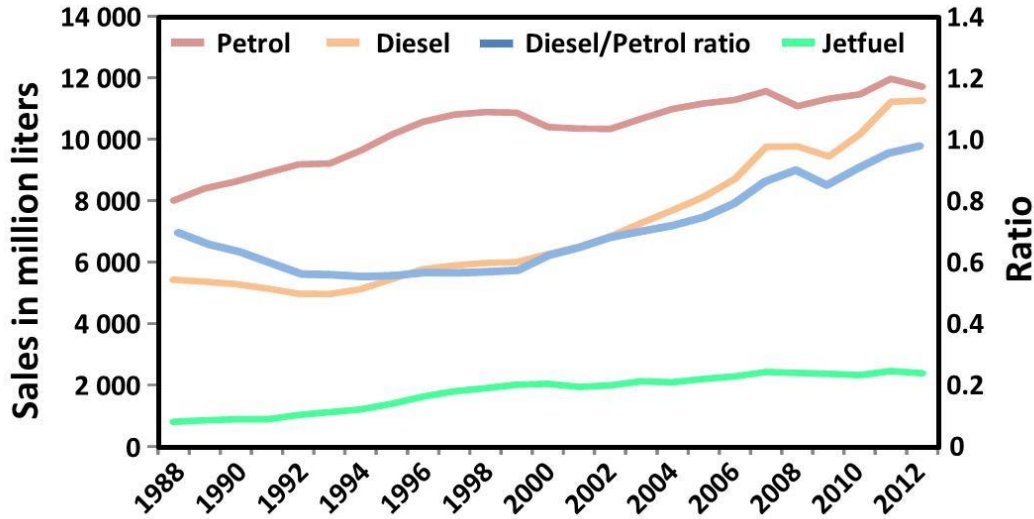


Figure 1. Consumption of petrol and diesel fuels in South Africa (1988-2009) (www.sapia.co.za)

**Land use and biomass availability**

South Africa possesses 993,780 km<sup>2</sup> of agricultural land with a large portion in the form of semi-desert (Figure 2). Due to the aridity of the land, only 13.5% can be used for crop production, and only 3% is considered high potential land. Agricultural activities range from intensive crop production and mixed farming in winter rainfall and high summer rainfall areas, to cattle ranching in the bushveld and sheep farming in the arid regions. Maize is most widely grown, followed by wheat, sugar cane and sunflowers. About 1% of the total land area is devoted to forestry in the form of pine and eucalyptus plantations in the provinces of Mpumalanga and KwaZulu Natal. In 2003, Lynd et al. estimated that up to 125% of South Africa’s liquid fuels could be produced as biofuels from agricultural and forestry residues and energy crops if just 10% of available agricultural land was used to grow energy crops (Table 2 and Figure 3).

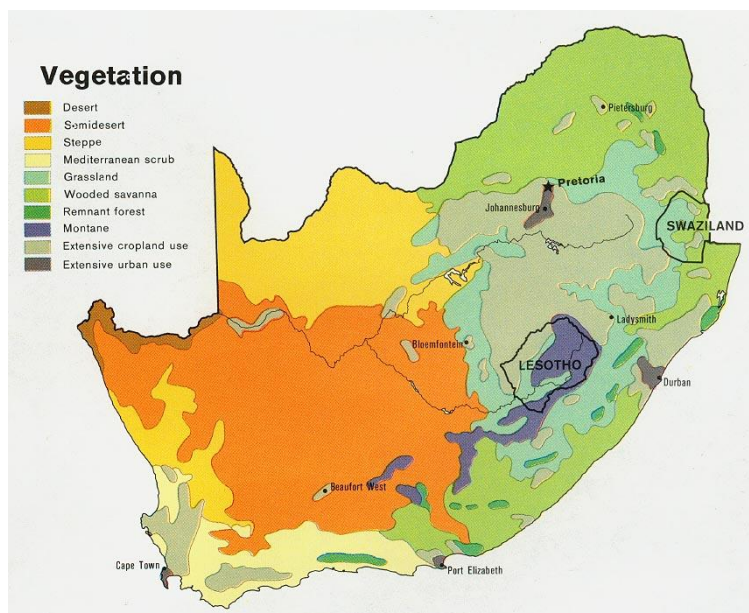
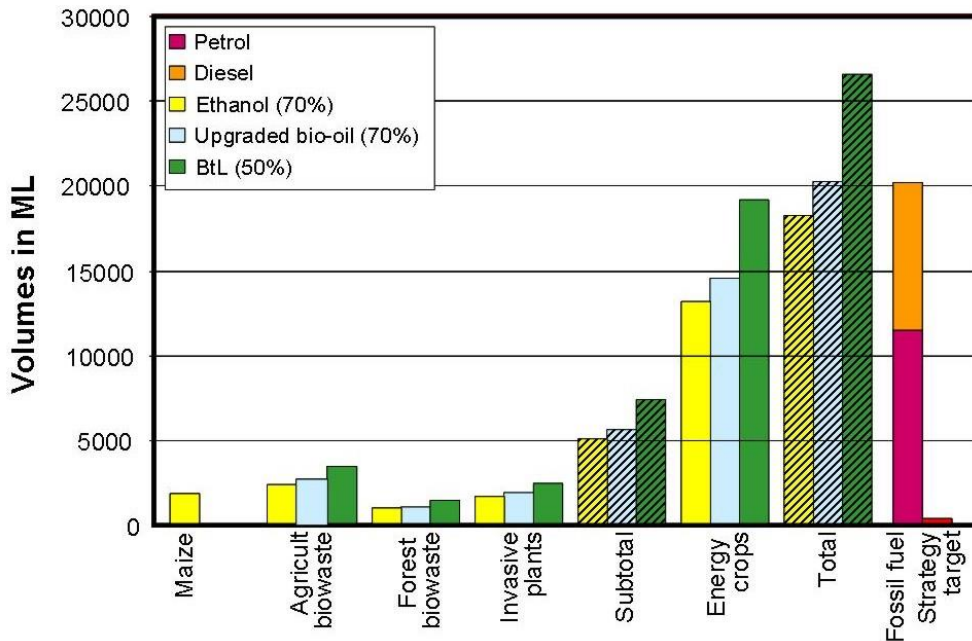


