CASE STUDIES FROM THE AFD GREEN CREDIT LINE FOR SOUTH AFRICA MAY 2015
BACKGROUND

South Africa is a country with high energy intensity and a major emitter of greenhouse gases (GHG). Abundant coal resources are the basis of traditionally cheap electricity, which does not encourage energy conservation. The South African government stands behind energy efficiency improvements and the adoption of renewables into the energy mix. AFD identified that these ambitions would have to overcome significant obstacles, such as the low profitability of energy efficiency projects, the capacity within the banking system to review and understand these project types and the general preference for revenue generating projects against cost saving ones.

THE PROGRAMME

The AFD credit line - Sunref - aims to increase the number of sustainable energy projects being financed by banks in South Africa and to support the country in its ambition to reduce its carbon footprint. The Sunref programme is a concessional loan facility made available to three banks, namely ABSA, IDC and Nedbank, targeted at financing small scale renewable energy and energy efficiency projects. Projects are identified by the banks following their own eligibility and risk criteria and vetted by AFD's technical assistance facility for eligibility. As of May 2015, most of the funds available through the credit facility have been committed to over 115 geographically, as well as technologically diverse projects.

In this document, we have selected a sample of interesting and innovative projects as case studies to highlight the application of different technologies in a variety of industry sectors and the potential for financing such projects across the country.
AFD’S €120M GREEN CREDIT LINE

CASE STUDIES

<table>
<thead>
<tr>
<th>CASE STUDY</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI’S BUSINESS EXTENSION INTO SOLAR PV</td>
<td>3</td>
</tr>
<tr>
<td>BIO2WATT’s FIRST INDUSTRIAL SCALE BIOGAS PLANT</td>
<td>4</td>
</tr>
<tr>
<td>CERES FRUIT GROWERS’ SOLAR PV SYSTEM</td>
<td>5</td>
</tr>
<tr>
<td>CONNACHER’ ENERGY EFFICIENT TEXTILE TEARING EQUIPMENT</td>
<td>6</td>
</tr>
<tr>
<td>ENERGY PARTNERS’ ENERGY EFFICIENCY AND OPTIMISATION PROJECTS</td>
<td>7</td>
</tr>
<tr>
<td>IDWALA LIME’S ENERGY EFFICIENT KILNS</td>
<td>8</td>
</tr>
<tr>
<td>LVG PLANTS’ SOLAR THERMAL SYSTEM</td>
<td>9</td>
</tr>
<tr>
<td>MEAN SEA LEVEL’S WASTE WATER MINI HYDRO</td>
<td>10</td>
</tr>
<tr>
<td>MOUNT CARMEL’S SOLAR PV SYSTEM</td>
<td>11</td>
</tr>
<tr>
<td>NETCARE’S ENERGY EFFICIENCY AND RENEWABLE ENERGY PROJECT PORTFOLIO</td>
<td>12</td>
</tr>
<tr>
<td>SUSTAINABLE HEATING’S BIOMASS BOILERS</td>
<td>13</td>
</tr>
<tr>
<td>UNIVERSAL PAPER MANUFACTURERS’ CAPITAL EXPANSION PROJECT</td>
<td>14</td>
</tr>
</tbody>
</table>
BMI’S BUSINESS EXPANSION INTO SOLAR PV

BMI is a property development company in Port Elizabeth (PE), Eastern Cape, currently embarking on a program to supply its tenants with solar power.

THE PROJECT

With residential, commercial and industrial property in its portfolio, BMI is considered a pioneer in sectional title ownership in PE and had long enjoyed strong yields in the property market. Following the 2008 electricity crisis, the Nelson Mandela Bay Municipality limited further property development. BMI considered alternative sources of revenue, including supplying electricity to its tenants. An agreement was reached with the municipality to allow the installation of rooftop PV systems on BMI properties to supply their tenants, with each installation limited to 100 kW in capacity. Systems will be grid-tied and will have net-metering systems. A 70 kW pilot installation was completed in December 2014, and a second installation of 40 kW is under development.

