IEA Bioenergy

South Africa – 2018 update

Bioenergy policies and status of implementation

Country Reports

IEA Bioenergy: 09 2018

This report was prepared from the 2018 OECD/IEA World Energy Balances, combined with data and information provided by the IEA Bioenergy Executive Committee. All individual country reports were reviewed by the national delegates to the IEA Bioenergy Executive Committee, who have approved the content. General background on the approach and definitions can be found in the central introductory report[1] for all country reports.

Edited by: Luc Pelkmans, Technical Coordinator IEA Bioenergy

Contributors: Thembakazi Bali, South African National Energy Development Institute (SANEDI)

NATIONAL POLICY FRAMEWORK IN SOUTH AFRICA

In March 2011 the Renewable Energy Independent Power Producer Programme (**REIPPP**), a public procurement programme, replaced the Feed-in Tariff system, which was introduced in 2009. Qualifying technologies: onshore wind, solar PV, solar thermal, biomass solid, biogas, landfill gas and small hydro plants. A ceiling tariff level is established for each technology in the auctions. Winning bidders sign PPAs, which are guaranteed for a period of 20 years. As of 31 December 2017, 112 IPP projects with a capacity of 6,422MW were procured and 62 with a combined capacity of 3,773 MW are fully operational. The bidders offer prices for 20-year Power Purchase Agreements (PPA) with Eskom with governmental guarantees, with requirements on local content and black ownership.[2]

An Integrated Resource Plan (IRP) 2010–2030 was promulgated in March 2011. The IRP is an electricity infrastructure development plan based on least-cost supply and demand balance taking into account security of supply and the environment (minimize negative emissions and water usage). At the time, it was envisaged that it should be a "living plan" to be revised by the Department of Energy frequently. A first draft revision of the IRP was published for public comments in October 2016. In August 2018 a new draft Integrated Resource Plan 2018[3] has been published for public comments. The Plan would include a major increase of 15 GW renewable energy capacity (particularly wind energy and PV), as well as 8.1 GW new natural gas capacity and 1 GW new coal capacity. It does not include nuclear expansion (while the previous government proposed a 9 GW nuclear expansion).

For biofuels, the Industrial Biofuels Strategy (IBS) was published 5 Dec 2007 to stimulate a biofuels industry in South Africa (DME, 2007). In March 2011 the first Industrial Policy Action Plan (IPAP) of the South African Government was published, that amongst others, acknowledged that the biofuels industry has to be revitalized (the dti, 2011). Key milestones were identified, which included (i) mandatory blending and (ii) a price support/incentive mechanism for biofuels producer. Mandatory blending was

[1] Available at https://www.ieabioenergy.com/iea-publications/country-reports/2018-country-reports/
[2] https://www.africa-eu-renewables.org/market-information/south-africa/governmental-framework/
[3] http://www.energy.gov.za/IRP/irp-update-draft-report2018/IRP-Update-2018-Draft-for-Comments.pdf

gazetted by the Department of Energy on 23 August 2012: As of 1 October 2015, the minimum concentration for biodiesel blending would have been 5% v/v; for bio-ethanol blending minimum level of 2% v/v and maximum of 10% v/v (DoE, 2012). Furthermore, 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.

The Department of Energy gazetted the Draft Position Paper on the South African Biofuels Regulatory Framework that proposed an incentive of a guaranteed return on assets (ROA) of 15% for biofuels manufacturers on 15 January 2014 (DoE, 2014). The Department undertook to publish the Final Position Paper later, however, the paper has not been published. In the meantime eight licenses for major biofuel manufacturers have been granted or issued, that would already cover the proposed mandatory target for 1 Oct 2015. However, with the Position Paper not been published, none of the manufacturers have committed to build commercial plants yet and mandatory blending cannot commence yet. Unfortunately, the biofuels industry in South Africa remains in stalemate.

All renewable energy projects (including biofuels) qualify for an Accelerated Depreciation Allowance of 50:30:20 over three years.

A detailed description of all fiscal and non-fiscal supports for bioenergy development is available at: http://www.iea.org/policiesandmeasures/renewableenergy/?country=South%20Africa.

TOTAL PRIMARY ENERGY SUPPLY (TPES) AND THE CONTRIBUTION OF BIOENERGY

The total primary energy supply of South Africa in 2016 amounted to 5,880 petajoule (PJ). This is dominated by fossil fuels, particularly coal (4,108 PJ), and some lower shares of oil products (901 PJ) and natural gas (185 PJ). There is also a limited share of nuclear energy (164 PJ). Renewable energy sources have a share of 9.3% or 545 PJ – 8.7% bioenergy and 0.6% other renewable energy sources.