Figure 2. Vegetation regions of South Africa (www.mapcruzin.com)

**Table 2.** Renewable biomass availability in South Africa [in units of Mt/yr (energy equivalent in PJ/yr)].

<b>Residues</b>		
<b>Agricultural</b>		
Maize stover	6.7	(118)
Sugar cane bagasse	3.3	(58)
Wheat straw	1.6	(28)
Sunflower stalks	0.6	(11)
<b>Subtotal</b>	<b>12.3</b>	<b>(214)</b>
<b>Forestry industry</b>		
Left in forest	4.0	(69)
Saw mill residue	0.9	(16)
Paper & board mill sludge	0.1	(2)
<b>Subtotal</b>	<b>5.0</b>	<b>(87)</b>
<b>Energy crops</b>		
From 5% of available land	34.0	(584)
<b>From 10% of available land</b>	<b>67.0</b>	<b>(1170)</b>
From 20% of available land	134.0	(2330)
<b>Total, annual basis</b>	<b>84.0</b>	<b>1470</b>
(assuming 10% available land)		
<b>Invasive plant species</b>	<b>8.7</b>	<b>(151)</b>



**Figure 3.** Potential biofuels production from lignocellulosic biomass (assuming only 50-70% were utilized) when advanced (or second generation) biochemical and thermo-chemical technologies are available. Optimal biofuels yields estimated when these technologies are available include: (i) biochemical processing of maize-to-ethanol = 460 L/ton or lignocellulosic-to-ethanol = 280 L/ton (only polysaccharide fraction); and (ii) thermo-chemical upgrading of bio-oils from fast pyrolysis = 310 L/ton and thermo-chemical biomass-to-liquid (BtL) = 570 L/ton (Ambali *et al.*, 2011).

### ***Policy and goals***

The South African government undertook in a white paper on renewable energy issued in 2003 to implement a policy fostering the development of a biofuels industry. The initial target proposed in 2006 was to achieve 4.5% penetration of liquid road transport fuels by 2013. This target was later reduced to 2% when the Industrial Biofuels Strategy was announced in December 2007, but without mandatory blending. The potential to generate many new jobs in the biofuel industry was a major motivation to start implementation but food-versus-fuel arguments have affected decisions. In March 2011, the Industrial Policy Action Plan of the South African Government was published. It addressed biofuels by proposing key milestones for 2011/2012 to revitalize the biofuels industry:

1. Create a permit-base rebate facility for importing bio-ethanol in the event of local supply disruption.
2. Amend fuel specifications to allow for requisite waivers.
3. Conclude and sanction price support/incentive mechanism for biofuel producers.
4. Mandate 2% blending of biofuel, increasing to 10% over the next 10 years.
5. Develop water tariff policy for biofuel feedstock producers.
6. The Industrial Development Corporation to provide industrial financing options to investors, thereby leading to the commissioning of biofuel processing facilities.

In 2012, the dates of implementation of milestones were moved a year forward in a revised Industrial Policy Action Plan. Only milestone 4 has been achieved by the announcement of mandatory blending in 2012. In The Budget Speech of February 2013, the Minister of Finances announced a ZAR 3.5–4.0c levy on all fuels to create an approximate ZAR 1 bn fund to support construction of the first commercial ethanol plants, addressing milestone 3.

