



CENTRE FOR RENEWABLE AND SUSTAINABLE ENERGY STUDIES

ANNUAL REPORT

1 January – 31 December 2012

**Centre for Renewable and Sustainable
Energy Studies**

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Centre for Renewable and Sustainable Energy Studies

ANNUAL PROGRESS REPORT

Reporting period from 1 January 2012 to 31 December 2012

Identification

Name of Director :	Professor J.L. (Wikus) van Niekerk
Name of Centre :	“National Hub for the Postgraduate Programme in Renewable and Sustainable Energy Studies”
Abbreviated Name :	CRSES
Host institution :	Stellenbosch University
Date completed :	28 January 2013 (First Draft) 20 February 2013 (Second Draft) 4 March 2013 (Third Draft for Management Board)

1. Introduction

The South African National Energy Research Institute (SANERI), a division of the Central Energy Fund (CEF), awarded Stellenbosch University in 2006 the responsibility to act as the National Hub of a Postgraduate Programme in Renewable and Sustainable Energy (RSE) Studies. SANERI was an initiative of the DST and the DME that was fully funded by the DST. The programme model described in the original call for proposals was that of a hub that would have been supplemented by a number of spokes in different fields of renewable and sustainable energy. The official launch of the Programme took place on Thursday, the 3rd of August 2006, with the signing of the contract between Stellenbosch University and SANERI. The overall objective of this initiative was to develop and enhance national capacity in renewable and sustainable energy in support of accelerated and shared economic growth. This objective was achieved by building human resource capacity, creating and disseminating knowledge, and finally by stimulating innovation and enterprise in the field of renewable and sustainable energy (RSE).

In 2010 the original contract between Stellenbosch University and SANERI was ceded by SANERI to the Department of Science and Technology (DST). The DST undertook to honour all obligations of the contract and was the primary funding agency of the Programme from that point on. The first contract came to an end on 31 December 2011. In 2012 the DST extended the contract for a further 6 months, from 1 January 2012 to 30 June 2012. The programme was then transferred to the National Research Foundation (NRF) from 1 July 2012. At this time a contract between Stellenbosch University and the NRF is still being finalised, but it is intended that it will cover the interim period of 1 July 2012 to 31 December 2012, as well as the funding for this period.

Nevertheless, the primary objective of the Postgraduate Programme in Renewable and Sustainable Energy Studies at Stellenbosch University remains the training of scientists and engineers with the required technical expertise to unlock the country's renewable energy resources on the one hand, and to implement appropriate technology for using renewable energy in a sustainable manner on the other.

The Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University was established in 2007 to implement the intent of the contract between Stellenbosch University and SANERI/DST and to manage this Programme. The Director of the Centre is Prof Wikus van Niekerk and the Associate Director, from the 1st of September 2009, is Prof Alan Brent. The Centre is currently also involved in a variety of renewable energy projects, from feasibility studies and technology reviews of using solar, wave and wind energy to power a variety of loads, to projects investigating the feasibility of large-scale concentrating solar power plants, as well as the measurement of the available solar resource.

The academic programme started in February 2007 with thirty students enrolled on the coursework masters degrees and various research degrees. In the 2012 academic year seven postgraduate modules were presented, starting with general modules on renewable energy technology and policies, as well as specialised modules such as on solar and bio-energy. Since January 2012 the Centre no longer administers the bursary programme in renewable energy as the DST transferred it to the NRF.

In January 2012 Stellenbosch University signed a contract with Eskom, the national electricity utility company of South Africa, to become the Specialisation Centre in Renewable Energy Technology as part of the Eskom Power Plant Engineering Institute (EPPEI). Part of the responsibility to implement this contract also vests in the Centre.

This is the seventh annual report of the Programme and spans the period 1 January to 31 December 2012. It represents the sixth full academic year that the Programme has been in place. In this report the various activities of the Centre, relevant to the Programme, are presented, some of the challenges are highlighted, and the financial statements of the period 1 January to 31 December 2012 are presented.

2. Summary of Outputs

For most of 2012 a new service level agreement (SLA) was not in place between the DST and Stellenbosch University. In this section the outputs of the Centre in 2012 are mapped against the SLA that was only agreed to late in December 2012. As this new SLA will also be the SLA for future years it is of value to evaluate the performance of the Centre in 2012 against these targets.

2.1 SLA Objective: Building of human capital and institutional capacity

2.1.1 Outputs

ACTIVITIES	SUB-ACTIVITIES	OUTPUTS/TARGETS (over five years)	<u>Target for 2012</u>	<u>Output 2012</u>
<ul style="list-style-type: none"> Establish, coordinate, and refine the postgraduate degree programmes with measurable research outputs 	<ul style="list-style-type: none"> Manage and coordinate the postgraduate degree programmes Track the outputs of associated students, supervisors and researchers Review and determine the need for new degree programmes by the end of the 2013 academic year Manage and coordinate technology roadmaps to identify priority research areas 	<ul style="list-style-type: none"> 50 postgraduate degrees (Masters and PhD) are conferred 	10	19
		<ul style="list-style-type: none"> Publish 25 papers in accredited journals and peer-reviewed conference proceedings 	5	9
		<ul style="list-style-type: none"> Establish at least two more formal postgraduate programmes at other universities in South Africa of which at least one must be at an HDI/HBI by 2016 	0	0
		<ul style="list-style-type: none"> Establish a continually-updated road-mapping mechanism to identify priority areas; this will include refining scenarios based on policies that are updated, and the associated areas of specialisation that will be required, on an annual basis 	1	1
<ul style="list-style-type: none"> Develop, manage and present guided postgraduate research and teaching programmes 	<ul style="list-style-type: none"> Develop a database of forecasted skills needed for the solar industry (wind industry is completed) Recruit and fund instructors for RSE courses 	<ul style="list-style-type: none"> Present at least six RSE courses at Stellenbosch University annually 	6	7
		<ul style="list-style-type: none"> Establish a database of related international programmes, and associated course contents, by the end of 2012; the database needs to be updated on an annual basis 	1	1
<ul style="list-style-type: none"> Develop and manage a fully integrated cross-cutting post-graduate training programme 	<ul style="list-style-type: none"> Scan the international landscape and establish a database of related programmes Investigate the appropriateness of study material for cutting across disciplines Facilitate and fund postgraduate courses in faculties other than engineering 	<ul style="list-style-type: none"> Publish academic materials for the core modules of the programme that can be used by programmes at other academic institutions and FET colleges 	6	6
		<ul style="list-style-type: none"> At least 2 of the RSE courses at Stellenbosch will not be technology focussed but deal with social, policy and financial issue 	2	2

2.1.2 Progress & Challenges

The academic programmes that the Centre coordinates currently consist of one postgraduate diploma in engineering (PDE), two coursework masters' degree programmes, and a variety of research masters' and doctoral degrees. The coursework masters' degrees are presented at Stellenbosch University, one in the Department of Mechanical and Mechatronic Engineering as an M.Eng. (Structured) in Mechanical Engineering with an emphasis on renewable and sustainable energy (RSE) and one in the School of Public Leadership as a postgraduate diploma (PGD)/M.Phil. programme in Sustainable Development, with an option to specialise in RSE. More information on the structure of the PDE, M.Eng.(Structured) and PGD/M.Phil. programmes can be found at the following website:

<http://www.crses.sun.ac.za/studies-postgraduate-programmes.php>

The research masters' and doctoral degrees are available in various academic departments at Stellenbosch University as well as other universities, in particular the University of Cape Town, University of Pretoria, North West University, University of KwaZulu/Natal, University of Fort Hare, and Nelson Mandela Metropolitan University. Students enrol for the research degree in the relevant academic department and work in that research group while completing their studies. A list of research projects that are available, underway, and completed at the various institutions cooperating with the Centre can be found at: <http://www.crses.sun.ac.za/research-available-topics-solar.php>

The students that are enrolled for the two coursework master degrees, as well as some of the research students, meet in a number of RSE postgraduate modules that are presented in a transdisciplinary manner at the Sustainability Institute, which is situated at the Lynedoch EcoVillage outside Stellenbosch. These modules are presented in a modular format where the students are required to do some preparatory reading, attend a week of contact sessions, consisting of five and half days at Lynedoch, which includes a group assignment and presentation on the Saturday morning, and then they have to complete a number of individual assignments and project to complete the course. During the week of contact, students participate in lectures, tutorials, group discussions, projects and some site visits. The modules presented in 2012, with the number of students that attended are listed in the **Table1**.

Table 1: Attendance of RSE Modules for 2012

<u>Module</u>	<u>Lecturers</u>	<u>Total</u>	<u>Coursework</u>	<u>Research</u>	<u>Staff</u>	<u>Exec Students</u>
Renewable Energy Systems	Dr Ben Sebitosi & Riaan Meyer	40	30	1	2	7
Renewable Energy Policy*	Prof Alan Brent	21	18	0	0	3
Thermal Energy Systems	Dr Jaap Hoffman	7	7	0	0	0
Introduction to Solar Energy	Dr Ben Sebitosi & Prof M Heun	37	19	0	0	18
Renewable Energy Finance*	Jako Volschenk	37	32	3	0	2
Wind & Hydro	Prof Theo von Backström & Francis Jackson	20	16	1	1	2
Bio-energy	Prof Johann Görgens & Team	21	17	2	0	2

* These courses are not technology focussed and are presented by the School of Public Leadership in the Faculty of Management and Business Sciences.

All of the modules are also registered with the Engineering Council of South Africa (ECSA) so that executive students who attend these modules as short-courses will receive recognition towards their required continuous professional development (CPD points). The modules were also attended by some of the research students and staff members involved with the Programme to improve their background learning and understanding of RSE.

