An introduction to BIOSSAM
– the South African BIOenergy Systems Sustainability Assessment and Management portal

The global bioenergy industry is advancing rapidly. New technologies and potential feedstocks are being proposed that aim for bioenergy to contribute to a wider range of economic, social, and environmental objectives. However, these advancements all require tradeoffs between potential technical advantages, and socio-economic and environmental consequences. Despite technological advances, a number of project failures have been noted with the development, design and implementation of such renewable energy systems in Africa.

The problems that need to be addressed are:

• How to screen bioenergy options based on technical feasibility, economic and financial viability, and social and environmental acceptance. This should be a first phase to prioritise and choose from the potential range of bioenergy options, in terms of their robustness and resilience;

• How to best implement technically feasible solutions, in an integrated manner, within the country’s prevailing political, socio-economic and social-ecological systems; and

• How to monitor the implementation of bioenergy programmes to ensure the sustainable adoption and operation of the chosen options.

The main problem is, therefore, how to ensure that policies and decision-making on bioenergy options result in localised social-ecological advantages that outweigh disadvantages. The complex behaviours that both socio-economic and ecological systems exhibit exacerbate this problem, primarily because of the fundamental uncertainty associated with them; these behaviours must be recognised and approaches are required to assess and manage behavioural uncertainties in a sustainable way. Therefore, both public and private sector policy-makers, decision-makers, and technology developers, operating from the regional and national levels to the local level, require robust methods to
guide structured assessments and the subsequent management of proposed bioenergy systems; before they can make sound recommendations relating to bioenergy supply interventions.

In other words, developed methods must be practical for all levels of policy- and decision-makers, and technology developers, yet they must ensure that the sustainability of the integrated bioenergy supply systems are assessed comprehensively; appropriate information must be provided on technical, financial, socio-economic and environmental considerations so that the users can take informed decisions that lead to sustainable bioenergy interventions.

The BIOenergy Systems Sustainability Assessment and Management (BIOSSAM) portal, which is the outcome of a three-year parliamentary grant to the CSIR, aims to provide the comprehensive and holistic assessment, monitoring and management of bioenergy interventions in order to plan for sustainable development. BIOSSAM is a participatory and transparent process to decision-making that involves multi-stakeholder engagement coupled with expert and public opinion.

This helps to ensure stakeholder buy-in as well as general trust brokering that facilitates the process of technology transfer and increases the long-term success of bioenergy interventions. The BIOSSAM portal (www.biossam.org) is an information hub and an analytical framework with a toolbox of decision-support systems for the assessment, monitoring and management of bioenergy for sustainable development.

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Efficiency energy management for SMEs in Southern Africa

There has been a growing worldwide interest in efficient energy management to reduce operation costs and improve the competitiveness of Small and Medium Size Enterprises (SMEs). Despite recent reductions in aggregated energy intensity of GDP in Southern African Development Community (SADC) member countries, the SME sector has fallen behind larger industry benchmarks in terms of productivity, technology upgrading and energy efficiency (EE). The SME sector in the Southern Africa Region is experiencing high and rising energy costs, while facing increased global competition. Price and cost pressures are of increasing significance for SMEs’ survival.

In the past, wide-ranging governmental programmes and other donors’ interventions have been targeting SMEs to address technology upgrading and adoption of clean production practices, but they have not yet focussed on energy management. The Centre for Development Enterprise (CDE) recognises that access to affordable and reliable energy services is a prerequisite for economic development. SMEs, especially those for whom energy costs represent a large portion of total production costs, can reap especially high direct economic benefits from improved efficiency of energy usage and reduction of energy wastage, yet numerous barriers and market failures have prevented widespread adoption of energy management best practices.

Many SMEs in the SAF region are energy-intensive, employing inefficient and obsolete technologies and operational modalities that endanger their competitiveness and future growth. Investments in cost-effective EE measures would therefore improve their productivity and bottom-line profits. Despite the financial attractiveness of these types of investments and several efforts to support the development of EE investment projects as well as the deployment of technical assistance to deliver EE services, only a small number of projects have actually been implemented in the SME sector.

The most significant of these barriers is a technical one: SMEs generally lack the technical resources/capacity necessary to perform a sound analysis of what can be achieved at the enterprise level to reduce energy cost permanently. This is the reason why the CDE launched in 2007, the Efficient Energy Management Programme (EEMP) benefiting ACP enterprises. The CDE EEMP is an initiative conceived to provide best-practice tools and advice to a number or selected SMEs for the improvement of their energy management system. The programme is focusing on critical and practical aspects of the energy management at SMEs: how they can control the use of energy resources in a systematic and methodical way to improve the profitability of their activities. Among the selected enterprises, it has shared best practices, actions and principles that can give concrete results, and some ‘guidance’ principles leading to a sound energy management. It was thus successful in overcoming the technical barrier for a significant number of SMEs.

More precisely, during EEMP Phase I in SAF region, energy audits have been performed in 20 enterprises in four participating countries, namely: Botswana, Mozambique, Namibia and Zambia. These ‘walk-through audits’
aimed at identifying sound opportunities of energy savings and raising awareness of SME managers to (i) explain the scope and usefulness of energy consumption diagnosis and (ii) introduce to top management an Energy Saving Action Plan aimed at structurally reducing the use (and thus the cost) of energy in their enterprise. The beneficiaries were officially invited to the CDE EEMP Regional Workshop, a high-level meeting of enterprises and key regional stakeholders including Governments, donor agencies as well banking sector representatives.

During the workshop, the participants noted the importance of keeping them informed on energy-saving opportunities that this programme created. Namely, enterprises expressed the willingness to go forward with energy-saving measures, financial institutions manifested their willingness to support these efforts through special credit lines, governments clearly stated their desire to act in synergy with the results of the programme, and business association pledged their supporting to networking efforts aimed at scaling-up the results of the programme.

This meeting was also an occasion to solidify the CDE Business Model with regards to the efficient management of energy. The Business Model is represented by the figure below.

The second phase of the CDE EEMP will closely follow this business model, both for SMEs which have received initial assistance and for new SMEs.

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Nuclear programme is a true opportunity for South Africa

The nuclear programme is an opportunity to boost growth at times of economic downturn, create hundreds of thousands of permanent jobs, develop vibrant, high-tech industries and research capacities, improve balance of trade from value-added products, and meet future electricity demand in an environmentally friendly, affordable way.