THE IMPACT

The installed systems will meet most of the energy requirements of the building’s tenants, with backup supply available from the municipal grid. Surplus power will be fed back into the grid. Because the generation costs of the solar systems are considerably lower than the average municipal electricity tariff, BMI is able to sell its solar power at a profit without raising its tenants’ electricity bill. Electricity sales now represent an important new revenue stream for the company. The municipality recognises that once the over forty buildings owned by BMI have received PV installations, they will reduce pressure on the highly constrained electricity supply in PE. Following the success of these pilot installations, BMI is looking to roll out several new PV installations per year across PE. The introduction of net-metering - allowing BMI to be both a consumer and producer of power - by the municipality sets an important regulatory precedent, which could potentially result in a legal framework for further distributed energy generation projects.

THE ROLE OF AFD

The existence of the AFD Green Credit line and the associated Technical Assistance Facility (TAF) provided both the financial support as well as the capacity building that crystallized BMI’s solar PV strategy and facilitated its implementation. Through its partner bank ABSA, AFD contributed a loan of 1.7 M ZAR (127 k EUR) of the total project costs of almost 2 M ZAR. The project also benefitted from favourable financing conditions, which shortened the payback period.

Because of AFD support, the planned pilot rooftop plant became an annual roll-out plan and a way to enhance revenues from an existing asset.
BIO2WATT’S FIRST INDUSTRIAL SCALE BIOGAS PLANT

The Bronkhorstspruit Biogas Plant, developed by Bio2Watt is the first industrial scale biogas-to-electricity plant to be built in South Africa.

THE PROJECT

This plant is situated on the premises of one of South Africa's largest feedlots, Beefcor, approximately 40 kms east of Pretoria. The key raw material used for the production of biogas is the manure generated from the 25 000 head of cattle on the property, supplemented with a variety of other waste streams from nearby food and paper processing plants. This waste is continuously being mixed with water and heated to become a methane producing sludge. The gas from the plant's digesters drives four large gas engines connected to generators and the Eskom grid. The plants' generation capacity stands at 4.4 MW generating electricity on a 24/7 basis, but this can be increased to over 6 MW with additional waste and engines. The plant has an expected initial life cycle of 20 years.

THE IMPACT

The project will deliver renewable electricity to BMW's Rosslyn factory, supplying a third of the factory's electricity needs. This was made possible by an electricity wheeling agreement - an agreement facilitating the transmission of electricity via an existing grid - reached with the Tshwane Metropolitan which, in its current form, had never been done before. Additional revenue streams for the biogas plant are the sale of fertiliser that is a by-product of the digestion process, the sale of carbon emission reduction credits as well as tipping fees. The project also materially improves waste management on the farm, eliminating the hazardous escape of cow manure into the nearby river during the rainy season and methane emissions from the accumulation of animal waste. The more frequent collection of manure also ensures healthier cows. Even more importantly, it is breaking ground for future biogas waste-to-energy developments in South Africa by setting the precedent for these kinds of projects in the country. The plant has created over 50 direct and indirect permanent and about 100 temporary jobs in a rural area, where employment opportunities are generally scarce.

THE ROLE OF AFD

Via its partner bank the IDC, AFD contributed a limited recourse loan of 97 M ZAR towards the project (7.4 M EUR). It is also in this respect that the project broke ground as the use of limited recourse finance techniques for projects of this size remains rare. The IDC however took great care with this transaction to enable subsequent standardisation of many of the legal components for small scale projects. As a pioneering project, BBP was deemed too high risk for commercial lenders at the time. Today commercial bankers from around the country and other Sub Saharan countries have visited the site. BBP, we hope, will become a catalyst for a thriving waste-to-energy industry in Southern Africa.
Ceres Fruit Growers (Pty) Ltd (CFG) is one of the largest fruit handling and packing companies in the Western Cape. In 2013, they installed what was at the time the biggest rooftop PV installation in South Africa.