Two modules, *Renewable Energy Finance* and *Renewable Energy Policy* are focused on social, policy and financial issues related to renewable and sustainable energy use and are non-technical in content. These modules are registered in the School of Public Leadership of the Faculty of Economic and Management Sciences. Students in the PDE as well as both the coursework masters programmes are required to take the module Sustainable Development in the School of Public Leadership to further ensure that these students are well aware of the social and ecological issues driving RSE.

The following **19 students graduated in 2012** and copies of their completed theses can be found at: <http://crses.sun.ac.za/research-completed-research.php>

March/April 2012

Mr Matthew Peter Moody with an MPhil in March 2012
Ms Caitlin Bergh with an MScEng graduation in April 2012
Mr Nelius Bekker with an MScEng in March 2012
Mr Ulwin Hoffman with an MScEng in March 2012
Mr Jacques du Plessis with an MScEng in March 2012
Ms Jacqueline L Crozier with an MSc in April 2012
Ms Maria M Meintjies with an MEng in April 2012
Ms Chantelle Clohessy with an MSc in April 2012
Ms Louise Tait with an MScEng in April 2012
Ms Gabby Coppez with an MSc in April 2012
Ms Lelanie Smith with an MEng in April 2012
Ms Cherilyn Vossberg with an MPhil in April 2012
Mr Hope Baloyi with MSc in April 2012
Mr Sewis van Zyl with a PhD in March 2012

September 2012

Ms Christina Trautmann with an MSc in September 2012
Ms Melissa Hallquist with an MEng in September 2012
Mr Rhidawaan Suliman with an MEng in September 2012

December 2012

Mr Jeremy Wakeford with a PhD in December 2012
Ms Sumetee Gajjar Pashwa with a PhD in December 2012

The target of 5 peer-reviewed journal articles were easily met with 9 journal articles and 26 papers at national and international conferences. Full details of these publications are available in Section 4 – Academic Outputs.

The initial preparation for the establishment of a course-work masters programme in renewable energy at the National Mandela Metropolitan University was initiated with a workshop in Port Elizabeth in December 2012. The planning and preparation will continue in 2013 with implementation targeted for 2014. The Centre offered to fund two new modules in 2013 to be developed by the staff at NMMU; one in batteries for energy

storage, and the other in advanced photovoltaic systems.

The database on other international postgraduate programmes in renewable energy is being compiled and should be available in the first quarter of 2013.

The Centre's activities in building human and institutional capacity have always progressed well. The large number of students graduating and the on-going success of the coursework masters program attest to this. The fact that the Centre no longer administers the bursary programme makes it difficult to identify and track new students entering the programmes at the other universities.

The development of the spokes have not progressed as expected over the years, mainly due to limited funding available to develop these activities at the other universities. This is part of an ongoing discussion between the Centre, the NRF and the research groups participating in the spokes. In 2012 the Solar Thermal Energy Spoke included the University of KwaZulu-Natal (UKZN) as an active partner and transferred some of the DST funding to the Sustainable Energy Research Group at UKZN.

2.2 SLA Objective: Deepening Knowledge/ Research and Technology Transfer

2.2.1 Outputs

ACTIVITIES	SUB-ACTIVITIES	OUTPUTS/TARGETS (for five years)	<u>Target 2012</u>	<u>Output 2012</u>
<ul style="list-style-type: none"> • Identify, prioritise, design and undertake research projects for knowledge production • Facilitate and inform the move from a carbon intensive energy economy by engaging with local government and NGOs • To undertake research which will enhance knowledge production, dissemination of knowledge and knowledge transfer and develop policy briefs to inform the move from a carbon intensive energy economy 	<ul style="list-style-type: none"> • Manage and coordinate technology roadmaps to prioritise research areas • Produce a report demonstrating the status quo of RSE in South Africa, and the impact of research conducted by the hub to contribute towards economic growth • Provide forum platforms for dissemination of knowledge • Develop and implement a programme in high schools to promote RSE among learners • Develop appropriate material • Raise funds for the reproduction and distribution of the material 	<ul style="list-style-type: none"> • Establish an annually-updated road-mapping mechanism to identify priority areas, one per annum 	1	1
		<ul style="list-style-type: none"> • Significant research and teaching activities in all the identified priority areas for South Africa on an annual basis 	1	1
		<ul style="list-style-type: none"> • Publish five policy briefs (at least 1 per annum) to inform the move from an energy intensive economy to one relying on RSE 	1	-
		<ul style="list-style-type: none"> • Assist at least 3 local governments with RSE projects 	1	1
		<ul style="list-style-type: none"> • A guideline document to assist the public sector with evaluating renewable energy options and implementing projects successfully. A first version is to be developed by 2014, with a revised version in 2016. 	-	1
		<ul style="list-style-type: none"> • Roll-out the Schools Programme to at least 2 Provinces by end of December 2013 	1	4

2.2.2 Progress & Challenges

Forums, Research Lectures and Awareness Programmes

The Centre arranged a number of forum discussions and research lectures over a wide range of topics, as listed in the **Table 2** below. Students and lecturers from Stellenbosch University as well as UCT, CPUT and other institutions, as well as the general public, are invited to attend these presentations. The presentations by visiting academics and researchers are also made available on our website at: <http://crses.sun.ac.za/service-events-lectures.php>

Table 2: Attendance of RSE Forums, Special Lectures and Renewable Energy Video Discussion Sessions in 2012

Topic	Presenter(s)	Attendees
<i>Free to the Sun</i>	Jon Böhmer, Kyoto Energy Ltd.	40
<i>Policy-oriented research on large-scale CSP deployment</i>	Stefan Pfenninger, IIASA, Austria	10
<i>Socio-economic impacts of energy resource scarcity</i>	Jeremy Wakeford, Stellenbosch University Prof. Martin de Wit, Stellenbosch University Prof. Matt Heun, Calvin College, Grand Rapids, Michigan, USA	60
<i>Reinventing Fire</i>	Video of a talk given by Amory Lovins of the Rocky Mountain Institute (CRSES Personnel)	21
<i>How concentrating solar power works – real state of the art plants in operation</i>	Video on CSP Plants (CRSES Personnel)	45
<i>Sustainability of GM technologies in bio-energy production</i>	Dr H Groenewald: Biosafety SA Prof Florian Bauer: Institute for Wine Biotechnology, SU Prof Jens Kossmann: Institute for Plant Biotechnology, SU Mr Glenn Ashton: Ekogaia Consulting Prof Johann Görgens: Department of Process Engineering, SU	53
<i>Biogas technology: Operation and applications</i>	Video on Biogas Technology (CRSES Personnel)	15
<i>Green star buildings</i>	Chris Bornman, Visit to Remgro's new building	20

In 2012 a new format for the monthly forums was tried out. A suitable video was screened followed by a discussion facilitated by a staff member knowledgeable in the field. Some of these events were not as well attended as in the past and this format will be reviewed in 2013. In general debates on somewhat controversial topics seem to be the best attended events.

School Outreach Programme

In addition to the forums a **School Outreach Project** was initiated in 2008. Therese Lambrechts, an experienced project manager with a passion for climate change and renewable energy, developed material on climate change and renewable energy suitable for grades 6 to 9. In addition to the Western Cape 25 students from Conservation Africa – Skeppies Project in the Northern Cape – were also reached. The outputs for the project are listed in **Table 3**.

Sustainable funding for the School Outreach Programme remains a challenge and that is one reason why fewer learners were reached in 2012 than the previous two years. A number of applications for funding were submitted to Eskom, Sasol, the DST and DoE without success. Funding is required to develop visual material for rural and township

schools where computers and data-projectors that display the electronic material is not readily available.

Table 3: School Outreach Programme Outputs 2008-20112

Outreach	2008	2009	2010	2011	2012
Total number of schools reached	3	18	119	72	30
Total number of educators reached	3	27	117	110	40
Total number of learners reached	0	0	23 600	14 400	500
Total number of students reached			376	257	25

Technology Roadmapping

The Centre has taken the lead to develop a solar technology roadmap for the DST; to inform the strategy of the country pertaining to the R&D of solar technology systems. It is expected that this roadmap will inform the larger solar energy roadmap that is underway, a collaboration between the DST and DoE with assistance of the IEA. In 2013 the Renewable Energy Policy module will be used to develop roadmaps for the different RE technologies with an emphasis on innovation ‘pull’ and ‘push’ mechanisms to enhance the national system of innovation.

Assisting local and provincial governments

Stellenbosch University signed a Memorandum of Agreement with the Hessequa Municipality in the southern Cape. As part of this action and in collaboration with the GreenCape initiative a project was started to study the effect that the introduction of rooftop PVs will have in Riversdal, as an example of a typical mid-size rural town. The aim of the study is to investigate both the technical and financial aspects of such a programme and in particular to investigate financial models that will ensure that the financial viability of the municipality is not adversely affected. This project will be completed by the end of February 2013 and the results made available to other municipalities who may be interested in such a programme.



Figure 1: GIS Study results of Hessequa PV study (The yellow roofs were identified in Riversdal as suitable for the installation of a photovoltaic system.)

The Centre is also part of the Stellenbosch Infrastructure Task Team (SITT), which aims to prioritise the short and medium term actions to address the backlog of the Municipality and ensure local economic development and socio-economic growth. The Centre is responsible for the energy aspects of the SITT and it is envisaged the learning of this participation will inform the implementations strategies of other municipalities.

The Centre was also instrumental to develop a new book, entitled: *A South African Renewable Energy Guide for Local Government*, published by Juta. The book is used as course material, and will be used in training events for local government officials. Based on the feedback from these training events, the book will be updated in 2015.