A number of incentives exist to promote the biofuels industry. Currently bioethanol falls outside the fuel tax net, and is therefore 100% exempt from fuel tax. Biodiesel falls within the fuel tax net, and biodiesel manufacturers receive a rebate of 50% on the general fuel levy. All renewable energy projects (including biofuels) qualify for an Accelerated Depreciation Allowance of 50:30:20 over three years. These incentives have proven not be sufficient to lure biofuels sector investments, hence there is a need to establish a more enabling and supportive regulatory framework.

### ***Implementation***

#### **Conventional biofuels**

South Africa has recently issued and granted licences for the production of at least 500 million litres per annum of bioethanol and biodiesel from sorghum, soybean and waste vegetable oils (Table 3). The biofuel plant to be built in Cradock in the Eastern Cape Province, to be funded by the Industrial Development Corporation of South Africa (IDC), has received the most attention as it will provide a case study for the nascent biofuels industry. In the first phase, 225,000 tonnes of grain sorghum will be imported from around the country, and in the second phase the produce of local farms, purchased by the Department of Rural Development and Land Reform, will be used. This will mainly take the form of sugar beet and sorghum, which will be turned into 90 million litres of bioethanol per year. The development of these biofuels facilities appears to be delayed by financing, availability of suitable land and policy decisions.

**Table 3.** Update on licensing of conventional biofuels manufacturing facilities (DoE, 2013)

No.	Company name	Plant Type	Capacity (ML/an)	Location	Licence status
1	Arengo 316 (Pty) Ltd.	Bioethanol (Sorghum)	90	Cradock, Eastern Cape	Granted
2	Mabele Fuels	Bioethanol (Sorghum)	158	Bothaville, Free State	Issued
3	Ubuhle Renewable Energy	Bioethanol (Sugarcane)	50	Jozini, Kwa-Zulu Natal	Granted
4	Rainbow Nation Renewable Fuels Ltd.	Biodiesel (Soybean)	288	Port Elizabeth, Eastern Cape	Issued
5	Exol Oil Refinery	Biodiesel (Waste vegetable oil)	12	Krugersdorp, Gauteng	Granted
6	Phyto Energy	Biodiesel (Canola (Rape))	>500	Port Elizabeth, Eastern Cape	Initial stage of application
7	Basfour 3528 (Pty) Ltd.	Biodiesel (Waste vegetable oil)	50	Berlin, Eastern Cape	Granted
8	E10 Petroleum Africa OC	Bioethanol	4.2	Germiston, Gauteng	Granted

## Advanced biofuels

### *Algae as a source of biodiesel*

A raceway pond (300,000 litre) that treats domestic wastewater with biodiesel recovery has been built in Durban under the guidance of Professor Faizal Bux at the Durban University of Technology. Results have demonstrated lipid yields of up to 35% oil/dry mass and cell concentrations of 1.5 g/l in an open pond system but challenges in scale-up, contamination, harvesting and extraction remain. This plant is not currently operating.

### *Research and development*

Research projects are underway at a number of South African universities on the production of biofuels including biodiesel from algae (University of the Western Cape, Durban University of Technology) and bioethanol from biomass (Stellenbosch, Rhodes, Free State Universities). Significant progress has been made within the Senior Chair of Energy Research (SCoER): Biofuels at Stellenbosch University. Under the leadership of Prof. Emile van Zyl, the SCoER has focused on the development of both biochemical and thermochemical processes for the conversion of cellulosic



feedstocks, such agricultural residues, to biofuels. The laboratory of Prof. Emile van Zyl participated in a joint project with VTT, Finland and Mascoma Corporation to develop consolidated bioprocessing yeast capable of converting pretreated hardwood to ethanol with significantly reduced requirement for enzyme addition. Mascoma is in the process of commercializing a Consolidated BioProcessing (CBP) type process utilizing proprietary strains developed in this joint project. The group of Prof. Johann Görgens developed the capability to carry out pilot-scale pretreatment using a 15-L capacity steam gun reactor. Pretreatment of different agricultural residues has been evaluated with South African sponsored research funding in anticipation of an emerging cellulosic ethanol industry. The laboratory of Prof. JH (Hansie) Knoetze has developed the capability to generate pyrolysis and gasification products using different cellulosic feedstocks to substitute fossil fuels such as coal, coking coal and reductants. This research also supports developments toward a future green economy. Apart from the development of both biochemical and thermochemical technologies, the SCoER has also developed expertise in process modelling, energy efficiency optimisation, economic viability assessment and life cycle analysis. Such assessment tools are critical to guide technology selection and technology integration into future biofuels/bioenergy/biorefinery industries.