A nuclear programme will oblige us to train not only post-graduates and engineers but also technicians, artisans and workers. The quality requirements of the nuclear industry necessitate the highest skills in all competencies, thus creating skilled and well compensated jobs. Skills developed during the course of development of the nuclear programme are portable and will benefit greatly to other technology intensive and specialised industries in South Africa. Skills development in partnership with universities will also lead to more R&D capacity in South Africa.

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INTRODUCTION

Established in 1986, MLT Drives is a respected and trusted brand throughout the alternative energy market. With a cutting edge research lab boasting 10 Electrical Engineers from world-class universities, MLT Drives continues to be at the forefront of the alternative energy industry.

MLT Drives wants to be the preferred source for inverter systems implemented in alternative energy systems especially in the upcoming African markets, with a constant dedication towards maximizing service levels and product upgrades the company houses the right values to remain a trusted and successful brand within a growing industry.

MOBILE POWER PLANT SYSTEMS IN ELIM

The Nuwejaars Nature Reserve Awarded MLT Drives a 2 million rand micro power plant project which has recently been completed. The project included 4 sites for a micro power plant next to the wineries of 4 of the most respected wine farms in South Africa. The Black Oyster Catcher, the Strandveld, the Berrio and the Zoetendal can boast that solar and wind energy was used to produce their wine.

Each micro power plant consists of a 20 ft container capable of producing 24 kW of renewable energy. PV is mounted on the container within a day and works in conjunction with a wind turbine within 10 meters of the container. The container serves as an affordable, secure, robust and mobile equipment enclosure.

Each micro power plant supplements energy sourced from the grid. Energy leaves the system via either the Uninterruptible Power Supply (UPS) line which provides conditioned backup power. The UPS line can output 24 kW from the source (Eskom) and 24 kW from a combination of the solar, wind and batteries.

The power star inverter is grid tied and bi-directional. It can export and import power seamlessly on the source line. The 24 kW inverter houses an internal 5 kW MPPT solar regulator which can be used in conjunction with external MPPT regulators.

The 4 sites are accessible for real time and historical data acquisition and control. An online billing system is available to the managers of the sites. The online system allows for accurate analysis of over 100 data channels as well as custom billing information.
GRID TIED INVERTER SYSTEMS AT VILLIERA WINERY

Villiera Wines, Stellenbosch, has just become the largest solar PV plant with a grid tied inverter (GTI) system in Southern Africa. The wine farm has 130 kW of solar panels feeding two Afrisun70 GTI inverters made by MLT Drives. Villiera winery was already the winner of the prestigious ‘Overseas Plan A Award’ award by Marks and Spencer UK for, among other things, their eco-friendly wine production.

Energyworx subcontracted MLT Drives to supply the inverters for this project – which has show cased the AfriSun70 in the largest solar installation in Southern Africa.

The AfriSun70 converts high voltage electricity produced by solar PV panels into high quality AC power and feeds it into the grid. The AfriSun70 can also be used in off grid applications.

Graphs of daily, weekly, monthly and total energy production are stored for years and can be displayed on the inverter’s touch screen.

This 70KVA grid tied inverter from MLT Drives is a 3-phase PV inverter for large grid tied or off grid PV power plants. The AfriSun70 is a reliable and affordable system that can be used with polycrystalline and monocrystalline photovoltaic solar panels. To maximize power harvested from the PV array the inverter has intelligent features that allow reliable and balanced export power at all times.

Easy integration is possible through versatility. Various types of PV configurations can be connected as the system has a wide input voltage operating range. A comprehensive monitoring system allows account of every watt harvested so that an accurate return on investment can be presented. Graphs of daily, weekly, monthly and total energy production are stored for years and can be displayed on the inverter’s touch screen.

The AfriSun70 boast small mass for the inverters capacity 310kg / 70 kW making the inverter easily wall mountable for professional looking installations.

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In business we are familiar with the concept of ‘return on investment’. This is what drives much of our decision-making. However, a new pressure is emerging that will play an increasingly important part in our analysis of business opportunities and business performance.

Dr Chris Cooper, a Central Energy Fund (CEF) corporate planner and a SANEA board member, did a presentation on Energy Returns on Energy Investments (EROEI). Some commentators believe this to have been in excess of 100:1 for oil from the super giant oilfields, particularly of the Middle East, while new fields are believed to have EROEIs of only around 15:1. We need to consider our ability to maintain and grow energy flows at a time when resource quantities and qualities are declining.

Stresses are also becoming evident in coal and gas. Most alternative energies have an EROEI of below 10:1. For bioethanol from maize a ratio of 1.8:1 is considered excellent. Some preliminary analyses indicate that it will not be possible for us to maintain the current industrial society at ratios below a level of 10:1. If this estimate is correct then serious effort will be required to understand the implications on society and how we need to restructure economies.

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The Academy of Science of South Africa (ASSAf) hosted the sixth African Science Academy Development Initiative (ASADI) conference on 9 – 10 November 2010 at the Lord Charles Hotel, Somerset West. This year’s theme was ‘Improving Energy Access in Sub-Saharan Africa.’ The ASADI VI conference attempted to cover topics as broad as traditional versus more modern forms of energy; who has access to energy and why; how to bridge the energy access gap between rural and urban areas; affordable and sustainable access to energy; and universal energy access as a goal towards social and economic development.

The African Science Academy Development Initiative (ASADI) was launched in 2004 by the United States National Academies and is funded by the Bill & Melinda Gates Foundation. ASADI is a 10-year effort aimed to improve the African science academies to provide independent, evidence-based advice to African government policy makers and the public especially in improving human health. The grant primarily supports the science academies of Nigeria, Uganda and South Africa. Modest support is provided to Cameroon, Ghana, Kenya and Senegal as well as regional African Academy of Sciences for strategic planning purposes. In addition to capacity building at the national levels of the above countries, the annual conference is intended to increase cooperation amongst the academies, strengthen their relationship with policy-makers, and improve the understanding of evidence-based policy advice.

The Energy, Poverty and Development Group (EPD) at the Energy Research Centre (ERC), University of Cape Town, were approached to compile the ASADI VI publication for policy makers on energy access entitled ‘Turning science on: Improving access to energy in sub-Saharan Africa.’ The booklet introduces the topic area of energy access, outlines energy’s role towards human and economic development, links its importance towards achieving the Millennium Development Goals (MDGs) as well as climate change objectives, discusses biomass, modern fuels, renewable energy and electricity, offers examples of energy interventions in Africa, and concludes how science academies can assist national governments to address energy access.