The Centre, in cooperation with the Sustainable Energy Research Group at the University of KwaZulu-Natal, procured a set of solar maps and solar GIS data on behalf of the KwaZulu-Natal Provincial Government. As part of this project a one-day training workshop was held at UKZN to assist users of these maps and data to correctly interpret the data.

2.3 SLA Objective: Stimulating innovation and enterprise in the field of RSE

2.3.1 Outputs

ACTIVITIES	SUB-ACTIVITIES	OUTPUTS/TARGETS (for five years)	Target 2012	Output 2012
<ul style="list-style-type: none"> • Commission, undertake, sub-contract and manage teaching, research and market transformation projects with partners • Investigate, evaluate and facilitate the transfer of appropriate technology • Engage with communities and NGOs to facilitate and establish developmental applications • Build networks locally and internationally with synergistic programmes to maximise impact and 	<ul style="list-style-type: none"> • Develop a database of local expertise that can undertake teaching, research and market transformation projects • Identify, contract, manage and participate in projects that are technology- and policy-oriented, such as resource assessment and informing the financing of renewable energy interventions; on a continual basis, namely, at least three a year • Report on the completed projects on an annual basis • Conduct feasibility studies on new technologies/ devices • Manage and coordinate technology transfer of at least 5 identified RSE technologies • Develop a guideline for RSE technology transfer into different markets • Develop a guideline for RSE technology transfer into different markets by 2013 • Engage with rural and/or poor communities to establish their energy needs and identify appropriate RSE technology • Manage and coordinate the development of a database of international expertise that can undertake teaching, research and market transformation projects 	<ul style="list-style-type: none"> • Establish a database of the network of partners available to undertake joint teaching, research and market transformation projects by December 2012 • Lead (Drive) and Participate in at least 15 such projects over the five-year period, typically three per year • Investigate at least 2 new technologies/ devices reported per annum (Outcomes shall also be incorporate into the annual reports) • Demonstrate the process of transferring at least 5 appropriate technologies to the market over 5-years • Demonstrate the process of transferring at least 5 appropriate technologies to the market focussing on rural applications or energy for the poor by December 2016 • Establish a database, by 2013, of the network of national and international partners to undertake joint teaching, research and market transformation projects • Arrange at least 2 workshops or conferences per year 	1	1
			3	24
			1	3
			1	-
			1	-
			1	1
			2	3

leverage external funding	<ul style="list-style-type: none">• Identify and arrange suitable workshops and conferences in RSE• Coordinate the attendance of international conferences of staff associated with the Programme• Develop and support the capacity in the Centre to leverage external funding• Investigate a funding model, by 2013, to exchange at least five postgraduate students with institutions in Europe and Australia	<ul style="list-style-type: none">• Attend at least two international conferences annually• An exchange programme established and external funding leveraged by end of December 2014	2 -	8
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2.3.2 Progress & Challenges

Projects

Table 4 indicates the scope of the completed projects while **Table 5** provides details of those projects that will continue in 2013.

Table 4: Completed Projects, 2012

	Project Description	Client	Project Leader	Amount (Incl.VAT)
1	Soltrain I (SWH Training, testing and awareness project)	AEE Intec	D Palmer/C Leonard	R 843 640.00
2	Exxro Botswana Measurements	Exxaro	AJ Meyer	R 399 580.66
3	Letsatsi Solar PV - Resource and yield prediction	Exxaro	AJ Meyer	R 80 057.07
4	Continuation of Lephahale Measurements	Exxaro	AJ Meyer	R 961 276.73
5	Study towards zero carbon emissions in Wine lands	X TERN	AC Brent	R 65 400.00
6	Supply of satellite derived solar data for Sasol	Sasol Technology	AJ Meyer	R 61 077.67
7	Onsite solar measurements - Bokpoort	SolAfrica	AJ Meyer	R 83 525.73
8	Continuation of solar measurements Bokpoort	SolAfrica	AJ Meyer	R 95 352.71
9	Eskom - grid study	ESKOM	AJ Meyer	R 677 876.38
10	Solar Measurements - Noupoot	Terra Solar Energy	AJ Meyer	R 152 038.51
12	Investigation of renewable energy for Distell's Wellington and Goudini facilities	Distell	AC Brent	R 98 639.98
13	Prefeasibility of solar process heat for Lonmin's leaching process	Lonmin (Pty) Ltd	J Reinecke	R 90 394.02
14	Renewable Energy Strategy for Rwanda	UNEP	AC Brent	R 199 200.00
15	Installation of solar resource measurement station and training in Lesotho	CS Africa (UNDP)	J Reinecke	R 153 131.93
16	PV Generation Forecast Report: Prieska PV Farm	Aeolus Development Corporation (Pty) Ltd	AJ Meyer	R 91 772.54
17	Noupoot - PV Yield Study	Amandla Welanga Solar Energy (Pty) Ltd	AJ Meyer	R 59 706.12
18	Noupoot - PV Yield Study	Dida Solar Energy	AJ Meyer	R 59 706.12
19	Noupoot - PV Yield Study	Inkululeko Solar Energy (Pty) Ltd	AJ Meyer	R 59 706.12
20	Noupoot - PV Yield Study	Tollie Solar Energy	AJ Meyer	R 59 706.12
21	Solar resource maps, GIS data and training for KwaZulu/Natal	KZN Provincial Government	C Leonard	R 224 898.00
22	Extension of Solar Measurements - Noupoot	Terra Solar Energy	AJ Meyer	R 93 227.04
23	Energy management on a wine farm	WineTech	AC Brent	R 171 000.00
24	SETRM (Solar Energy Technology Roadmap)	WNNR	AC Brent	R 182 400.00

Table 5: On-Going Projects 2013

	Project Description	Client	Project Leader	Amount (Incl.VAT)
1	DNI measuring equipment procurment, installation, commissioning and reporting	SASOL New Energy	AJ Meyer	R 1 219 177.00
2	SI measurements Danielskuil en Kimberley	Afri Devo	AJ Meyer	R 670 593.48
3	Maintenance of Solar Measurement Stations in the Northern Cape	Aveng - (Vexicom (Pty) Ltd)	AJ Meyer	R 11 024 823.00
4	Installation and Measurements at Solar Station in Upington	SASOL New Energy	AJ Meyer	R 601 135.56
5	Continuation of on-site Solar Insolation Measurements – Bokpoort	SolAfrica	AJ Meyer	R 95 352.72
6	De Beers On-vessel Technology Overview	De Beers Marine	J Reinecke	R 162 810.35
7	Exxro Botswana Measurements - Extention	Exxaro	AJ Meyer	R 273 076.74
8	PV Rooftop Study - Hessequa	GreenCape	C Leonard	R 80 000.00
9	Eskom Resource Analyst Manager (with GeoSUN Africa and 3E)	ESKOM	AJ Meyer / C Leonard	R 1 908 818.21
10	Qatar Review Report	Qatar National Food Security Programme	AJ Meyer / C Leonard	R 60 900.00
11	Extension - Solar Measurements - Noupoot	Terra Solar Energy	AJ Meyer	R 93 227.04
13	SETRM (Solar Energy Technology Roadmap)	WNNR	AC Brent	R 182 400.00
14	Soltrain II	AEE Intec	C Leonard	R 1 532 824.20

On these projects both staff of the Centre, as well as other expert consultants in the University and private industry, combined to form strong, multi-disciplinary project teams to execute the technical work. A number of international partners also contacted the Centre to discuss cooperation; examples are the DLR, Fraunhofer ISE, GTZ and the German Development Bank who are interested to partner with the Centre on wind and CSP projects, and IIASA that wants to collaborate to develop regional-scale models to inform renewable energy oriented policy.

A large number of the projects completed in 2012 were related to solar resource measurement and assessment. Stellenbosch University decided to provide these services in future through a spin-off consulting company, GeoSUN Africa (Pty) Ltd. The company was formed in 2012 and started to operate as a separate entity from 1 November 2012. The shareholders in the company are Stellenbosch University (25%), GeoModel Solar (25%), Riaan Meyer (25%) and Wikus van Niekerk (25%). A cooperation agreement was signed between Stellenbosch University and GeoSUN Africa to ensure the University will be able to complete the continuing projects. Riaan Meyer is the CEO of the new company and has resigned from the staff of the Centre to take on this full-time responsibility.

The projects undertaken by the Centre range from initial feasibility studies, for the deployment of renewable energy, to highly technical studies on specific technologies.

The Centre is also regularly requested to assess the ideas of individual entrepreneurs that are referred to the Centre by SANERI, DST, DoE and others. The Sea Renewable Energy Turbine System is one of these that may lead to a significant future research project if the current application for funding to the Technology Innovation Agency is successful. A register of these ideas and the responses of the Centre are kept, as requested by SANERI and DST. The submissions that were received and reviewed in 2012 are listed in Table 6.