### ***Possible role of South Africa in Africa's sustainable future***

A study by Smeets *et al.* (2007) recognized the potential role of biofuels/bioenergy in the sustainable future of Africa. The role biofuels can play in addressing human needs through integration of bioenergy and food production is particularly pronounced in the African context (Lynd and Woods, 2011). This point can be illustrated by considering the potential of sugarcane as a bioenergy crop. Currently, South Africa produces about 20 million tonnes of sugarcane (about 50% of Africa's production) on 325,000 hectares of land. South Africa is recognized as one of the more efficient countries in sugar production from limited land available. A recent study by Helen Watson at the University of Kwa-Zulu Natal showed that an estimated 6 million hectares of land suitable for sugarcane production are available in Angola, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe, above that already providing for primary food production and conservation (Watson, 2011). Based on conservative yields of 65 t/Ha for sugarcane produced under South Africa's relatively dry conditions; this 6 million hectares could yield roughly about 400 million tonnes of cane per annum. If conventional (1<sup>st</sup> generation) and advanced (2<sup>nd</sup> generation) technologies are used, this could potentially yield 35-49 GL of biofuels (depending on the amount of sugarcane used for biofuels production), which represents about 20% of Africa's current total petroleum consumption (Van Zyl *et al.*, 2012). Africa thus has the potential of becoming another Brazil in terms of biofuels production and as a major technology provider South Africa is well positioned to play a key role of realizing this potential.

### **Conclusions**

A number of outstanding issues that require further technical and policy investigations are delaying initiation of the biofuels industry in South Africa. Even though the 2013 target of 2% biofuel penetration will be missed, the country is set to produce biofuels in excess of the originally set annual target when the overall enabling and supporting framework (mandatory blending regulations, pricing framework) takes effect. As much as the local biofuel industry is currently in its infancy stage, it does possess long term potential for growth and job creation.

Centres of excellence in biofuels research exist in South Africa. Harnessing its science and technology potential, economic power and strategic position at the southern tip of Africa, South Africa can change its role from being the main emitter of CO<sub>2</sub> in Africa to being the technology provider to set Africa on a future of sustainable development.

**References:**

1. Ambali, A., P.W. Chirwa, O. Chamdimba and W.H. van Zyl. 2011. A review of sustainable development of bioenergy in Africa: An outlook for the future bioenergy industry. *Scientific Research and Essays* **6**: 1697-1708.
2. IEA: Key World Energy Statistics 2012, 2011, 2010, 2009, and 2006 [http://www.iea.org/publications/freepublications/publication/]
3. Lynd, L.R., H. Von Blottnitz, B. Tait, J. De Boer, I. S. Pretorius, K. Rumbold, and W. H. van Zyl. 2003. Plant Biomass Conversion to Fuels and Commodity Chemicals in South Africa: A Third Chapter? *South African Journal of Science* **99**: 499 – 507.
4. Smeets, E.M.W., A.P.C. Faaij, I.M. Lewandowski, and W.C. Turkenburg. 2007. A bottom-up assessment and review of global bio-energy potentials to 2050. *Progress in Energy and Combustion Science* **33**: 56–106.
5. South African Petroleum Industry Association [http://www.sapia.co.za/industry-overview/fuel-industry.html].
6. Update on the Biofuels Industrial Strategy. Department of Energy (DoE), South Africa [http://www.innovationeasterncape.co.za/download/presentation18.pdf]
7. Winkler, H. 2005. Renewable energy policy in South Africa: Policy options for renewable electricity. *Energy Policy* **33**: 27–38.
8. Mapcruzin [http://www.mapcruzin.com/free-south-africa-maps.htm].
9. Watson, H.K. 2011. Potential to expand sustainable bioenergy from sugarcane in southern Africa. *Energy Policy* **39**: 5746–5750.
10. Lynd, L.R., J. Woods. 2011. Perspective: A new hope for Africa. *Nature* **474**: S20–S21.

## Reports and Research

### **United States Energy Department Announces Five-Year Renewal of Funding for three Bioenergy Research Centers** - Centers will receive \$25 million per year for innovative biofuel research.