Compared to 5 years earlier (2011) the share of coal products, oil products, natural gas and nuclear energy remained rather stable. The share of bioenergy was also stable; other renewable energy sources increased from 0.2% to 0.6%.

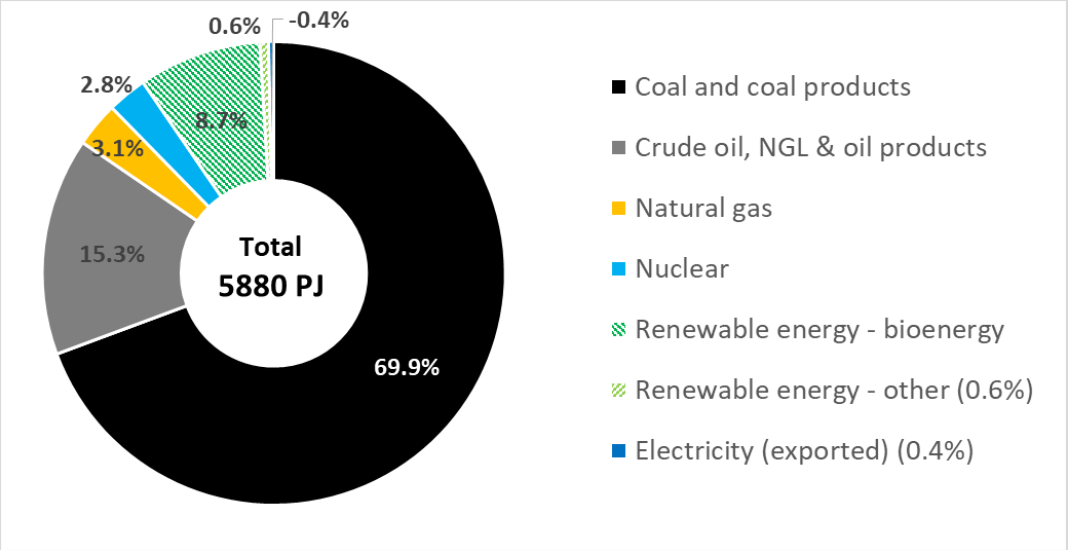

Figure 1: Total primary energy supply in South Africa in 2016 (Source: World Energy Balances © OECD/IEA 2018)

Over 93% of the total primary energy supply of renewable energy sources is covered by energy from biomass (509 PJ); the remaining 6.5% is split between solar energy (19 PJ), wind energy (13 PJ), and hydropower (3 PJ).

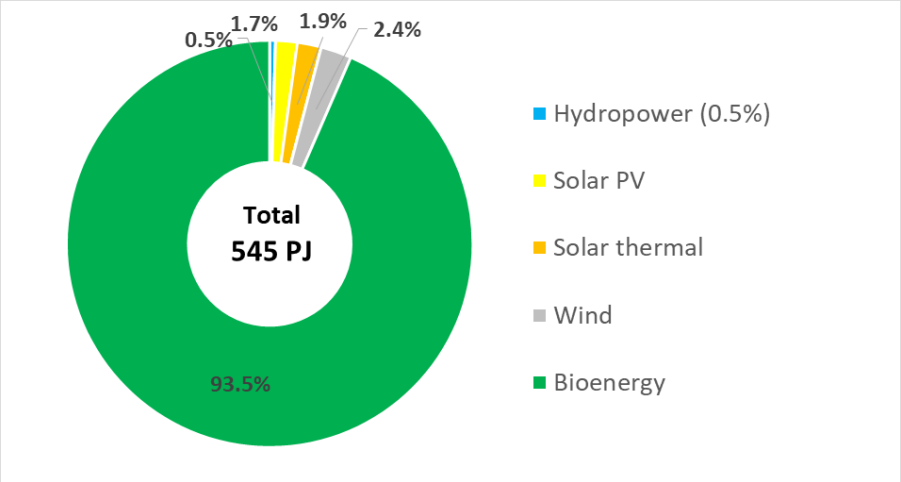

Figure 2: Total primary energy supply of Renewable Energy Sources in South Africa in 2016 (Source: World Energy Balances © OECD/IEA 2018)

All of the bioenergy consumed in South Africa comes from solid biofuels (517 PJ), of which 274 PJ primary solid biofuels and 34 PJ charcoal are used in residential applications. This is mostly used in traditional way (cooking, heating, open fire); modern boilers are not common. There is a net export of 10 PJ charcoal.