Database of expertise

A database of local expertise in renewable energy was maintained in 2012. This database is available at: <http://www.crses.sun.ac.za/home-people-renewable.php>

Table 6: Proposed Patents and Ideas Investigated in 2012

Solar water heater embodiment using copper 'U' pipes as receivers	Kesavan Nulliah
Tidal Wave Concept: Device to extract energy from waves	Ken K. Phillips
Power Pod Generator: Floating device with a rolling ball generating electricity. (Figure 2)	Alex Smith

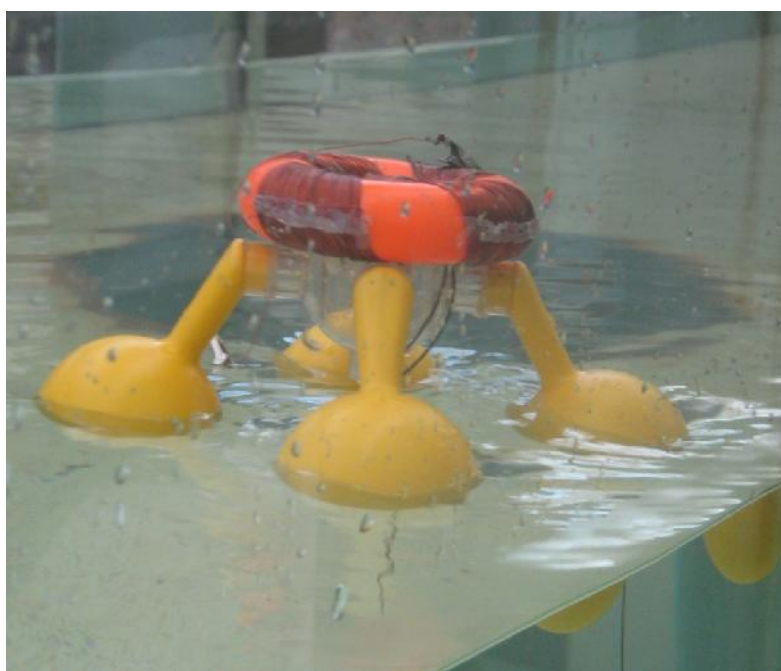


Figure 2: Power Pod Wave Energy Converter

The Centre is also playing a coordinating and facilitating role in a number of flagship projects:

- South African Wind Energy Centre (SAWEC) project to establish a research, development and training facility in the Western Cape for the wind energy sector.
- Southern African Solar Resource Database project, which will include 10 to 20 ground stations to accurately measure solar radiation, updating satellite derived solar data and establishing expertise in South Africa to interpret and assess the information.

- Small-Scale CSP Demonstration Plant and Research Station, which will be built as a public-private partnership.

Of these projects the one that gained the most momentum was the establishment of the South African Renewable Energy Training Centre (SARETC). This Centre will incorporate the SAWEC and will be hosted at the Cape Peninsula University of Technology (CPUT). In 2012 a proposal was drafted in cooperation with the GreenCape initiative that was submitted to the Department of Higher Education and Training for a grant of R 80m to establish the physical infrastructure and R 25m for the first three years' operating expenses of the Centre. This proposal was accepted by the DHET and planning and construction will continue in 2013.

Conferences and Symposia

The **First Southern African Solar Energy Conference (SASEC)** was held in May 2012 in Stellenbosch with sponsorship from TIA and Eskom. An overview of the conference can be found on the website: <http://www.sasec.org.za/>. The conference that was opened by the Premier of the Western Cape Province was very well attended by national and international delegates and received a fair amount of media coverage. In total two keynotes and 47 regular papers were delivered to the 134 delegates that attended. Some of the papers presented at the conference were selected for publication in the Journal of Energy in Southern Africa (JESA). The next SASEC will be hosted by Nelson Mandela Metropolitan University in 2014.

The **Third Annual CRSES Post Graduate Student Conference** was held from 22 to 23 November 2012 at the Lynedoch EcoVillage and was well attended by students and supervisors from all over the country. Twenty post-graduate students from the University of Pretoria, North West University, University of KwaZulu-Natal, Nelson Mandela Metropolitan University, University of Cape Town, Walter Sisulu Univeristy, and Stellenbosch University presented papers at the symposium. The aim of the conference is to create a forum for postgraduate students to share their research. The Centre sponsored those students from outside the Western Cape with a grant for their travel and accommodation cost from the DST/NRF funds. The papers are available on the website: <http://www.crses.sun.ac.za/service-conferences.php>



Figure 3: Presenters and supervisors at the 3rd CRSES Post Graduate Student Symposium, Lynedoch, Stellenbosch

RE Training Workshops/In-House Training Courses

During October 2012 a three-day RSE training event was held in Midrand, which was

attended by 17 delegates from various industries, e.g. Eskom, DBSA, Cennergi, Windlab Systems and SA Mainstream Renewable Power Development. The main purpose of presenting this event in Midrand was to test the market for such workshops in the Gauteng area.

The Centre presented a RE training session on behalf of the University of Stellenbosch Business School for the staff of the Development Bank of South Africa in October 2012.

A group of 11 delegates from Mozambique attended the Introduction to Solar Energy module in Lynedoch. Three delegates from Mozambique also attended the Bio-Energy course. This forms part of an on-going relationship with the Department of Energy and FUNAE in Mozambique.

National and International Conferences Attended by Staff and Students:

Table 7: International Conferences Attended 2012

Name of Conference	Date and Place	Attendees
Funded from DST/NRF Funds		
World Renewable Energy Forum	May 2012, Denver, Colorado, USA	Prof Wikus van Niekerk
1 st Southern African Solar Energy Conference	May 2012, Stellenbosch, South Africa	Prof Wikus van Niekerk, Prof Alan Brent, Somila Xosa, Dane Links, Riaan Meyer, Athi Ntisana, Josh Reinecke,
SolarPaces 2012	September 2012, Marrakesh, Morocco	Prof Wikus van Niekerk
Gleisdorf Solar 2012	September 2012, Gleisdorf, Austria	Billy de Lange
AEE Solar Heating & cooling	September 2012, Graz, Austria	Billy de Lange
4 th International Conference on Ocean Energy	October 2012, Dublin, Ireland	Josh Reinecke
Funded from CRSES other funds		
1 st Southern African Solar Energy Conference	May 2012, Stellenbosch, South Africa	K Chedi (University of Botswana),
4th International Conference on Ocean Energy	October 2012, Dublin, Ireland	Prof Wikus van Niekerk, Bavesh Kooverji, Jonathan Frick, James Joubert,
Sponsored conferences		
Windaba 2012	October 2012, Cape Town, South Africa	Prof Wikus van Niekerk (Presenter)
Already beyond? 40 years to limit to growth	Volkswagen Foundation, November 2012, München, Germany	Prof Wikus van Niekerk (Presenter)
IEEE International Technology Management Conference	June 2012, Dallas, Texas	Prof Alan Brent (Presenter)

Staff also attended and presented at the following local conferences:

- CSP Today South Africa 2012, 7-8 February 2012, Johannesburg.
- TUT Centre for Energy and Electrical Power: Inaugural Workshop on Energy and Environ for Africa's Public Officials, March 2012, Pretoria, South Africa.
- Domestic Use of Energy, 2-4 April 2012, CPUT, Cape Town.

The Director attended the International Solar Energy Society (ISES) board meeting in May 2012 in Denver Colorado, USA as he represents South Africa on the Board of ISES

The Director joined the GIZ's SAGEN German wind energy training centre study tour in September 2012 and afterwards was the sole presenter at a renewable energy round

table discussion on South Africa organised by Bocconi University in Milan, Italy.

3 Human Resources

3.1 Centre Staff Complement

The following staff members' salaries were funded by the DST/NRF grant in 2012.

Table 8: Centre Staff Funded by DST/NRF Grant

Position	Incumbent	Gender	Race
Director and Professor in M&M*	Prof Wikus van Niekerk	M	W
Associate Director and Professor in the SPL [#]	Prof Alan Brent	M	W
Professor in M&M*	Prof Ben Sebitosi	M	B
Research Engineer	Mr Riaan Meyer (Resigned October 2012)	M	W
Admin/Finance Officer	Ms Jos Liebenberg	F	W
Research Technician	Mr Dane Links (Resigned October 2012)	M	B
Schools' Programme Coordinator	Ms Therese Lambrechts	V	W
Intern	Mr Athi Ntisana	M	B

* M&M: Department of Mechanical and Mechatronics Engineering

[#] SPL: School for Public Leadership

The following staff members' salaries were funded from other sources, mainly project income and the Eskom grant.

Table 9: Centre Staff Not Funded by DST/NRF Grant

Position	Incumbent	Gender	Race
Research Engineer	Josh Reinecke	M	W
Research Engineer	Corli Leonard	F	W
Research Engineer	Billy de Lange (From 10 April 2012)	M	W
Receptionist	Denielle Andrews	F	B

Riaan Meyer and Dane Links resigned in October 2012 to join the spin-off company from the Centre; GeoSUN Africa (Pty) Ltd. Ms Imke Meyer and Mr Athi Ntisana will replace them in 2013. Ms Sinevuyo Poni will join the Centre in 2013 as an intern and Ms Imke Meyer as a research engineer.

A number of other staff members were associated with the Centre as supervisors, lecturers and specialists working on projects. These are listed in **Table 10**.

Table 10 Associated Staff

Position	Incumbent	Gender	Race
Lecturers & Supervisors	Prof Theo von Backström (M&M)	M	W
	Francis Jackson (Windlab Systems)	M	W
	Jako Volschenk (USB)	M	W
	Prof Johann Görgens (Process Engineering)	M	W
	Prof Matt Heun (Calvin College, USA)	M	W
	Dr Jaap Hoffman (M&M)	M	W
	Prof Hanno Reuter (M&M)	M	W
	Dr Johan van der Spuy (M&M)	M	W
	Mr Paul Gauchè (STERG and M&M)	M	W
	Prof Johan Vermeulen (E&E)	M	W
	Dr JH Beukes (E&E)	M	W
Visiting academics	Prof Bernhard Möglinger, Hochschule Bonn-Rhein-Sieg, Germany	M	W
	Dr Christoph Richter, DLR, Germany	M	W

3.2 Student Support

From 2012 the administration and disbursement of the bursaries, previously the responsibility of the Centre, has been ceded to the NRF. The Centre did however award 3 bursaries from the reserves to the following three students studying at Stellenbosch University.

- Eben Grobbelaar – MScEng White Male R80 000/year for 2 years
- Cebo Selinga – MEng Black Male R80 000/year for 2 years
- Tshela Maloba – MPhil Black Male R80 000 for 1 year

Of this only R 40 000 was paid from the DST/NRF grant and the rest from other reserves of the Centre. An additional R 35 000 was paid out to students to attend the annual Student Symposium.