On April 4, 2013, the U.S. Department of Energy announced it would fund its three Bioenergy Research Centers for an additional five-year period, subject to continued congressional appropriations. The three Centers—the BioEnergy Research Center (BESC) led by Oak Ridge National Laboratory, the Great Lakes Bioenergy Research Center (GLBRC) led by the University of Wisconsin-Madison in partnership with Michigan State University, and the Joint BioEnergy Institute (JBEI) led by Lawrence Berkeley National Laboratory—were established by the Department's Office of Science in 2007 to accelerate fundamental research breakthroughs toward the development of advanced, next-generation biofuels. [More...](#)

### **IEA says cellulosic biofuels capacity has tripled since 2010: new Task 39 global report**

The IEA Task 39 group publishes its latest report on advanced biofuels and how the global industry is progressing. The 207-page report entitled “Status of Advanced Biofuels Demonstration Facilities in 2012” contains detailed project summaries as well as summary tables that track the company, location feedstocks, products, capacity, project type (e.g. pilot, demo, commercial) and status (operational, closed or planned). [More...](#)



### **Cellulosic biofuels in the US: How much and how soon? 2014's Terrific Ten**

Although just the one pre-commercial-scale cellulosic biofuels facility is presently operating in the United States (KiOR's small commercial plant in Columbus, MS), at least ten projects exceeding 20 million gallons per year are expected to begin operations by 2014. Tristan R. Brown and Robert C. Brown at Iowa State University's Bioeconomy Institute at have prepared, for Biofuels Digest, a 5-page summary of commercial-scale cellulosic biofuels projects expected by 2014. [More...](#)

### **Report by PARTNER (MIT) analyzes the cost of meeting the US FAA biojet goal**

A new MIT report examines the cost to US aviation of meeting the FAA's aviation biofuel goal of consuming one billion gallons of renewable jet fuel (biojet) each year from 2018 onwards. This work models policy/technology scenarios and assumes HEFA (hydrotreated esters and fatty acids) biojet as the only source of biojet in the US while it considers interactions with RIN prices. Among the highlights is that biojet will require a premium (implicit subsidy) of \$0.35/gal to \$2.69/gal depending on whether a sufficient amount of fallow land is available for oilseed crops. This premium will have to be voluntarily covered by the aviation (and military) sector if they wish to stay committed to their FAA goal. [More...](#)

### **Bloomberg New Energy Finance Free Report: “US BIOFUELS IN 2013: STORIES TO WATCH”**

Last year's headlines were all about high corn prices, brought on by the United States' worst drought in 50 years. This year, the story of US biofuels can be boiled down to the collision of policies - with each other, and with reality. Policies that govern the use of US corn-based ethanol - one which calls for a minimum amount of consumption, and another which limits how much can go into automobile tanks - are set to collide in 2013. The relaxation of the cellulosic biofuels target was only the first of several critical choices that policymakers and industry players are facing this year. These conclusions are based on eight inter-related subplots presented throughout this report, which aims to encapsulate the dynamics in the US biofuels market. These involve new mandates, cellulosic biofuels outlook, Brazil, the 'blend wall', banked RINs, blending economics, US farmers, and politics. [More...](#)

### **Bloomberg report shows cellulosic biofuels are on track to achieve cost parity by 2016**

London, 12 March 2013 - Ethanol manufactured from non-food “cellulosic” feedstock is on course to be cost competitive with corn-based ethanol by 2016, according to an industry survey conducted by research company Bloomberg New Energy Finance. The survey collected data and predictions on the production

costs of 11 leading players in the cellulosic ethanol industry. All use a technique, commonly called enzymatic hydrolysis, to break down and make available the complex sugars in non-food crop matter, and a fermentation stage to convert the resulting sugars into ethanol. [More...](#)

#### **United States Energy Information Administration reports on cellulosic biofuel capacity**

On February 26, the Energy Information Administration (EIA) posted a report on its website estimating U.S. capacity for producing cellulosic fuels in 2013. The report notes that several companies combined to produce a little over 20,000 gallons of cellulosic fuels in 2012, and that output could grow to more than 5 million gallons in 2013. EIA further estimated that aggregate nameplate capacity for cellulosic fuels production in the U.S. could reach 250 million gallons by 2015, although the report noted that its past projections of cellulosic output have proven to be overly optimistic. [More...](#)

#### **Report shows progress by developing cellulosic biofuels industry**

The Advanced Ethanol Council has published a report profiling cellulosic biofuel projects under development in the U.S. and Canada. It also highlights efforts in China, Denmark, Germany, Italy and Spain. The paper clearly shows how much progress the industry has made since the United States' renewable fuels standard was amended in 2007 to include cellulosic biofuels. [More...](#)

#### **US CRS report overviews the Renewable Fuel Standard (RFS)**

On March 14, 2013, the US Congressional Research Service released a new Report titled "[Renewable Fuel Standard \(RFS\): Overview and Issues](#)". This report describes the general nature of the United States' RFS mandate and its implementation, and outlines some emerging issues related to the continued growth of U.S. biofuels production needed to fulfill the expanding RFS mandate, including the emergence of potential unintended consequences of this rapid expansion.