For more information on ASADI and for a copy of the newly released booklet please go to the ASSAf website: www.assaf.org.za.

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INTRODUCTION
Prof. Philip Lloyd attended the conference, the second of its kind. The opening function was a cocktail party in the wonderful International Convention Centre, Gaborone. There was an opportunity to chat to many old friends and make a few new ones, while admiring the splendid spaces of the Centre and its gleaming marble.

FIRST SESSION
The Permanent Secretary of the Ministry of Minerals, Energy and Water Resources, Mr Gabaake G.Gabaake, opened proceedings. He reflected on progress made since the 2007 Conference:

At the last conference we were talking about an impending power crisis in Southern Africa, particularly in Botswana. The power crisis has since become a reality... In 2007 the expansion of the Morupule Power Station was being planned. Today the expansion of the Morupule Power Station to produce an additional 600 MW is ongoing with commissioning scheduled for 2012. The project is currently 35% complete. Associated with the expansion of the power station is the expansion of the Morupule Colliery from a capacity of about 1 million tonnes to about 3 million tonnes per annum. Work on the colliery expansion has started.

Many commented on the directness of the Botswana approach, in contrast to the continual review of plans that characterises the South African approach to the same problem.

Gabaake also spoke of developments in exploration:

In the exploration scene, as at end of June 2007 there were a total of 115 Prospecting Licences granted for fossil fuels (coal and coal bed methane). The number of licences has since increased to 259 as at end of June 2010. – - It is, I believe, a reflection of our effort in promoting our mineral resources, our competitive mining code and the leverage offered by conferences such as the one we are attending.

Again, there was favourable comment, contrasting the transparent stance taken by the government of Botswana with the ever-shifting stances and occasional extraordinary decision within the South African Department of Mineral Resources.

Lovemore Chilimanzi, of the Botswana Power Corporation, described the problems the corporation had faced over the past few years. The system owned 153 MW of capacity and had rented 70 MW of diesel generation. Maximum demand was 553 MW in 2009, and had grown at 10% per annum in recent years. 74% of the supply was presently from Eskom, but this would reduce to nil by 2013. 90 MW diesel-fired gas turbines would come into operation at Orapa in October 2010, and the main power station, Moropule, was being upgraded to 600 MW with the first 150 MW unit commissioned by October 2012 and the last by July 2013. Post 2013 there would need to be more capacity. A second 600 MW at Moropule; 1200 MW at Mmamabula (contingent on some South African off-take); 300 MW at Mookane (IPP); 250 MW of open cycle gas turbine fuelled by coal-bed methane (uncertain at this stage); and 200 MW of concentrated solar power (bankable feasibility study in preparation) were all being studied. Extensive modifications to the grid were necessary to handle this additional power. Demand side management has already saved 35 MW through CFL’s, and 8 MW through the timing of water pumping; while 30 MW should be saved through load shifting of domestic geysers (programme beginning shortly).

Moleke Mohaja of Debswana and Etienne Bredell of Fluor then gave a joint paper on the Moropule expansion. At present the mine has a nominal capacity of 1Mt/a. The new power station will increase demand to 2.8Mt/a. The owners (Debswana) were expanding the mine and infrastructure, and Fluor as EPCM was doing surface works. Construction had just started, and handover was expected in November 2011.

Alan Golding, Analytika Holdings, described developments of many of Botswana’s coalfields. Dukwe (>200Mt), Sowa (>1200Mt), Lechana/Tshoyapula (674Mt), Moropule/Kgaswe (915Mt); Moijabane (>300Mt) and Takotakwane (300Mt) had all been the subject of extensive drilling over the past few years, and the tonnages given are indicated reserves; inferred resources seem at least 20 times the size. With other known coalfields taken into account, the total resource approached...
300bt – which should be seen in the context of a global reserve of some 850bt.

Philip Lloyd then presented a paper for Derek Taylor, former Energy Advisor to the EU, on coal, climate change and carbon capture and storage (CCS). He stressed how many countries still relied heavily on coal. Across the EU, 30% of the electricity generated was from coal combustion – although countries like Poland derived up to 90% of the electricity from coal. World coal consumption was increasing and had increased 50% over the first decade of this century. Globally, coal now enjoyed a larger share of primary energy supply than ever before. EU production of hard coal was around 154Mt/a and the reserve to production ratio was about 240. Production of lignite was around 425Mt/a and the reserve to production ratio about 120. In spite of this, the EU imports about 40% of the coal (hard coal + lignite) that it burns, primarily from Russia and South Africa. Coal is seen as an affordable source of energy, and provides security as it is a local resource. But over 80% of the EU CO2 emissions arise from energy, and there is now a law calling for 20% reduction by 2020. The emission trading scheme may help, but the magnitude of the problem is such that it seems CCS is inevitable. There are, however, major hurdles to be crossed before CCS becomes viable on the necessary scale.

Nathan Mitche of Tlou Resources spoke on coal-bed methane (CBM) exploration in Botswana. His company specialised in drilling for CBM and had much success in Australia, India, China and the US. Prospects in Botswana included:

- Tasama in the far NE of the country, bordering on Zimbabwe, 5 holes drilled, all positive, depths 400 – 680 m, coal thickness 60-81 m.
- Karoo West, about 50 km north of Gaborone, 2 holes to 700 m, results not yet in.
- Karoo Central, about 100 km north of Gaborone, 5 holes, all positive, depths 480 – 720 m, coal thickness 14-28 m.

The resource could be 23 tcf, but will require further investigation to quantify to SAMREC standards.

Rosemary Falcon of Wits, founder of the Fossil Fuel Foundation (FFF), gave her talk on spontaneous combustion. All coals were at risk, but not all coals do. Shipment losses had caused banks and insurers to take a much more stern view of the problem, and had introduced a code of practice for shipping coal. Spontaneous combustion occurred because the heat built up within a heap or block of coal. Causes of heating included oxidation and wetting (due to the heat of adsorption). Below 40 deg C, there was no heating; between 45 and 50 deg C adsorption of oxygen commenced; runaway occurred between 50 and 80 deg C. There were qualitative indicators of spontaneous combustion risk, and she presented a case study where prior risk assessment had been borne out in practice.