3.3 Staff Training

The following staff members attended training opportunities in 2012:

- Josh Reinecke, Athi Ntisana and Billy de Lange attended weeklong GIS course.
- Athi Ntisana attended the Renewable Energy Systems and Wind & Hydro short-courses.
- Corli Leonard attended the Renewable Energy Systems short-course.
- Denielle Andrews attended a basic MS Excell and Communication in a Professional Capacity courses.

4. Publication Outputs

4.1 Articles in Peer Reviewed Journals

PEER-REVIEWED JOURNAL ARTICLES

2012	
1	Danie Diedericks , Eugène van Rensburg and Johann F. Görgens. (2012). Fractionation of sugarcane bagasse using a combined process of dilute acid and ionic liquid treatments. <i>Manuscript submitted for publication to Bioresource Technology</i> .
2	Danie Diedericks ; Eugène van Rensburg; María Del Prado García-Aparicio; Johann F. Görgens. Enhancing the enzymatic digestibility of sugarcane bagasse through the application of an ionic liquid in combination with an acid catalyst. <i>Biotechnology Progress</i> 2012; 28(1):76-84.
3	Gouws PA, Brent AC , Pierce WT , 2012. The contribution of energy efficiency towards the success of industrial organisations in South Africa. <i>South African Journal of Industrial Engineering</i> 23 (2), 57-65.
4	Pienaar J, Brent AC , 2012. A model for evaluating the economic feasibility of small-scale biodiesel production systems for on-farm fuel usage. <i>Renewable Energy</i> 39 (1), 483-489.
5	Brent AC , 2012. Technology assessment in developing countries: Sustainable energy systems in the African context. <i>International Journal of Innovation and Technology Management</i> , December 2012, 9 (5).
6	Broughton EK, Brent AC , Haywood L, 2012. Application of a multi-criteria analysis approach for decision-making: The case of concentrating solar power in South Africa. <i>Energy & Environment</i> , December 2012, 23(8), 1221-1232.
7	Musango JK, Brent AC , Amigun B, Pretorius L, Müller H, 2012. A system dynamics approach to technology sustainability assessment: The case of biodiesel developments in South Africa. <i>Technovation</i> 32, 639-651.

4.2 Published Conference Proceedings

CONFERENCE PROCEEDINGS

2012	
1	Kotze, J.P. , Erens, P.J., Von Backström, T. W. , Evaluation of a latent heat thermal energy storage system using AlSi12 as a phase change material. SolarPaces 2012, 11- 14 September, Marrakech, Morocco.
2	Kotze, J.P. , Erens, P.J., Von Backström, T.W. , NaK as a primary heat transfer fluid in thermal solar power installations. SolarPaces 2012, 11- 14 September, Marrakech, Morocco.
3	Meyer, A.J. , The South African REFIT: Solar Resource Assessment Options for CSP Developers. SolarPaces 2012, 11- 14 September, Marrakech, Morocco.
4	Gauché, P., Pfenninger, S., Meyer, A.J., Von Backström, T.W and Brent, A.C. , Modeling Dispatchability Potential of CSP in South Africa. SASEC 2012, 21-23 May, Stellenbosch, South Africa
5	Gauché, P., Von Backström, T.W., and Brent, A.C. , A Value Proposition of CSP for South Africa. SASEC 2012, 21-23 May, Stellenbosch, South Africa
6	Harper, P.J., Von Backström, T.W., Fluri, T.P., and Kröger, D.G. , TRNSYS Modeling of a 100MWE Hybrid Combined Cycle Concentrating Solar Power Plant. SASEC 2012, 21-23 May, Stellenbosch, South Africa
7	Meyer, A.J. , The South African Refit: Solar Resource Assessment Options for Solar Developers. SASEC 2012, 21-23 May, Stellenbosch, South Africa.
8	Gauché, P., Von Backström, T.W. and Brent, A.C. , A Value Proposition of CSP for South Africa. SASEC 2012, 21-23 May, Stellenbosch, South Africa
9	Walker, G., Von Backström, T.W., and Paul Gauché. , A Method of Increasing Collector Aperture in Linear Fresnel Solar Concentrators at High Zenith Angles. SASEC 2012, 21-23 May,

	Stellenbosch, South Africa
10	Kotze, J.P., Von Backstrom, T.W. , and Erens, P.J., NaK as a Primary Heat Transfer Fluid in Thermal Solar Power Installation SASEC 2012, 21-23 May, Stellenbosch, South Africa
11	Okou, R., Sebitosi, A.B. , Khan, A., Barendse, P., Pillay, P. Design and Analysis of an Electromechanical Battery for Rural Electrification in sub-Saharan Africa. 2012 IEEE Power Engineering Society General Meeting.
12	Kimera, R., Okou, R., Sebitosi, A.B. , Awodele, K. A concept of dynamic pricing for rural hybrid electric power minigrid systems for sub-saharan Africa. 2012 IEEE Power Engineering Society General Meeting
13	Baloyi, H. , Chiyanzu, I., Marx, S. Algae Liquefaction, Poster presentation, SAICHe conference, 16-19 September 2012, South Africa
14	Meerholz A., Brent A.C. , 2012. Assessing the sustainability of wastewater treatment technologies in the petrochemical industry. IEEE International Technology Management Conference, 387-392, Dallas, Texas.
15	Du Clou, S. , Brooks, M.J., Lear W.E., Sherif S.A. and Khalil E.E., Pulsed ejector cooling systems, AIAA International Energy Conversion Engineering Conference, July, Atlanta, Georgia, USA, 2012.
17	LE ROUX WG , BELLO-OCHEENDE T and MEYER JP; Thermodynamic optimization of an integrated design of a small-scale solar thermal Brayton cycle, International Journal of Energy Research, Vol. 36, No. 11, pp. 1088 – 1104, 2012.
18	LE ROUX WG , BELLO-OCHEENDE T and MEYER JP; Optimum performance of the small-scale open and direct solar thermal Brayton cycle at various environmental conditions and constraints, Energy, Vol. 46, No. 1, pp. 42 – 50, 2012.
19	LE ROUX WG , BELLO-OCHEENDE T and MEYER JP; Optimum small-scale open and direct solar thermal Brayton cycle for Pretoria, South Africa, Proceedings of the 1st Southern African Solar Energy Conference, SASEC 2012, Stellenbosch, paper number ST7, 21 – 23 May 2012
20	LE ROUX WG , BELLO-OCHEENDE T and MEYER JP; Optimum small-scale open and direct solar thermal Brayton cycle for Pretoria, South Africa, Proceedings of the ASME 2012 6th International Conference on Energy Sustainability (ES2012), San Diego, paper no: ES2012-91135, 23 – 26 July 2012.
21	GARACH DV , DIRKER J and MEYER JP; Heat transfer and pressure drop in microchannels with different inlet conditions for water in the laminar and transitional flow regimes, Proceedings of the Ninth International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT2012), Malta, pp. 763 - 770, 16 – 18 July 2012

4.3 Books & Book Chapters

BOOKS AND CHAPTERS IN BOOKS

	2012
1	Chapter in book: Brent AC, Meyer R, van Niekerk JL , 2012. Energy – Towards sustainable energy flows for Stellenbosch. In: Swilling M, Sebitosi B, Loots R (Eds.): <i>Sustainable Stellenbosch – Opening dialogues</i> . SUN MeDIA, Stellenbosch.
2	Chapter in book: Brent AC , van Heyningen P, Pahwa-Gajjar S , 2012. Business – Transformation towards sustainability. In: Swilling M, Sebitosi B, Loots R (Eds.): <i>Sustainable Stellenbosch – Opening dialogues</i> . SUN MeDIA, Stellenbosch.
3	Chapter in book: Brent AC , Thompson-Smeddle L, 2012. Towards sustainable energy solutions. In: Thompson-Smeddle L (Ed.): <i>A South African Renewable Energy Guide for Local Government</i> . Juta, Cape Town.
4	Chapter in book: Brent AC , Spencer F, 2012. Our changing energy climate. In: Thompson-Smeddle L (Ed.): <i>A South African Renewable Energy Guide for Local Government</i> . Juta, Cape Town.

5	Chapter in book: Brent AC , Guy D, Mosdell S, 2012. Our energy policy and regulatory environment. In: Thompson-Smeddle L (Ed.): <i>A South African Renewable Energy Guide for Local Government</i> . Juta, Cape Town.
6	Chapter in book: Brent AC , 2012. An overview of Environmental Management and Sustainable Development concepts for management practices. In: Nel W (Ed.): <i>Management for Engineers, Technologists and Scientists</i> . Juta, Cape Town.

4.4 Other Relevant Outputs

TECHNICAL REPORTS

	2012
1	Tshangela M, Nyakulanini G, Tshabalala L, Gueye MK, Kinuthia-Njenga C, Brent AC , Musango JK, Bassi A, 2012. South African Green Economy Model (SAGEM). Department of Environmental Affairs, Pretoria.
2	Brent AC , Hundt B, Mapako M, Stafford W, 2012. Eskom biomass fuel supply study – Milestone 5: Impacts and Risks: Section A: Impacts. CSIR, Pretoria.
3	Lubkoll, M, Gauché P , Brent AC , 2012. Pre-feasibility study of a Concentrating Solar Power (CSP) plant at Distell. Centre for Renewable and Sustainable Energy Studies, Stellenbosch University.

4.5 Published Student Conference Abstracts

Abstracts submitted for the 3rd CRSES Student Symposium held from 22-23 November 2012 were published as a book of abstract (ISBN nr: 978-0-7972-1397-5).