## In the News

### Policy and Regulatory Developments

#### **Big Oil calls for end of Renewable Fuel Standard**

Major oil companies called on Congress Wednesday to repeal the Renewable Fuel Standard, the six-year-old federal law mandating biofuels use that is the base of demand for both ethanol and biodiesel. The American Petroleum Institute, which represents the biggest oil companies, on Wednesday released a study purporting to show that the RFS and associated Renewable Identification Numbers (RIN)s used to track compliance, have added to the price of gasoline. [More...](#)

#### **Economist article "Difference Engine: End the ethanol tax"**

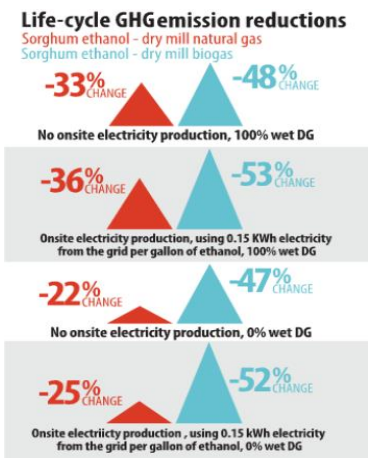
The uneasy relationship between America's corn (maize) farmers and its oil refiners is fraying at the edges. The source of the conflict is the amount of corn-derived ethanol to be blended into petrol as an oxygenator, to boost the fuel's octane rating (while also providing a generous off-budget subsidy for corn-growers). The farmers want the amount of ethanol used in petrol to be increased from 10% to 15% in each gallon sold at the fueling pump. The distillers argue that diluting petrol with that amount of ethanol would damage engines and leave them liable to lawsuits from motorists and manufacturers alike. [More...](#)

#### **Obama's new energy policy**

Major push from Obama administration on energy. From US DOE: "Liquid fuels demand can be sufficiently reduced so that biomass can meet all liquid fuel needs." A companion study released by the DOE was, in its way, more ambitious and more specific: "[The Transportation Energy Futures (TEF) [study] does not project that all liquid fuels will be eliminated from the future transportation sector, but rather that demand can be sufficiently reduced so that biomass can meet all liquid fuel needs." [More...](#)

### Final US RFS rule for sorghum pathways published

Grain sorghum ethanol now qualifies as a renewable fuel and, in some cases, an advanced biofuel, under the United States' renewable fuel standard (RFS). The U.S. EPA published the final rule in mid-December. According to the EPA, its analysis determined that when grain sorghum ethanol is produced at dry mill facilities fired with natural gas, the 20 percent greenhouse gas (GHG) emission threshold for renewable fuel is met, qualifying it for RFS compliance use. Where grain sorghum ethanol is produced at dry mill facilities that use specified forms of biogas to supply process energy and most electricity, the resulting fuel achieves GHG reductions of more than 50 percent, qualifying sorghum ethanol produced in this manner as an advanced biofuel for RFS compliance purposes. [More...](#)



### U.S. Congress revives biodiesel tax credit revived through 2013

Jan 2 (Reuters). The \$1 a gallon tax credit for biodiesel will run through 2013 at a cost of more than \$2 billion under a provision of the mammoth legislation passed by Congress to avoid the so-called “fiscal cliff”. In reviving the credit, lawmakers made the extension retroactive to its expiration at the end of 2011. It now is set to expire at the end of this year. [More...](#)

### Tracking the bioeconomy in the EU

About a year after it introduced its bioeconomy strategy, the European Commission (Brussels, Belgium) announced plans to launch a 3-year observatory to map the progress and impact of the strategy. The observatory, described in the EC's bioeconomy action plan, will gather data on the evolution of markets, national and regional bioeconomy policies, research and innovation capacities, and the scale of related public and private investments. The EC plans to make the data gathered by the observatory available to the public via a dedicated web portal beginning in 2014. Performance measures to be tracked will include economic and employment indicators, innovation indicators, and measures of productivity, social wellbeing, and environmental quality. Other components will include a “technology watch” and a “policy watch”. [More...](#)

### US invests in energy security

The White House (Washington, DC) released details of its “Blueprint for a Clean and Secure Energy Future” and encouraged the US Congress to consider proposals aimed at further reducing the country's dependence on oil, reducing pollution, and providing protection against spikes in gasoline prices. The Obama Administration called on Congress to establish a new Energy Security Trust, designed to invest in breakthrough research that will lead to better and less costly technologies to make America less dependent on foreign energy resources. The Administration's proposal would provide \$2 billion over a 10-year period to support the development of cost-effective transportation alternatives. [More...](#)

## Sustainability

### USDA Announces new conservation collaboration with DuPont to promote sustainable harvesting of bio-based feedstocks for cellulosic ethanol