Tebogo Segwabe from the Geological Survey reviewed the conditions under which exploration licences were granted in Botswana. There were five mineral categories, namely energy, precious stones, metals, radioactive substances and industrial minerals. If an application was formulated carefully, then a licence would be granted within 60 days. An exploration licence was valid for 3 years in the first instance, and could be renewed twice for 2 further years each time. The licence holder was required to submit quarterly and annual reports on progress. These reports remained confidential while the exploration licence was current. Thereafter they formed the database of geological knowledge held by the Department.

Jonathan Vergeer gave an outline of the further development of Moropule. The mine had a reserve of 425 Mt (measured, indicated and inferred) and a total resource of some 2.9 billion tons. The mine to support a further 600 MW power station (in addition to that described earlier) and provide for some export coal would have an output of 8.5Mt/a. After washing this would yield 5Mt/a of export quality material, which it was hoped to export via the Trans-Kalahari railway that in turn would feed a new port (two sites had been identified on the Namibian coast). It would also yield the 2Mt/a needed for the new power station. The mine would probably be an underground mine, but if adequate export contracts could be assured, then an opencast mine would be developed, which would make better overall use of the resource.

Celia Barbosa of Inspectorate M&L gave an impassioned plea for exploration to consult with the analytical laboratories before finalising their sampling programme. For instance, an abrasivity test typically required 4kg of material of +4.75mm size, and few sampling programmes were designed to yield such a large sample. She gave an example of a typical sample preparation and analytical scheme for coal samples.

Steve Martin, of Karoo Sustainable Energy, brought the first day to a close with a review of some alternative energy options. KSE had won a contract to provide 90 MW of open cycle gas turbine power at Orapa. The turbines were being installed as he spoke. A second phase would be 180 MW of gas turbines fuelled by coal-bed methane, which would start in 2012. They owned ~6.2tcf of gas, and had pledged 1.5tcf to support the turbine project. That was sufficient gas for approximately 1000 MW for 20 years. The company was also looking at an Integrated Gasification Combined Cycle (IGCC) plant for clean combustion of low-grade coal. They proposed to use a circulating fluidized bed gasifier for this.

On the second day, Mike Nightingale (Nightingale Africa Partnership) started the ball rolling with a proposal to maximise use of Botswana’s energy resources by close integration of coal, coal bed methane and underground coal gasification. It should be possible to turn Botswana’s resources into an industry that would make it the energy hub of the sub-continent.

Alan Golding returned with an excellent paper on the rationale for introducing underground coal gasification into Botswana. There were extensive coal resources which were probably too deep to permit ready exploitation by conventional mining. Gasification technology had improved markedly in recent years, and opened up the possibility of relatively clean power generation. Moreover, the utilization of the resource was significantly higher than extraction of the coal bed methane.

Clyde Foster of Megachem spoke on coal-to-liquid processes. Pyrolysis at low temperature yielded reasonable liquids at minimal cost; increasing the temperature reduced the liquid flow significantly, but yielded coke from coking coals. There were a number of direct liquefaction processes, all of which involved adding hydrogen to coal. The first commercial plant was about to be commissioned in China. It was also possible to co-process coal and heavy oils with hydrogen under similar conditions. Finally, there was indirect lique-
faction such as Sasol's Fischer-Tropsch or the Mobil methanol-to-gasoline project. However, it had to be noted that the emissions from the indirect routes were high.

Robert Godbolt, of Scientific Drilling, gave a fascinating exposition of modern directional drilling technology. Various down-the-hole tools were available to coax the drill from the vertical and to follow coal seams through faults and dips. He gave examples of where drill holes had intersected in a perfectly controlled way. Drill motors that were an integral part of the drill string were driven by the drilling mud used as a hydraulic fluid.

Julian Scales, from Kalahari Energy, described the exploration for coal bed methane. There was an estimated 280 tcf in place, of which 40 to 60 tcf was recoverable. In comparison with other CBM provinces, Botswana was characterised by relatively low gas contents (<100 cu ft/t), low permeability (1-10 mD), but good total yield per well (1-2 Bscf/well). There had been much hurried exploration initially; now progress was more focussed, aimed at improving the estimates of the resource and the rate at which it could be tapped.

David Farr, of Exploration Geophysics, read an excellent paper on the use of explosive penetration of well casings to gain access to the methane-bearing strata in CBM production. There were several ways in which this could be done, by physical drilling; by water-jet erosion or by shaped-charge explosives. The explosive method had a number of advantages – it was very rapid, very precise, and could create a clean hole as much as 1.5m deep into the rock. This facilitated the introduction of proppants and ensured good flow conditions from the production horizon.

Finally, Philip Lloyd spoke on the opportunities for natural gas in Southern Africa. The finding of large quantities of CBM made it necessary to start looking at optimal ways of turning the resource into good account. A wide range of potential uses was explored. There was comparatively little that could be done with it in Botswana at its present state of development, which suggested that opportunities should be sought outside its borders. Details of the Temane-Secunda pipeline were given. It was 845 km long, 25 cm in diameter, and yielded 1.5EJ/a. Such a pipeline from the Botswana gas fields would reach almost to Durban. The most profitable prospect appeared to be the use of the gas to prereduce iron oxide near the iron ore mines of the Northern Cape. This would increase the value that could be shipped down the Sishen-Saldanha rail and from the Saldanha port.

This was a very successful conference, with lots of opportunities to interact with the delegates. There was high-level representation by the Botswana government. The developments in Botswana are making it apparent that this could become the source of energy for much of the subcontinent in the near future. The proceedings are available on CD from the Foundation.

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Cabinet held its ordinary meeting in Cape Town on 10 November 2010.

Cabinet noted and supported a hybrid funding solution to enable Eskom to continue with its Build programme to ensure the security of supply of energy. The hybrid solution consists of increasing the guarantee framework from R176 billion to R350 billion to enable the utility to continue with its committed Build Programme up to Kusile Power Station and an equity injection of R20 billion over three years starting in the 2011/12 financial year. The equity injection of R20 billion will be funded through the Minister’s Committee on the Budget as part of the budgeting process.

Cabinet approved the fourth edition of the Development Indicators (2010) report. The report shows two major trends i.e. the negative impact of the global recession on employment, poverty and equality and illustrate that there are areas where state performance still requires improvement. The development indicators will sharpen the country’s ability to assess the impact of government policies and improve planning. The report, which will be published shortly, is expected to generate debate on the milestones achieved thus far and the challenges still facing the nation. Minister Trevor Manuel will release the report shortly and lead the public discourse on the measures that need to be taken to address the challenges it raises.