Thursday, 22 November 2012

Johannes Potgieter: Evaluation and Application of a Slip-Synchronous Permanent Magnet Wind Generator

Kerryn Newey: Optimising Performance of small HAWT's through improved rotor/alternator matching

Bavesh Kooverji: Pneumatic power measurement of an oscillating water converter model

Peni Yekoladio: Thermodynamic analysis and performance

Friday 23 November 2012

Holger Kretzschmar: Development of a Flat-Plate calorimeter for a small-scale heliostat field

Gregg Walker: A method of increasing collector aperture in linear Fresnel solar concentrators at high zenith angles

Andre Louw: DEM-CFD approach to predict the pressure drop through an air-rock bed thermal energy storage system

Sebastiaan Bode: The design and testing of a small scale solar flux measurement system for central receiver plants.

Johan Kotze: Evaluation of a latent heat thermal energy storage system using AlSi12 as a phase change material

optimisation of organic Rankine Cycles for the conversion of low-to-moderate grade geothermal heat

Thapelo Mokomele: Ethanol production from Xylose and Glucose in a membrane bioreactor with Zymomonas

Lloyd Ngo: Exergetic analysis and optimisation of a Parabolic Dish collector or low power application

Willem le Roux: Solar tracking for a parabolic dish used in a solar thermal Brayton cycle

Ross Schultz: The design of a High Concentrator Photovoltaic Module (HCPV).

Willem Landman: Sensitivity analysis of a curved heliostat facet profile

Gerhard Hartwig: Grey water reclamation using solar thermal power

Primrose Njingana: Growth and characterisation of spray pyrolytic doped zinc and aluminium oxides spectral selective thin films.

Brendon MacLeod: Proposed test procedure for the laboratory characterisation of grid-connected micro-inverters

Lucian Bezuidenhout: On the characterisation of solar cells using light beam induced current measurements

Jacqui Crozier: High resolution spatial electroluminescence (EL) imaging of photovoltaic (PV) modules

Mario Benecke: The design and analysis of a vertical receiver LCPV system

4.6 Media Interaction

Solar electricity generated locally, Eikestadnuus, 7 December 2012:13

New company targets solar energy market,
<http://www.innovus.co.za/pages/english/news-and-events/our-newsletter/innovus-e-news-17th-edition---october-2012.php#story3>

Research in renewable energy gets a boost with the opening of new facilities at Stellenbosch, Green Business Guide, 23 November 2012,
<http://www.greenbusinessguide.co.za/research-in-renewable-energy-gets-a-boost-with-the-opening-of-new-facilities-at-stellenbosch/>

Sentrum vir Hernubare en Volhoubare energiestudies het rede om fees te vier/Centre for Renewable and Sustainable Energy Studies has reason to celebrate, Kampusnuus, November & December 2012.
<http://www.sun.ac.za/kampusnuus/pdf/2012/Dec2012Kampusnuus.pdf>

Windaba2012, SA-German Chamber booth –Prof Wikus van Niekerk, Southern African-German Chamber of Commerce, CapeNewsMail, October 2012,

http://suedafrika.ahk.de/fileadmin/ahk_suedafrika/NewsMail/CapeNewsMail_October_2012.pdf

SA: Statement by the Sustainable Energy Society of Southern Africa, affirms that power license grants are a step in the right direction (18/09/2012), Polity.org.za, <http://www.polity.org.za/article/sa-statement-by-teh-sustainable-energy-society-of-southern-africa-affirms-that-power-license-grant-are-a-step-in-teh-right-direction-18092012-2012-09-18>

Sasol sponsors Stellenbosch solar thermal energy research, Engineering News, 4 August 2012, <http://www.engineeringnews.co.za/article/sasol-sponsors-stellenbosch-solar-thermal-energy-research-2009-08-04>

Sasol supports solar thermal energy research at Stellenbosch University, Sasol Internet article, September 2012, http://www.sasol.com/sasol_internet/frontend/navigation.jsp?navid=4&rootid=4&articleId=25900002

Workshop discussion: Can we find critical elements for our energy supply?, 9 June 2012, Sphinx Mining Systems.com, <http://sphinxminingsystems.com/blog/?p=271>

Stellenbosch University hands out 200 Candles of Hope in Macassar, Stellenbosch News, May 2012 <http://blogs.sun.ac.za/news/2011/06/08/stellenbosch-university-to-hand-out-200-candles-of-hope-in-macassar/>

US firm aims to demonstrate power of the ocean off Durban coast, Engineering News, 25 May 2012, <http://www.engineeringnews.co.za/article/ocean-current-power-generation-2012-05-25>

SA Representative at International Solar Energy Society, Specifier, 14 March 2012, <http://www.specifile.co.za/specifier/environmental-sustainability/1023-sa-representative-at-international-solar-energy-society>

South African Wind Energy Training Centre, South African Renewable Energy Training Centre, Green Cape, Belmont Conference Centre, 22 February 2012, http://green-cape.co.za/upload/SARETC_JLvN.pdf

CSP Market more attractive than ever, Renewable Energy Magazine, 6 February 2012, <http://www.renewableenergymagazine.com/article/csp-market-more-attractive-than-ever>

Company announcement: Solar investment appeal, Engineering News, 31 January 2012, <http://www.engineeringnews.co.za/article/company-announcement-solar-investment-appeal-2012-01-31>

5. Review of Progress

The Progress of the Centre over the last year was in line with the performance over the previous years and met the expectation of the University and the management. Some of the highlights of the year were:

- Nineteen students graduated with postgraduate degrees, well above the target of ten students per year, which also resulted in the large number of publications. The Centre had a very good record of retaining contact with the students and supervisors of the students supported over the years.
- The First Southern African Solar Energy Conference was successfully held with quality presentation and participation as well as good media coverage.
- The contract between Stellenbosch University and Eskom, to establish the Specialisation Centre in Renewable Energy Technology at Stellenbosch University, was finalised. This five-year contract will contribute towards the long-term sustainability of the Centre.
- The number of projects completed for Eskom, other public and private sector parties, and international agencies, attest to the high regard the expertise in the Centre currently commands in South Africa. These projects will also contribute to the financial viability of the Centre in future.
- The activities of the Centre have resulted in the first spin-off company from the University, in partnership with an international group.

The Centre was successful to meet, and in some cases exceed, the output targets set in the Service Level Agreement. Those targets that were not met were either targets introduced very late in 2012 – in December when the SLA was still being negotiated – or were part of on-going work that led to them being met early in 2013.

The major challenge in 2012 was the uncertainty regarding when the funding from the DST/NRF will be received due to the on-going process to transfer the contract between the University and the DST, to the NRF.

6. Conclusion

The Centre is well positioned to maintain, and in some cases expand, its activities and programmes in 2013 and beyond. The main assets of the Centre remain the excellent staff, both those employed by the Centre as well as the other academics and researchers associated with the Centre, the excellent facilities at Stellenbosch University, and the students at the different universities cooperating in the Programme.

Table 11: Expenditure 1 January 2012 to 31 December 2012:

					Expenditure Reported to DST	Expenditure Reported to NRF	
		Budgeted		Actual	Still Available	1 Jan-30 Jun 2012	1 Jul-31 Dec 2012
1. Staff			R 3 410 000.00	R 3 444 390.95	-R 34 390.95¹	R 1 598 617.58	R 1 845 773.37
HRST HUB STAFF COST	Act Director, Admin Ass, Research Ass	R 1 810 000.00		R 1 272 438.64	R 537 561.36	R 629 530.58	R 642 908.06
HRAC, HRCO	Part-time Academics	R 1 600 000.00		R 2 171 952.31	-R 571 952.31 ¹	R 969 087.00	R 1 202 865.31
2. Running Expenses			R 575 000.00	R 502 473.73	R 72 526.27	R 214 383.84	R 323 089.89
RXTE, RXIT	Telephone, fax and internet	R 50 000.00	R 0.00	R 55 298.95	R -5 298.95 ²	R 21 832.59	R 33 466.36
RXST	Stationary and printing	R 25 000.00	R 0.00	R 19 738.91	R 5 261.09	R 6 518.79	R 13 220.12
STBU, STCO, , STTR	Travel (Staff Members)	R 80 000.00		R 104 716.28	R -24 716.28 ³	R 54 222.12	R 50 494.16
STST, STVA	Travel (Students, Visiting Aca)	R 40 000.00		R 4 393.07	R 35 606.93	R 2 876.00	R 1 517.07
RXAD	Advertisements	R 100 000.00		R 89 530.87	R 10 469.13	R 48 705.26	R 40 825.61
RXFN, STCF, RXCF, RXAF	Conferences and workshops	R 80 000.00		R 164 483.92	R -84 483.92 ⁴	R 51 029.08	R 148 454.84
SCHO	Community Projects	R 80 000.00		R 48 411.73	R 31 588.27	R 21 000.00	R 27 411.73
FARE	Office refurbishment & maintenance			R 15 900.00	-R 15 900.00 ⁵	R 8 200.00	R 7 700.00
FABU - Facility Rental	Floor Space Charge	R 120 000.00			R 120 000.00		R 0.00
3. Academic Expenses			R 20 000.00	R 7 886.13	R 12 113.87	R 0.00	R 7 886.13
CXTB	Textbooks	R 0.00		R 0.00	R 0.00		R 0.00
RXCM	Teaching Material & Books	R 20 000.00		R 7 886.13	R 12 113.87		R 7 886.13
4. Capital Expenses			R 165 000.00	R 61 465.77	R 103 534.23	R 56 169.22	R 5 296.55
CXEQ, CXOF	Office furniture and equipment	R 0.00		R 7 245.83	-R 7 245.83 ⁶	R 6 195.83	R 1 050.00
CXCF	Classroom furniture	R 0.00		R 0.00	R 0.00	R 0.00	R 0.00
CXIT	Computers Equipment (Staff)	R 15 000.00		R 54 219.94	-R 39 219.94 ⁷	R 49 973.39	R 4 246.55
CXIS	Computers Equipment (Sts)	R 150 000.00		R 0.00	R 150 000.00	R 0.00	R 0.00
5. Contingency			R 0.00	R 132 335.02	-R 132 335.02	R 60 797.85	R 71 537.17
RXWE	Website develop & maintenance			R 31 920.00	-R 31 920.00 ⁸		R 31 920.00
FABU building	Facilities: Building			R 100 415.02	-R 100 415.02 ⁹	R 60 797.85	R 39 617.17
	Total DST Core Grant for 2012	Total	R 4 170 000.00	R 4 183 551.60	-R 13 551.60	R 1 929 968.49	R 2 253 583.11
7. Bursaries			R 0.00	R 75 000.00	-R 75 000.00¹⁰	R 0.00	R 40 000.00
HRBU	DSTBursary Grant	R 0.00		R 0.00	R 0.00		R 0.00
HRBU	From CRSES Reserves	R 0.00		R 75 000.00	-R 75 000.00		R 40 000.00
	Total DST /NRFGrant for 2012*	Total	R 4 170 000.00	R 4 223 551.60	-R 53 551.60	R 1 929 968.49	R 2 293 583.11