JOHNSTON, IOWA, March 29, 2013. Agriculture Secretary Tom Vilsack announced a new federal-private collaboration with DuPont to safeguard natural resources on private lands used to supply bio-based feedstocks for cellulosic ethanol production. The joint agreement between USDA's Natural Resource Conservation Service (NRCS) and DuPont aims to set voluntary standards for the sustainable harvesting of agricultural residues for renewable fuel, and supports rural job creation, additional income for farmers, bio-based energy development, and the safeguarding of natural resources and land productivity. [More...](#)



## Industry News

### Neste oil uses tall oil pitch to produce motor fuel

Neste Oil is the first company in the world to begin using tall oil pitch as a feedstock for refining into motor fuel. Up until now, it has not been possible to use tall oil pitch, a residue produced by tall oil refiners, as a commercial-scale feedstock for fuel refining purposes. Neste Oil successfully tested tall oil pitch in commercial refinery operations and is now ready to begin using it on a continuous basis. Fuel refined from tall oil pitch will be distributed to service stations in Finland this spring. [More...](#)

### Abengoa begins operating the first demonstration plant using waste-to-biofuels (W2B) technology

Seville, April 1, 2013. Abengoa (MCE: ABG.B) has started operations at a demonstration plant that uses waste-to-biofuels (W2B) technology. The plant has a capacity to treat 25,000 tons of municipal solid waste (MSW), from which up to 1.5 million liters of bioethanol will be produced for use as fuel. [More...](#)

### Brazil doubles down on next-gen biofuels

BNDES invests \$294 million in GraalBio, adds \$137M in financing. Brazilian development arm takes 15% stake in cellulosic ethanol venture, and sweetens the deal with a low-cost loan for the first commercial project. In Brazil, BNDESPAR, the Banco Nacional de Desenvolvimento Economico e Social venture group, announced a \$294 million equity investment in GraalBio aimed at developing technology and projects in cellulosic ethanol and renewable chemicals. [More...](#)



### KiOR now shipping world's first cellulosic diesel from its first commercial plant

In Texas, KiOR announced the initial shipments of cellulosic diesel from its first commercial-scale facility in Columbus, Mississippi. KiOR's facility uses pine wood chips previously feeding a now shut down paper mill in Columbus and produces gasoline and diesel, the first renewable hydrocarbon fuels in the U.S. manufactured at commercial scale and derived solely from non-food feedstocks to avoid competition with human food needs. Unlike traditional biofuels like ethanol or biodiesel, KiOR's fuels have no compatibility issues. KiOR's renewable gasoline is also the first renewable cellulosic gasoline registered by the Environmental Protection Agency for sale in the U.S. [More...](#)

### Chemtex's Crescentino plant produced its first ethanol volumes; other plants are scheduled

In addition to the plant under commissioning in Italy, Beta Renewables has licensed its technology to Brazil's GraalBio Investimentos SA which expects the first of several planned plants to be mechanically complete by the end of the year and started up in early 2014. A Chemtex/Beta Renewables project in North Carolina has received a conditional \$99 million USDA loan guarantee. Ghisolfi said the company is still working through the planning details and hopes to begin construction in the third quarter. [More...](#)

### Abengoa's 25 MGPY Hugoton facility to start production by end of 2013

Abengoa Bioenergy is currently over one year into construction of one of the world's first commercial scale cellulosic ethanol facilities. Located in Hugoton, Kansas, this first of a kind facility is expected to be completed and producing fuel by the end of 2013. [More...](#)

### POET-DSM's 20 MGPY Project LIBERTY on track for start-up by end of 2013

EMMETSBURG. After walls started going up for its receiving facility and the Palo Alto County Supervisors approved rezoning for the POET/DSM Project Liberty facility on the southeast edge of Emmetsburg, Iowa, this project remains on schedule. The \$200 million plant is scheduled to begin production in late 2013. At peak capacity, this plant is expected to produce 25 million gallons of ethanol per year, all from corn stover - stalks, leaves and cobs. [More...](#)

### ZeaChem: Operations temporarily minimized at Boardman facility

There have been rumors flying around the industry in recent days regarding ZeaChem. Anything from "laying off 27 staff and shutting down operations in Boardman" to "the plant is going to get parted out and sold". Let's set the record straight. This, from ZeaChem's Director, Public Affairs, Carrie Atiyeh:

“Operations have been temporarily minimized at the Boardman plant - it is not being sold. We have recently proven our technology end-to-end with our first cellulosic ethanol production and are confident about quickly raising additional funds and re-starting production.” [More...](#)

#### **LS9: Change in command. The struggle to raise capital dogs a high-profile biofuels star.**

The company has been known for its awesomely promising technology, leisurely pace towards commercialization compared to synth-bio companies like Amyris, brutal fundraising struggles, and for its regular turn-over in CEOs. The original acting CEO, Doug Cameron, gave the reins to Bob Walsh in July 2007, who handed off to Bill Haywood in October 2008, and Ed Dineen arrived in December 2010. Now de Rooter appears, after serving several months as the company's chairman. The capital raises were relatively light along the way - the company always balancing the need for cash against maintaining valuations and “giving the company away”. [More...](#)