Cabinet approved the publication of the draft National Climate Change Response Green Paper and the Second National Communication for public comment. Following public comments, a white paper will be compiled at the beginning of the year for further comments and Cabinet is expected to finalise the policy by the end of the first quarter of 2011.

Cabinet approved the publication of the Integrated Strategy for the Promotion and Development of Co-operatives 2010 – 2020 for public comment. The strategy identifies coops as one of the critical and viable means of alleviating poverty, under-development and unemployment. The strategy identifies the following four pillars as enablers for the success of coops i.e. increasing non financial support services to co-operatives; creating demand for co-operatives products and services; improving the sustainability of co-operatives and to increasing financial support services. The strategy will be implemented by the Department of Trade and Industry.

The meeting noted and agreed that South Africa hosts the 17th Session of the Conference of Parties (COP 17) which will also serve as the Meeting of Parties at the beginning of December 2011 in the KwaZulu-Natal province.

Cabinet noted the report on the outcomes of the Eighteenth Session of the United Nations Commission on Sustainable Development (CSD 18) that took place from 3 to 14 May 2010 in New York that focused on mining; transport, chemicals, waste and sustainable consumption and production.

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Green Campus Initiative launches Ridelink

The Green Campus Initiative (GCI) launched the new Ridelink carpooling scheme for the University of Cape Town (UCT) in September. This student-led initiative was set up for several reasons.

First, this free carpooling service will make it easy for students and staff to share lifts. The system matches up users based on their travel schedules and routes. Hosted on Vula, Ridelink can be accessed by anyone with a UCT student or staff number. It is set up to allow participants to organise carpools without compromising their privacy.

Second, Ridelink can help solve UCT’s parking congestion, especially at Upper Campus. Members of the GCI took an informal survey of 200 cars entering the Sports Centre parking area one morning last term, and found that almost 90% of these vehicles had only one occupant. They calculated that if half of these drivers began sharing lifts to campus, they would help free up 90 more parking spaces.

Third, Ridelink can save money and help reduce carbon emissions. You can split the cost of petrol with your carpool. At the same time, you’ll cut your carbon footprint in half (or more, depending on how many are in your carpool) and contribute to a cleaner environment. Ridelink is a viable, practical alternative for students and staff members who live outside the area served by the Jamie Shuttle.

Fourth, UCT car-poolers will have access to special parking on campus, which will be reserved for multiple-passenger vehicles only. Access will be controlled by a boom gate operated by a UCT traffic official.

Ridelink is supported by the UCT Properties and Services Department.

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This conference was held in Cape Town in September and the theme was: Sustainable energy solutions for South Africa: How can we ensure public participation and improved accountability in policy processes?

A feverish pace of energy-related policy processes has been set in motion this year. The South African government announced almost in one breath that they were to finalise the second Integrated Resource Plan, the Integrated Energy Plan and the Climate Change Response Policy, amongst others. What’s more is that these policies hold dramatic implications for the country’s energy future. For instance, the IRP2 will make key decisions for electricity planning for the next 20 years which locks us into particular technology-favoured choices.

In this context, the dominant development ideas, interrelated institutions, incentives and interest groups play an important role in the process to draft and shape the new policies and support their implementation. South Africa is still trying to deal with a recent past where energy policy was considered as captured by narrow interests. This gave rise to what was widely known as the minerals-energy complex, the effects of which we are still experiencing today.

As government proceeds with its new Capital Expansion Programme – developed as a response to the electricity crisis of 2008 – the building more coal and nuclear power stations, which it is largely based on, makes us question again in whose interest decisions are being taken. Furthermore, we need to understand how to foster accountability and broad based participation through policy and policy processes so that corruption is reduced and more sustainable energy solutions are favoured. Adequately tackling the crises of energy poverty, and climate change are dependent on it.

This two-day meeting of the energy caucus was designed to focus on the issues that have been thrown up by civil society engagements in the various policy processes, given the above themes. In particular, questions were posed on the following:

- How do dominant development ideas shape energy policies?
- What has the path of government policy on energy been thus far and where has it gone wrong?
- What are the parameters within which policy processes operate? How do we consider the following for instance: legal rights including access to information & the impact of the new proposed ‘secrecy’ legislation, public hearings, consultations, multi stakeholder task teams and recourse?
- What is the nature, value and influence of various interests groups on energy policy?
- What are some of the key lessons we have learnt from engaging in policy processes this year?
- How well developed are mechanisms of policy oversight?
  - Parliamentary oversight?
  - Regulatory oversight?
  - How do we ensure an independent and well functioning Independent Systems Market Operator?
- What is our strategy for a way forward as civil society in dealing with policy processes that are ongoing and still to come?

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Oxfam launched a new report in October on climate finance governance titled: ‘Righting two wrongs: making a new Global Climate Fund work for poor People.’

Climate change is already negatively affecting the lives and livelihoods of poor men and women. Yet it is estimated that less than a tenth of climate funds to date have been spent on helping people in vulnerable countries adapt to the impacts of climate change. The poor are losing out twice: they are hardest hit by climate change they didn’t cause, and they are being neglected by funds that should be helping them. Climate finance can and must be made to work from the bottom up, particularly for women smallholder farmers.

Starting with the formal establishment of a new Global Climate Fund, decisions on climate finance governance need to set a new direction for a post-2012 era. This paper presents a vision for a new Fund and broader finance system that is effective in meeting the scale of developing country financing needs, and is widely considered – by governments and civil societies – to be legitimate in its decision-making.

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Four factors key to the development of the carbon markets in Africa

Green Power Conferences recently carried out a survey to establish the factors which will have the greatest positive impact on the growth of the carbon market in Africa. They received an overwhelming response, with the most important factor identified as development of institutional capacity and skills. This is unlikely to come as a surprise as it has always been a significant obstacle to the development of the African carbon market.

The Results

- Improvement and development of institutional capacity and skills – 44.8%
- Government-led regulatory reform and incentivisation schemes – 20.9%
- Simplifying the CDM registration process – 19.4%
- Identifying and leveraging a source of core finance for African projects – 14.9%

In an attempt to overcome this problem, the Carbon Markets & Climate Finance Africa Conference and Exhibition will feature two pre-conference workshops on the means of building capacity and a keynote address from Dr. John Kilani, Director of Sustainable Development Mechanisms at the UNFCCC on the role of the carbon market in the development of African economies.