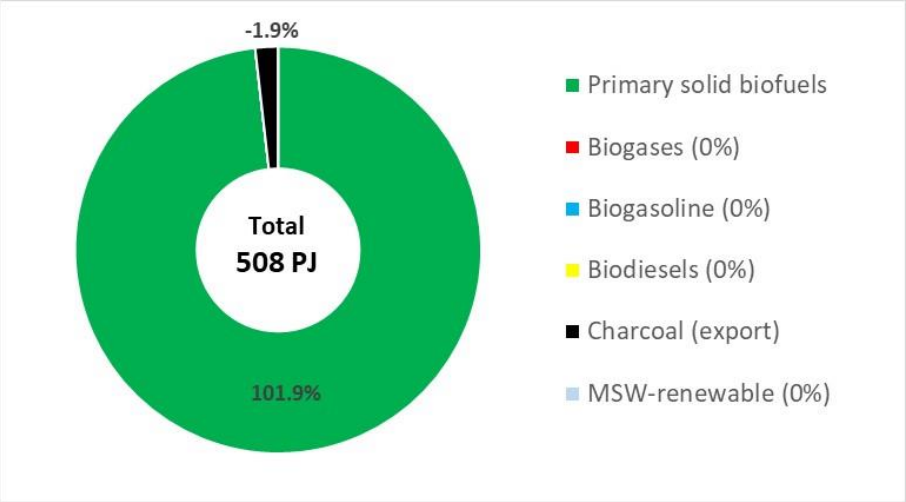

Figure 3: Total primary energy supply from bioenergy in South Africa in 2016 (Source: World Energy Balances © OECD/IEA 2018)

Bioenergy consumption in South Africa is assumed to be stable around 515 PJ in the past 15 years – mind that these are estimations. In the full period, the sole source was solid biomass; biogas, liquid biofuels or renewable MSW were not reported.

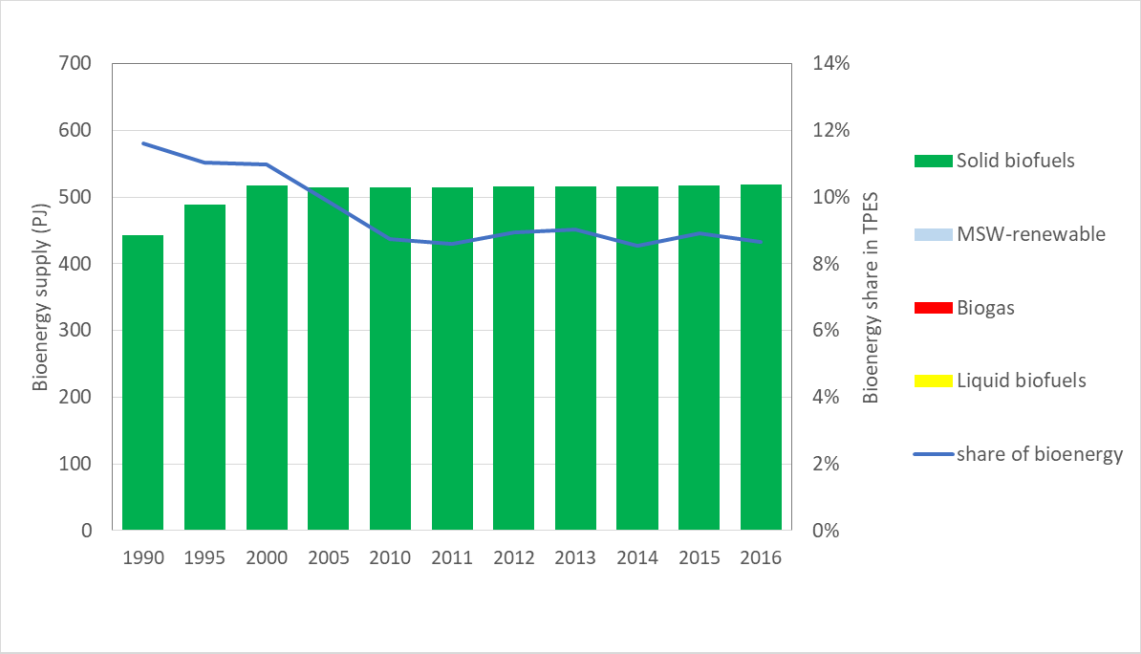

Figure 4: Development of total primary energy supply from bioenergy in South Africa 1990 – 2016 (Source: 2018 World Energy Balances © OECD/IEA)

Table 2 expresses the 2016 TPES figures per capita, considering South Africa's population of 55.9 million people. Compared to the other 22 member countries of IEA Bioenergy (expressed per capita), South Africa ranks halfway for the use of solid biomass for energy. Liquid biofuels, biogas and renewable MSW for energy are underdeveloped in South Africa compared to the other countries.