#### **Rentech to close Colorado demonstration unit, drop advanced biofuels R&D activities**

In California, Rentech announced plans to cease operations, reduce staffing, and mothball its research and development Process Demonstration Unit located in Commerce City, CO, and to eliminate all related R&D activities. As a result of these changes, Rentech will eliminate 65 employee and contractor positions in the Company's alternative energy segment during the first half of 2013. In addition, Rentech will attempt to sell its Commerce City PDU as well as approximately 450 acres of land it acquired in Natchez, MS for the development of an alternative energy facility. [More...](#)



#### **Ethanol producers respond to market conditions: Simple (no corn oil) ethanol plants struggle**

Beginning in summer 2012, the prices of ethanol and corn reached levels where production costs at relatively simple ethanol plants exceeded revenue. These simple plants, which are not able to recover corn oil, make up a diminishing portion of the ethanol industry. Reacting to the market conditions, several ethanol plants temporarily shut down. By January 2013, the number of idled ethanol plants had grown to at least 20. [More...](#)

#### **Shell, Iogen, Codexis and Raizen “in concert” in Brazil**

Using cellulosic sugar conversion technology developed by Royal Dutch Shell (The Hague, Netherlands) in collaboration with Iogen (Ottawa, Canada) and Codexis (Redwood City, USA), a planned facility to be developed by Raizen Energia (Sao Paulo, Brazil) will convert sugarcane residue into ethanol. The nearly \$102 million facility will be situated near a sugarcane mill in Piracicaba, Brazil, and will have an approximate capacity of 10.6 million gallons of ethanol/year. [More...](#)

#### **DOE awards \$10M to accelerate advanced biofuels, bioproducts**

In Washington, the U.S. Department of Energy announced more than \$10 million to five projects in California, Washington, Maryland, and Texas that will develop new technologies to convert biomass into advanced biofuels and bioproducts like plastics and chemical intermediates. These projects use innovative synthetic biological and chemical techniques to convert biomass into processable sugars that can be transformed into bioproducts and drop-in biofuels for cars, trucks, and planes. The awards announced on January 3<sup>rd</sup> 2013 will support projects led by collaborative teams, including universities, national laboratories and private industry. [More...](#)

## Upcoming Meetings & Conferences

### 21st European Biomass Conference and Exhibition

June 3-7, Copenhagen, Denmark

The EU BC&E covers the entire value chain of biomass to conduct business, to network, and to present and discuss the latest developments and innovations. From the organizers: “With this event, we will continue the biomass specialist's role as the leading technical platform covering all aspects of biomass from research to industry and markets. We also continue the industrial exhibition that brings biomass scientist and engineers together with the biomass industry.”

### The 17th International Symposium on Wood, Fibre and Pulping Chemistry of the Future 2013 (10<sup>th</sup> International Conference on Biofuels)

June 12-14, Vancouver, Canada

PAPTAC (Pulp and Paper Technical Association of Canada) is pleased to be hosting the 17th edition of the ISWFPC conference in Canada. Progress in technology and science for the advancement and transformation of the pulp & paper and forest industries is at the forefront of PAPTAC's objectives. As a leader in the dissemination of information on industry research and the improvement of operations, PAPTAC is excited to be playing an active role in the success of this international forum.

### The 10<sup>th</sup> (BIO) World Congress on Industrial Biotechnology

June 16-19, Montreal, Canada

The BIO World Congress on Industrial Biotechnology is the world's largest industrial biotechnology event for business leaders, investors, and policy makers in biofuels, biobased products, and renewable chemicals. BIO is excited to bring this conference to Montreal to highlight the industry's growth and its importance for generating green jobs, making greener products and cleaner processes all aimed at building a biobased economy.



For more events visit [www.task39.org](http://www.task39.org)

## IEA Bioenergy Task 39 Meetings

The following is a tentative schedule of Task 39 events and meetings over the course of the next two years. Please [contact us](#) for more detailed information:

- 2013 May 1, Portland, US, hosting cosponsored evening technical session at [35<sup>th</sup> SBFC](#).
- 2013 October 15-16, Nanjing, China, Bioenergy/Biofuels Symposium held in association with the International Academy of Wood Science AGM conference.
- 2014 January, Germany (Berlin): business meeting in conjunction with 11th BBE/UFOP International Congress on Biofuels; also joint workshop with Task 42.
- 2014 May-June, Sweden: business meeting and joint workshop with Task 43.