The Carbon Markets & Climate Finance Africa Conference and Exhibition will be held in Johannesburg on 25 and 26 January 2011.

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World Bank coal funding hits record high as it seeks climate finance control

World Bank funding for coal power stations has soared 40-fold over the last five years to hit a record high of $4.4 billion in 2010, new figures reveal.

Bank lending to coal-fuelled power projects significantly exceeds its financing of new renewable energy and energy efficiency projects, which stood at $3.128 billion in 2009 (the latest figure available).

‘This new analysis reveals incoherence at the heart of the World Bank’s thinking about energy,’ said Dr Alison Doig, Christian Aid’s Senior Adviser on Climate Change. ‘At the same time as it is seeking to gain control of the billions which will be channelled to developing countries to help them cope with global warming, the Bank is still lending staggeringly large and growing sums to finance coal-fired power.

‘Yet we know that coal is the dirtiest of all the fossil fuels – the one which most exacerbates the climate crisis which is having devastating effects on the lives of people living in poverty. We also know that by financing the building of coal power stations, the Bank is locking countries in to coal use for the next 40 to 50 years.’

The new figures were produced by the Washington-based Bank Information Centre (BIC) – an independent, non-profit making organisation which seeks to improve the transparency and accountability of the World Bank.

The BIC analysis also reveals that during the current financial year, the World Bank Group provided more than £1 billion for oil and gas exploration and production, including two offshore oil drilling operations which received a total of $729 million.

Dr Doig continued: ‘If the World Bank is going to use its considerable resources to invest in energy, then it must prioritise energy access for poor people, as well as low-carbon development. Its record of funding vast, dirty coal projects such as the Eskom power station in South Africa suggests that it ignores these criteria.

‘Given its lending record, it would be deeply worrying for the Bank to be put in charge of the billions that rich countries have promised to help developing countries adapt to climate change and to grow in ways which do not greatly exacerbate the problem.

‘Christian Aid hopes that the Bank’s new energy strategy, which it is currently preparing and which will guide its lending for the next decade, will fundamentally change its approach.’

The new figures from the Bank Information Centre are based on an analysis of records published by the World Bank and International Finance Corporation.

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Climate-vulnerable developing nations could use international law to break the current deadlock in the intergovernmental negotiations on climate change by taking industrialised nations to court, says a paper published in October by the Foundation for International Environmental Law and Development (FIELD).

The publication comes as government officials from around the world gathered in Tianjin, China for three days of negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). The climate change meeting from 4 to 9 October 2010 comprised the 12th session of the Ad hoc Working Group on Long term Cooperative Action (AWG-LCA) and the 14th session of the Ad hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). Their main purpose is to prepare the 16th Meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Cancun (Mexico) in December 2010.

‘A large part of the relevant legal literature suggests that the main polluting nations can be held responsible under international law for the harmful effects of their greenhouse-gas emissions,’ says the paper’s author, lawyer Christoph Schwarte.

‘As a result affected countries may have a substantive right to demand the cessation of a certain amount of emissions. In selected cases they also have the procedural means to pursue an inter-state litigation in an international judicial forum such as the International Court of Justice in The Hague.’

Schwarte’s paper outlines a possible legal argument for such a lawsuit and offers some observations on the potential impacts of bringing a case before an international court or tribunal. While there are various substantive and procedural legal hurdles, under certain circumstances litigation under public international law would be possible and could become a bargaining chip in the negotiations.

‘Today, a credible case for inter-state litigation on climate change can be made,’ says Schwarte. ‘Developing country governments are understandably reluctant to challenge any of the big donor nations in an international court or tribunal. But this may change once the impacts of climate change become even more visible and an adequate agreement remains wanting.’

FIELD analyzed the current legal discourse and has summarized its findings in a longer working paper, which it has made available online as an open wiki document to allow legal academics and practitioners to comment on, criticize or strengthen the arguments.

‘While international judicial organs are unlikely to issue hard hitting judgments, climate change litigation may help to create the political pressure and third-party guidance required to re-invigorate the international negotiations, within or outside the UNFCCC,’ says Schwarte.

Since the failed Copenhagen summit in 2009, there has been limited progress in the UNFCCC climate negotiations. At the current rate of progress, a new legal framework and ambitious emission reductions look unlikely in the near-term.

As a result billions of extra tons of carbon dioxide and other greenhouse gases will be released into the atmosphere, and many scientists warn that this means global temperatures could rise by 4 degrees Celsius by the end of the century.

Joy Hyvarinen, Director of FIELD says ‘Progress in the international climate change negotiations is nowhere near enough to reduce greenhouse gas emissions to a safe level. Something new is needed to push the negotiations forward. Perhaps an international court case could help bring new momentum to the negotiations.’

The Foundation for International Environmental Law and Development (FIELD) is a group of public international lawyers based in London working towards a fair, effective and accessible system of international law that protects the global environment and promotes sustainable development. In connection with the UNFCCC negotiations, FIELD lawyers provide support and assistance to negotiators from developing countries.

FIELD is a subsidiary of the International Institute for Environment and Development (IIED).
Gender and Energy Network of South Africa

An informal meeting was organised in September by the Gender and Energy Network of South Africa (GENSA) and hosted in the Energy Research Centre, UCT.

This gathering was aimed at women in the energy sector to come together informally and share their experiences as practitioners in this sector. See this as a start of a ‘sisterly support’ circle.

As we all know, the energy sector is predominantly led and operated by males. Female professionals often feel left out and have no one to share their work related challenges with, in the fear of appearing weak in this male-dominated sector. The meeting was to learn from each other, through stories and ideas, and create a warm support structure.

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LPGas – exceptional energy

Peak demand times can be seen to be when the majority of South Africans are preparing morning and evening meals and this is further exacerbated during the winter months when the need for warmth becomes paramount.

Currently, outside of electricity, much focus is being placed on Wind and Solar as alternative energy sources. However, LPGas is a ‘here and now’ energy which does not require research and/or development. It is available and has proven itself, internationally, for many years. In fact, it’s often the fuel of choice for cooking, water and space heating.

So, what is preventing it from offering the same safe, efficient and affordable solution to South Africa’s energy woes?