7. Financial Information

The DST extended the five-year contract for a six-month period from 1 January 2012 to 30 June 2012. The budget for the Programme from the DST accepted by the Management Board for the Programme for 2012, came to R 4 170 000. Of this amount the DST only transferred R 2 018 500 in March 2012; this amount was R 66 500 less than the expected transfer of R 2 085 000, or half of the agreed budget for 2012. The total expenditure for the year was R 4 223 551.60 (see **Table 12**) of this R 1 929 968.49 was reported to the DST for the period 1 January tot 30 June 2012. The amount of R 2 293 583.11 will be reported to the NRF as the expenditure for the period 1 July tot 31 December 2012.

The following over-expenditure occurred (refer to superscripts in **Table 11**):

- ¹ There was a small over-expenditure on the salaries of the staff, academics and part-time academics. This was partly due to the unexpected increase in salary of one of the academics whose salary is paid from the grant. The Senior Management of the Faculty and University approved this increase.
- ² There was an over-expenditure of 10% on telephones; fax and internet cost, which, although not significant, will be addressed in 2013 by moving to VOIP telephones.
- ³ The total travel budget for 2012 was R 120 000, of this only R 109 109.35 was spent. There was an over-expenditure of R 24 716.28 on travel of staff members. All travel expenditure was approved by the Director as being in line with the business of the Centre. There were many trips on which the Centre only paid part of the cost as the rest was borne by other cost points and/or external funding agencies, i.e. the wind energy study tour to Germany.
- ⁴ There was a significant over-expenditure of R 84 483.91 on the allocation for conferences and workshops. In 2012 the Centre was responsible for two conferences, the 1st Southern African Solar Energy Conference, and the annual Student Symposium. The Director approved this expenditure as it was in line with the mandate of the Centre.
- ⁵ There was no provision made for the cleaning of the Centre's offices in the 2012 budget and this amount of R 15 900 was used to pay an outside contractor, DLC Cleaning Services, to clean the offices. The Director approved this expenditure.
- ⁶ There was no provision made for new office furniture in the budget. As the move to the new offices required additional furniture the Director approved that the amount of R 7 245.83 be spent from the NRF grant for this purpose.
- ⁷ The total budget for new computers in 2012 was R 200 000, of this only R 54 219.94 was spent. Some of this expenditure could be moved to the line below to restore this and hence there was no over-expenditure on the combined budgeted amount.
- ⁸ There was no provision made for website development and maintenance in the 2012 budget. The website of the Centre needed upgrading and it was therefore completely renewed in 2012. The Director approved this expenditure as it was important for the Centre to have an up to date, attractive website.
- ⁹ The Centre moved into new offices in 2012. Sasol sponsored the new offices with a grant of R 4 560 000. There was however a shortfall of R 60 797.85 on the building cost that was, after approval from the Management Committee of the Centre, contributed

from the DST funds. In addition, an amount of R 39 617.17 was spent on smaller items associated with the move-in to the new offices. The Director approved this additional expense.

¹⁰ There was no provision made for bursaries in the budget for 2012 but the Director, in consultation with the Associate Director, approved three bursaries, one of which was paid from the NRF Grant.

There was a shortfall of R 2 138 551.60 for the year because the second payment for 2012 was not received from the NRF by the end of the year. If the NRF transfers the second tranche of R 2 085 000 in early 2013 there will still be a shortfall of R 120 051.60 for 2012. This shortfall is due to an over-expenditure of R 53 551.60 on the approved budget as well as the fact that the DST only transferred R 2 018 500 of the R 2 085 000 as the first tranche. The shortfall will be funded from the interest of R 97 287.47 that was received in 2012 as well as the reserves available in the cost point at the start of the financial year.

The final balance available in the DST/NRF cost point (11550) of the programme on 31 December 2012 was R 42 980.55. The audited statements for cost point 11550 for the period 1 January – 30 July 2012 is included as **Appendix B**.

The total income of the Centre in 2012 was R 10 548 604.36 that is less than what it was in 2011. However, in 2012 the Centre was no longer responsible for disbursing the bursaries to the students which reduced the cash flow through the 11550 cost point by over R 3,5 million. The total expenditure of the Centre, including transfers to other cost points outside the Centre was R 9 485 426.15. The funds available on 31 December 2012 were R 5 782 803.07. The audited statements of all the cost points of the Centre are included as **Appendix C**.

Appendix A: Letter from Finance Department



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13 August 2012

The Deputy Director General: Research, Development and Innovation
The Department of Science and Technology
Private Bag X894
Pretoria
0001

To Whom It May Concern

Close out Statement of Income and Expenditure for the period 2006 – 2012 (SU Ref S000761 Prof JL van Niekerk)

I hereby confirm that the attached statements for the periods 2006 - 2012 agree with the balances for the cost center 11550, Centre for Renewable and Sustainable Energy Studies, in the records of Stellenbosch University.

A separate audit of the validity of the transactions charged to the project has not been performed. A key control at Stellenbosch University is that all expenses are independently measured against the financial policy of the University by accountants within the Finance Department. This objective is audited on a cyclical basis by our outsourced internal auditors, KPMG.

The financial statements of the university were audited by independent auditors, PricewaterhouseCoopers Inc, in terms of International Standards on Auditing for the years ended 31 December 2006 - 2011. The income and expenditure of cost center 11550, Centre for Renewable and Sustainable Energy Studies, are included in the various line items in these consolidated annual financial statements.

Unqualified audit certificates were issued for the 2006 to 2011 financial years.

The university's annual reports for these periods, which contain these financial statements and audit reports, are available on request.

As the University has a financial year end of 31 December, the audit for 2012 will only take place at the beginning of 2013. The income and expenditure of cost centre 11550, Centre for Renewable and Sustainable Energy Studies, for the period 01/01/2012 – 30/06/2012 will be included in the various line items in the consolidated annual financial statements for 2012.

The available balance as at 30 June 2012, the end of the agreement period, amounts to R2 259 565.74. This balance will be utilised to cover the Centre's remuneration and operating expenses for 2012.

Please do not hesitate to contact me if you have any further queries.

Kind regards

A handwritten signature in black ink, appearing to read 'Faiza Majiet', with a large, stylized flourish at the end.

Faiza Majiet
Director: Financial Services
E-mail: faizam@sun.ac.za

Appendix B: Audited Financial Statement of Cost Point 11550 (DST/NRF Funds)



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Statement of Income & Expenditure - OSP Centre for Renewable&Sustainable-11550

For the period ending :	31/12/2012	31/12/2011
TOTAL INCOME	-2 194 111.87	-7 798 267.51
INCOME: BURSARY	-65 000.00	-3 624 000.00
INTEREST RECEIVE: INTERNAL ALL	-97 287.47	-131 348.99
PROFIT: EXCHANGE RATE FOREIGN	-1 810.40	0.00
SALES: TO INTERNAL ORG UNITS	-11 514.00	-3 418.52
SUNDRY INCOME: NON TAXABLE	-2 018 500.00	-4 039 500.00
TOTAL EXPENDITURE	2 314 535.18	6 082 062.26
CURRENT EXPENDITURE		
ADVERTISEMENTS: GENERAL	58 432.86	86 022.74
AFFILIATION & REGISTRATION EXP	39 192.09	26 463.85
AUDIOVISUAL EXPENDITURE	0.00	270.00
BURSARY POST GRADUATE	75 000.00	3 637 000.00
CELL PHONE AIRTIME	9 795.79	3 413.99
CELL PHONE RENT	3 751.52	5 180.08
COMPUTER MATERIALS	3 986.00	0.00
CONSULTATION FEES	283 398.49	209 554.45
CONSUMABLE MATERIALS	44 370.61	15 391.71
COPY AND PRINTING	10 060.45	25 053.87
ENTERTAINMENT: GENERAL	44 356.55	24 682.19
FLOWERS, WREATHS, GIFTS	274.97	700.99
FOREIGN EXCHANGE LOSS	0.00	147.18
FOREIGN TRAVEL & SUBSISTENCE	45 557.17	16 798.21
INTERNET NETWORK EMAIL LEVY	15 643.40	15 608.32
LCW NON-CAPITALISED	33 538.46	0.00
MAINTENANCE OF APPARATUS EN/O	11 251.80	0.00
NON-CAPITALISED BOOKS	8 606.13	0.00
POSTAGE STAMPS AND TELEGRAMS	107.16	417.66
PRIZES AND MEDALS	4 800.00	4 500.00
RENT OF ROOMS	0.00	600.00
SERVICES	18 767.08	12 875.00
SMALLER FURNITURE AND EQUIPMEN	9 917.69	11 939.14
SOFTWARE	729.60	1 890.01
STATIONERY	15 133.41	11 512.86
SUBSCRIPTION & MEMBERSHIP FEES	10 776.13	3 000.00
TELEPHONE INSTALLATION COSTS	3 047.08	1 238.04
TELEPHONE: CALLS	7 929.43	9 185.76
TELEPHONE: RENT	12 339.35	10 646.81
TOTAL REMUNERATION	1 332 438.64	1 748 970.80
TRAVEL & SUBSISTENCE: DEPARTM	122 144.39	120 905.43
TRAVEL & SUBSISTENCE: NON TEAT	15 098.13	26 101.30
WORKSHOPS	21 999.45	32 273.00
ASSET TRANSACTIONS		
ASSET PURCHASES	52 091.35	19 718.87
OPERATING (SURPLUS) / SHORTFALL FOR PERIOD	120 423.31	-1 716 205.25
FUNDS TRANSFERS	1 906 874.00	1 493 141.00
TRANSFERS FROM	1 906 874.00	1 493 141.00