***Table 1**: Total primary energy supply per capita in South Africa in 2016*

	GJ/capita
Total energy	105.2
Bioenergy	9.1
Solid biofuels	9.3
Renewable MSW	0.0
Biogas	0.0
Liquid biofuels	0.0

Role of bioenergy in different sectors

South Africa has a low share of renewable electricity, reaching 3.1% of total electricity production in 2016. Only 0.1% is produced from biomass; wind and solar PV together represent around 2.7% of electricity production.

There is no reporting of biofuels consumed in transport.

The direct share of biomass for heating in the different sectors together is around 27%. In the residential sector, biomass represents 66% of fuel use.

Table 2: *Role of bioenergy and renewable energy in electricity production, transport energy consumption and fuel/heat consumption in 2016*

Sector	Share of bioenergy	Share of renewable energy	Overall production/ consumption
Electricity production	0.1%	3.1%	249 TWh (898 PJ)
Transport energy (final consumption)	0.0%	0.05%	787 PJ
Overall fuel and heat consumption[4]	27.0%	27.0%	1,251 PJ

Source: World Energy Balances © OECD/IEA 2018

RESEARCH FOCUS RELATED TO BIOENERGY

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 University of the North West and University of Cape Town) and bioethanol from biomass (Stellenbosch, Rhodes, Free State Universities). Significant progress has been made in the conversion of cellulosic feedstocks, such as agricultural residues, to biofuels at Stellenbosch University.

When advanced second generation biofuel technologies come to fruition and 50% of the residual lignocellulosic biomass (almost 50 Mt on an annual basis) is used, biofuels could play a significant role in South Africa's transport fuel future (Lynd et al., 2003). If integrated BtL (biomass-to-liquid fuels using both biochemical and thermochemical processes) technology is used, the contribution from biofuels could represent 25% from agricultural residues, 8.2% from forestry residues, 26% from burned grasses, and 10.8% from invasive plants. The production of biofuels from 50% of lignocellulosic biomass available could potentially replace 70% of current fossil fuel usage, which would far exceed the expectations of the IBS if advanced second technologies come to fruition (ASSAf, 2014).

RECENT MAJOR BIOENERGY DEVELOPMENTS

The Waste to Wing feasibility project, aimed at ascertaining the viability of waste-based sustainable aviation biofuel production and consumption in South Africa, started in January 2018. The project is a collaborative effort between Cape Town-based enterprise development specialist Fetola, who also acts as consortium lead, Amsterdam-based sustainable aviation fuel specialist SkyNRG and WWF-SA. The project is set to run until the end of 2020 and will act as a proof of concept to identify possible issues and find corresponding solutions regarding biojet fuel production and supply. Waste to Wing has received financial support from the European Union's Switch Africa Green Programme of €1.2-million. http://www.engineeringnews.co.za/article/biojet-feasibility-project-under-way-2018-08-01/rep_id:4136

Renewable energy and waste disposal solutions provider Global Energy has constructed a fully operational biogas demonstration plant, which has been specifically developed for application in Africa. The plant aims to showcase the potential for biogas in South Africa and demonstrate the capabilities of

[4] This includes final consumption of fuels and heat in industry, the residential sector, commercial and public services and agriculture/forestry. Transport fuels are excluded. Energy used for transformation and for own use of energy producing industries is also excluded.

this new technology. The plant is producing biogas for the generation of electricity, and is in final commissioning stage (dd August 2018). It uses discarded organic produce from the farm as feedstock for the biodigester, processes 2.5 t/d of organic waste and is fully scalable up to 1 MW. http://www.engineeringnews.co.za/article/biogas-plant-demonstrates-potential-using-new-tech-2018-08-01

LINKS TO SOURCES OF INFORMATION

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Market information and governmental framework renewable energy in South Africa: https://www.africa-eu-renewables.org/market-information/south-africa/

Draft Integrated Resource Plan 2018: request for comments: http://www.energy.gov.za/IRP/irp-update-draft-report2018/IRP-Update-2018-Draft-for-Comments.pdf