During the past eighteen months, there have been some significant changes taking place, not least of which has been a significant increase in demand for the product and the Department of Energy’s decision to cap the retail price of LPGas for domestic consumption.

The LPGas Safety Association, through its Chief Executive Officer, Dennis Herold, has focussed on encouraging ‘Best Business Practices’ throughout the industry and is focussed on promoting the safe use of LPGas as an ideal alternative energy carrier. Often viewed as the best kept secret, LPGas has a significant role to play in the energy efficiency mix.

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Biomass Fuels Holding Group

The Biomass Fuels Holdings Group operates from Southern Technical Services offices in Harare, Zimbabwe. Southern Technical Services are consultants & project managers, promoting various large projects within the region north of the Limpopo River. They are the lead promoter of biomass waste power.

Among projects they are currently involved in is the promotion of the generation of power using Municipal Solid Waste (MSW) as raw material and the production of Bio-diesel from Bamboo Biomass, 74 000 litres per hectare of Bamboo after reaching maturity at 4 years from planting and sustainable for up to 100 years.

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The City of Cape Town has produced a Smart Events Handbook to guide event organisers, venue staff and suppliers in planning and implementing events in a sustainable and responsible manner.

Says Alderman Marian Nieuwoudt, the City’s Mayoral Committee Member for Planning and Environment: ‘This user-friendly handbook aims to promote resource efficiency and sustainability in every organised event in Cape Town’.

The handbook has been developed in consultation with partners and key role-players in the events industry and has been endorsed by the Certified Meeting Professional (CMP) Network SA, the Event Greening Forum for South Africa, the Exhibition and Event Association of South Africa (EXSA), the Federated Hospitality Association of South Africa (FEDHASA), the International Festivals & Events Association (IFEA), the Services SETA, the Southern African Association for the Conference Industry (SAACI) and the Technical Production Services Association (TPSA).

Events draw people, who need transport and accommodation, and this leads to economic growth. Events do, however, also require resources such as energy and water, while creating waste and pollution.

‘As much as we wish to promote events in Cape Town, we would like these events to be hosted in a smart and responsible way,’ says Alderman Felicity Purchase, Mayoral Committee Member for Economic Development and Tourism.

Event greening is the process of incorporating socially and environmentally responsible decision making into the organisation, implementation and participation of an event. Regardless of the size or type of event, it can be organised in a responsible manner.

The handbook is aimed at the following main groups:

- Event organisers – conferences, meetings, seminars, workshops, festivals, exhibitions
- Venues – hotels, convention centres, and other venues where events are held
- Suppliers and subcontractors – infrastructure, audiovisual equipment, transport, products.

This handbook is not intended for professional event organisers only, but also for people arranging small informal events at schools or in their local community. It provides an overview of the main aspects that need to be considered in organising an event.

The book is divided into four sections with practical tips for implementation:

- WHAT? Basic information about event-greening principles and practices
- WHY? Benefits of event greening, and the environmental impact of events
- HOW? Practical information on how to get started, and what you need to consider
- RESOURCES: Additional information, with a glossary and websites.

Events can have a large environmental footprint, and therefore it is important to understand the basic principles and reasons why we need to change our actions. This needs to become an integral part of planning and implementation at a micro level, but it is also important to understand the bigger picture and an event’s relation to global warming.

The production of the Smart Events Handbook is one of the FIFA World Cup™ Green Goal 2010 legacy projects. Green Goal 2010, with its 42 projects under nine themes, contributed to raising awareness, minimising waste, diversifying and using energy efficiently, consuming water sparingly, compensating for the event’s carbon footprint, practicing responsible tourism, and constructing infrastructure with future generations in mind. These greening initiatives looked beyond the actual time frame of the 2010 FIFA World Cup™, and included concerns for post-event environmental, social and economic impacts on the immediate and extended environment.

The Smart Events Handbook also forms part of the Smart Living Series. The Smart Living Handbook, which was developed in 2007 and is currently being updated, was developed for Cape Town households, with a focus on the efficient use of natural resources such as water and energy, the reduction of waste and the protection of our natural biodiversity. It has been successfully used to train and raise awareness among City staff, in schools, communities and the corporate sector in Cape Town. A Smart Office Handbook is also currently being developed.

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Climate Protection Fellowships, Germany

The International Climate Protection Fellowships enable prospective leaders to conduct a research-related project of their own choice during a one-year stay in Germany. Submit an application if you are a prospective leader from a non-European threshold or developing country, working in the field of climate protection and resource conservation in academia, business or administration in your country.

Applicants must provide clearly visible leadership potential either by experience in a first leadership position or be able to provide appropriate references. They must also have completed their first university degree (Bachelor’s or equivalent academic degree) less than 12 years prior to the start of the fellowship (1 September 2011) with outstanding results. They must also hold a further academic or professional qualification (Master’s, PhD, LL.M., MBA etc.) or have extensive professional experience in a leadership role (at least 48 months at the time of application). Furthermore, they are expected to have gained initial practical experience through involvement in projects related to climate protection and resource conservation. The fellowship will enable the recipients to conduct a research-related project of their own choice with hosts in Germany whom they are free to choose themselves.

The programme, which is being funded under the International Climate Protection Initiative by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, includes a preparatory intensive language course in Germany, a several-week introductory seminar, a two-week training course and a final meeting in Berlin. These activities will enable you to gain additional insights into academic, social, cultural, economic and political life in Germany.

In addition to applicants who have been trained in the natural and engineering sciences, candidates who have been engaged in legal, economic and societal issues relating to climate change are encouraged to apply for this programme. Every year, the Alexander von Humboldt Foundation grants up to 20 International Climate Protection Fellowships to prospective leaders from the countries named. The programme is currently scheduled to run until 2012.

Completed applications must reach the address below by 15 December 2010.

Contact: Alexander von Humboldt-Stiftung
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Sustainable energy stories

Munyaradzi Makoni is a freelance science journalist based in Cape Town, regularly writing for SciDev.Net and University World News.

He is doing stories for an Action Aid pamphlet that illustrate good or bad practice of delivering energy in the country and the impact on communities in Western Cape.

He would like people or organizations to contact him that have projects that are running in communities where renewable sources of energy are currently in implementation, either solar, wind or any other. He wants to do people’s stories, but emanating from the benefits of research of sustainable energy.