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Statement of Income & Expenditure - OSP Centre for Renewable&Sustainable-11550	31/12/2012	31/12/2011
For the period ending :		
NET (SURPLUS) / SHORTFALL FOR THE PERIOD	2 027 297.31	-223 064.25
Plus: ACCUM (FUNDS) / SHORTFALL ON 01/01/2012	-2 070 277.86	-1 847 213.61
ACCUM (FUNDS) / SHORTFALL ON 31/12/2012	-42 980.55	-2 070 277.86
FUNDS AVAILABLE ON 31/12/2012	<u>-42 980.55</u>	<u>-2 070 277.86</u>


F Majiet

Director: Financial Services

Appendix C: Audited Financial Statement of All Cost Points of the Centre



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Statement of Income and Expenditure -Centre for Renewable & Sustainable(1155)

For the period ending :	31/12/2012	31/12/2011
TOTAL INCOME	-10 548 604.36	-11 966 824.44
ASSIGNED RESEARCH (TAXABLE)	-1 761 852.52	-1 192 993.04
CONFERENCE/CONGRESS (NO VAT)	-518 229.75	-675 986.00
DONATION: SPECIAL PURPOSES	0.00	-102 500.00
INCOME FOREIGN EXEMPT	0.00	-28 661.26
INCOME: BURSARY	-65 000.00	-3 624 000.00
INCOME: FOREIGN_ZERO RATE	-651 539.39	-264 539.42
INCOME: SPONSORSHIPS	-126 315.79	0.00
INCOME: SUNDRY TAXABLE	-1 511 988.11	-1 709 299.41
INTEREST RECEIVE: INTERNAL ALL	-315 704.83	-305 641.79
PROFIT/LOSS: EXCHANGE RATE DEB	0.00	-9 253.81
PROFIT: EXCHANGE RATE FOREIGN	-12 909.81	-440.50
SALES: TO INTERNAL ORG UNITS	-16 564.16	-11 482.82
SUNDRY INCOME: NON TAXABLE	-5 568 500.00	-4 042 026.39
TOTAL EXPENDITURE	6 147 491.80	8 986 954.83
CURRENT EXPENDITURE		
ADVERTISEMENTS: GENERAL	62 901.66	86 022.74
ADVERTISEMENTS: POSTS	31 275.97	0.00
AFFILIATION & REGISTRATION EXP	72 584.11	26 963.85
AUDIOVISUAL EXPENDITURE	0.00	270.00
BURSARY POST GRADUATE	225 000.00	3 696 500.00
BURSARY UNDERGRADUATE	10 630.00	0.00
CELL PHONE AIRTIME	9 795.79	3 461.99
CELL PHONE RENT	3 751.52	5 180.08
CLOTHING: OTHER	4 479.34	3 385.94
COMPUTER MATERIALS	450 904.51	337 850.34
CONSULTATION FEES	608 434.49	481 772.74
CONSUMABLE MATERIALS	95 957.56	47 556.99
COPY AND PRINTING	26 541.96	36 611.97
COURSES	5 926.65	0.00
ENTERTAINMENT: GENERAL	162 204.79	75 702.06
FLOWERS, WREATHS, GIFTS	2 395.82	8 287.16
FOREIGN EXCHANGE LOSS	4 246.12	5 448.37
FOREIGN TRAVEL & SUBSISTENCE	82 893.79	21 798.21
GENERAL VEHICLE EXPENDITURE	74 853.36	25 844.35
INS, LICENSES & 3RD PARTY	250.00	0.00
INTEREST PAID: INTERNAL APPOR	184.26	408.62
INTERNET NETWORK EMAIL LEVY	25 183.55	19 976.03
LCW NON-CAPITALISED	33 538.46	0.00
LEVY: SPACE AND FACILITY	29 720.21	25 036.82
LEVY: SURCHARGE	259 272.81	311 905.68
MAINTENANCE OF APPARATUS EN/O	11 251.80	0.00
NON-CAPITALISED BOOKS	8 606.13	0.00
POSTAGE STAMPS AND TELEGRAMS	5 213.74	7 028.83
PRIZES AND MEDALS	4 800.00	4 500.00
RENT OF EQUIPMENT GENERAL	0.00	2 290.00
RENT OF ROOMS	14 495.00	600.00
SERVICES	18 767.08	15 875.00
SMALLER FURNITURE AND EQUIPMEN	55 305.13	13 273.63
SOFTWARE	7 414.98	8 656.88



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Statement of Income and Expenditure -Centre for Renewable & Sustainable(1155) For the period ending :	31/12/2012	31/12/2011
STATIONERY	20 513.66	17 210.09
SUBSCRIPTION & MEMBERSHIP FEES	10 776.13	3 000.00
SUNDRY EXPENSES	319.81	0.00
TELEPHONE INSTALLATION COSTS	5 702.12	2 087.34
TELEPHONE: CALLS	17 177.36	13 499.60
TELEPHONE: RENT	19 659.67	14 111.62
TOTAL REMUNERATION	2 408 048.39	2 575 498.25
TRAVEL & SUBSISTENCE: DEPARTM	416 874.53	216 371.90
TRAVEL & SUBSISTENCE: NON TEAT	96 315.45	160 099.80
WORKSHOPS	232 793.75	108 173.64
ASSET TRANSACTIONS		
ASSET PURCHASES	510 530.34	604 694.31
OPERATING (SURPLUS) / SHORTFALL FOR PERIOD	-4 401 112.56	-2 979 869.61
FUNDS TRANSFERS	3 337 934.35	2 130 735.84
TRANSFERS FROM	4 771 893.49	4 668 987.07
TRANSFERS TO	-1 433 959.14	-2 538 251.23
NET (SURPLUS) / SHORTFALL FOR THE PERIOD	-1 063 178.21	-849 133.77
Plus: ACCUM (FUNDS) / SHORTFALL ON 01/01/2012	-5 927 817.25	-5 078 683.48
ACCUM (FUNDS) / SHORTFALL ON 31/12/2012	-6 990 995.46	-5 927 817.25
Min: BALANCE SHEET ITEMS	1 208 192.39	488 035.80
DEB CONTR-DT SYSTEM	1 301 720.05	513 278.45
SPACE AND FACILITY CONTROL ACC	-9 801.75	-302.78
SURCHARGE CONTROL	-83 725.91	-24 939.87
FUNDS AVAILABLE ON 31/12/2012	-5 782 803.07	-5 439 781.45


F Majlët

Director: Financial Services



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**ANNEXURE TO Statement of Income and Expenditure -Centre for Renewable & Sustainable(1155)
Consolidated according to CC table FOR THE PERIOD : 01/01/2012 - 31/12/2012**

COST CENTRES INCLUDED IN THE FINANCIAL REPORT

11550	OSP SENTRUM VIR HERNUBARE EN VOLHOUBARE ENERGIE STUDIES
11551	HERNUBARE VOLHOUBARE ENERGIE STUDIES (MEG ING)
11552	EXXARO BOTSWANA: BOTSWANA SONMETING S002167 (MEGING)
11553	OSP SASOL SOLAR MEASUREMENTS S002172 S003049: JL VAN NIEKERK
11554	WASTE FLOW ANALYSIS OF WASTE IN CAPE TOWN S002277*GESLUIT*
11556	EXXARO KONTRAK SONMETING S001809: PROF JL VAN NIEKERK
11557	SONMETING DANIELSKUIL EN KIMBERLEY S002342: JL VAN NIEKERK
11558	UNEP RWANDA S002835: PROF JL VAN NIEKERK
11560	ALUFER ECONOMIC EVALUATION DIFF ENERGY SCEN S002448*GESLUIT*
11561	ESKOM GRID STUDY S002465: PROF JL VAN NIEKERK
11562	SASOL UPINGTON CSP SITE S002781: PROF JL VAN NIEKERK
11563	SOLAR MAP KZN S002868 DEPT OF ECONOMIC DEVELOPMENT & TOURISM
11564	ESKOM RESOURCE ANALYST MANAGER RENEWABLE ENERGY S002884
R1111	KORT KURSUSSE: CENTRE FOR RENEWABLE & SUSTAINABLE ENERGY STU
R1651	KORT KURSUS: RENEWABLE ENERGY TRAINING
R1652	ESKOM CHAIR IN RENEWABLE ENERGY S002400: PROF JL VAN NIEKERK
R1654	ESKOM TESP GRANTS
T571	PAPIERVERKOPE - SENTRUM VIR HERNUBARE & VOLHOUBARE ENERGIE