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Africa Gas Summit 2011

4 – 6 APRIL 2011, ROYAL GARDEN HOTEL, LONDON, UK

OPPORTUNITY AND STRATEGY FOR IOCS, NOCS, JUNIORS AND THEIR PARTNERS

Africa Gas Summit is an oil and gas conference to discuss opportunity and strategy to maximize the oil and gas possibilities in Africa.

The Africa Gas Summit will bring together Government, NOCs, IOCs, Independents and their partners to discuss and build business relations that will advance the monetisation of this great energy frontier.

What can you expect?
- To gain a greater understanding of the major developments in African gas
- Dedicated case studies from the major IOCs and NOCs who are working in partnership to achieve the monetization of Africa’s huge natural gas reserves
- Extensive networking sessions, including speed networking, guaranteeing the opportunity for you to spend time with the key decision makers in the African energy industry
- Learn how to invest in Africa, what countries offer the best opportunities to see a long term return on investment for European and international investors
- Benefit from a focused workshop looking at LNG and Floating LNG.

2011 key speakers

The speakers include:
- Dr Osten Oluronsolu, Regional Vice President Gas, Sub-Saharan Africa, Shell
- Salah Wabhi, CEO, Sudapet
- Chima Ibeneche, Managing Director, Nigeria LNG
- Boris Ivanov, Director-General, Gazprom International
- Paul Arinze, General Manager Policy & Corporate Affairs, BG Nigeria
- Stephen Ratcliffe, SVP E&P, Eni SpA
- Charles Hendry MP, Minister of State, Department of Energy and Climate Change
- Honourable Dr P.H.K. Kedikilwe, Minister of Minerals, Energy and Water Resources, Republic of Botswana
- Stefan Liebing, Director International Gas Business, EnBW
- Marco Arcelli, Executive Vice President New Ventures Upstream, Enel SpA
- Dr Raphael S. Awoseyin, Chief Engineering and Technology Officer, Oando plc
- Dr Mike Fischer, Chief Operating Officer, Ophir Energy

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Creating a low-carbon future is a global goal to which all international organizations and almost all countries in the world are committed. South Africa is no exception. In fact, our target for reducing carbon emissions is very high by international standards.

Against this background, the Government’s announcement and release on 8 October of its Integrated Resource Plan (IRP) is of profound importance. The IRP is the foundation for a new energy capacity plan which will significantly influence every aspect of our society.

How it is to be implemented and the coordinated strategies which need to be followed is what this conference is about.

It involves not just policy-makers at national and local level but all forms of energy generation – both now and in the future.

The Low Carbon Future Conference will bring together decision makers and participants from government, power generators, utilities, municipalities, large energy users, investors and developers.

Attend Low Carbon Future and benefit from:

Presentations by expert speakers on

- The global carbon situation and the international response to climate change
- The IRP and its purpose, including the recommended expansion plan
- Implications and challenges of the IRP
- Achieving a dynamic energy mix
- Reviewing industry progress and changing market trends

PLUS

Networking amongst senior level energy sector experts and decision-makers planning and developing South Africa’s energy future.

About the organiser

Omega Investment Research is an African / UK consultancy with partner representatives in most major international financial centres including Dubai, Hong Kong, Shanghai, Singapore, Munich, and Zurich.

For over 20 years, the company has assisted decision-makers across the globe with political risk analysis, business intelligence, business development and strategic financial consulting.

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Energy events 2011

JANUARY 2011
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WIND TECHNOLOGY & MARKET BRIEFING
Bucharest, Romania
Website: www.greenpowerconferences.com

24
SOLAR TECHNOLOGY BRIEFING
Las Vegas, USA
Website: www.greenpowerconferences.com

27
SOLAR POWER ECOMONICS
Las Vegas, USA
Website: www.greenpowerconferences.com

27 – 29
COMMUNITIES, COMMODITIES AND CARBON: INNOVATIONS IN TROPICAL FOREST MANAGEMENT
Yale University, USA
Website: www.greenpowerconferences.com

FEBRUARY 2011
23
GEOTHERMAL POWER ECONOMICS 101
San Francisco, USA
Website: www.greenpowerconferences.com

MARCH 2011
7 – 9
5TH AFRICA ECONOMIC FORUM 2011
BMW Pavilion, Cape Town, South Africa
E-mail: babette@glopac.com
Website: www.petro21.com/events/?id=578

APRIL 2011
5 – 6
CARBON MARKETS & CLIMATE FINANCE AMERICAS
Sao Paulo, Brazil
Website: www.greenpowerconferences.com

18 – 21
POSTGRADUATE SUPERVISION CONFERENCE
Centre for Higher and Adult Education, University of Stellenbosch, Spier Estate, Stellenbosch, South Africa
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JULY 2011
27 – 29
RENEWABLE ENERGY AFRICA CONFERENCE & EXPO
Sandton Convention Centre, Johannesburg, South Africa
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Visit www.erc.uct.ac.za for further events and details

Visit www.erc.uct.ac.za for further events and details
The newsletter is published quarterly by the Energy Research Centre (ERC) of the University of Cape Town. (ERC is an amalgamation in 2004 of two organisations at the University: the former Energy Research Institute and the Energy and Development Research Centre.)

Energy Management News is available free of charge. The articles do not necessarily reflect the views of the editor or of ERC.

Enquiries, comments, articles, and information on energy events are welcome, and should be sent to:
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The Journal of Energy in Southern Africa (JESA) has been running for twenty years, and has proved to be of a consistently high standard and to have a widening subscription base. The key receivers of this quarterly journal are researchers, consulting engineers, energy producers, energy consumers and decision makers.

The publication is balanced, representative, up to date and authoritative. It is becoming increasingly known in other countries especially in Africa.

It is accredited by the South African Department of Education for university subsidy purposes. It is abstracted and indexed in Environment Abstract, Index to South African Periodicals and the Nexus Database System. It has also been selected into the Science Citation Index Expanded by Thomson Reuters, and coverage begins from Volume 19 No. 1.

The JESA is a successful vehicle for the dissemination of information on the latest results and activities in the Southern African energy field, publicising results achieved and stimulating future activities. The potential impact in terms of distribution is the whole of sub-Saharan Africa. It covers matters of local and regional interest as opposed to the internationally high technology content of other journals serving energy interests.

It is the intention to keep the subscription rate relatively low to allow as many people as possible to have access to the JESA.

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