**THE PROJECT**

CFG was established in 1923 and now employs approximately 1,750 people that harvest, store, package and market fresh fruit. In the past few years, CFG embarked on a drive to reduce the company's energy consumption and reliance on the national grid for electricity supply. The largest single component of CFG's demand for electricity emanates from its cold rooms accounting for 86% of the electricity usage at the company's site. To meet part of this continuous electricity demand, CFG installed a rooftop PV system adding to a total capacity of approximately 1 MW.

**THE IMPACT**

The rooftop PV system is expected to directly supply the refrigeration compressors. The cost of the solar electricity is estimated to be roughly 50% below the current municipal electricity price and savings will only increase in the future as national grid electricity tariffs continue to rise. Of particular significance is that electricity demand of the cool rooms is highest in the middle of the day, which corresponds to the peak output of the PV panels.

By displacing part of CFG's usage of coal-based electricity from the national grid, the project will result in significant CO2 emission reductions for at least the next 25 years. The project has also been welcomed by the Witzenberg Municipality, as it will ease the burden of power demand on the municipal distribution grid. As the Western Cape is a significant fruit and wine growing area, the Ceres project has led the way for agro-processing companies in the region, who are now exploring options to implement their own solar systems.

Through its partner bank ABSA, AFD contributed a loan of 17.6 M ZAR (1.2 M EUR), which covered almost all project costs.

AFD's concessional finance shortened the project's payback period to a level that makes a future expansion of the solar system an attractive option.
Connacher recycles textiles extremely efficiently thanks to new machinery that has substantially reduced the energy intensity of the process.

**THE PROJECT**

Connacher (Pty) Ltd, based in Hammersdale, Kwa-Zulu Natal, recycles dumped textiles by processing them into a form usable by the motor and linen industries. To help these industries use more recycled materials, Connacher embarked on a program to triple its production. As a first step, the company acquired a new state-of-the-art tearing machine (by Laroche) to replace its older, smaller tearing machines. Besides having a processing capacity that allows Connacher to increase its output 2.5-fold, the new machine also reduces the process’ energy intensity by more than 50%. For these benefits to fully materialise, Connacher needed to improve other aspects of the production line. This was achieved by installing a robotic feeding unit, a semi-automatic bale ejector and a dust compactor that produces bio-briquettes from the large amounts of textile dust generated by the tearing machine.

**THE IMPACT**

The new production line halves the energy intensity of processing textiles and brought Connacher’s electricity bill down by 16% - while allowing for a doubling of production. Textile dust that previously had to be deposited in a nearby landfill at a cost is now being turned into bio-briquettes, which are sold profitably. The energy efficient equipment installations have improved the viability of the recycling enterprise tremendously, allowing the owners to think about expansion and a higher margin product line. Increased production also means the company has to source greater quantities of raw textile material generating jobs at landfill sites, as more collectors are required to sift through the refuse.

**THE ROLE OF AFD**

Through its partner bank ABSA, AFD contributed two loans totalling 20.8 M ZAR (1.5 M EUR) for the tearing machine and additional briquetting equipment.

Following intense consultation with AFD’s TAF team the company expanded its activities and moved into the bio-briquetting business. This has shortened the project payback period and increased the viability of the overall business.
Energy Partners aims to assume the role of an energy services company (ESCO) to help improve the energy efficiency and energy management systems for a broad range of commercial clients.

Energy Partners (EP), a Cape Town based energy consultancy, has a pipeline of several projects, which will improve their clients’ energy efficiency and increase the use of renewable energy. In the first round, the following types of projects were proposed for funding under the AFD Green Credit facility:

- Five bakery optimisation projects, where the energy efficiency of the bakeries would be improved significantly;
- Three Rooftop solar PV systems in the range of a few hundred kW;
- Energy efficient refrigeration based on ‘multiplex refrigeration plants’, which allow for more efficient temperature regulation for clients with large refrigeration loads.

EP’s proposed projects are expected to offer a combined saving of up to 40 million kWh per annum. Bakery and refrigeration optimisation projects will generate an expected 40% reduction in electricity costs, while the proposed solar PV projects will displace coal-based grid electricity. These projects are not only based on innovative technologies but also novel contractual agreements. The energy services company (ESCO) model employed by EP, whereby the company retains the assets and sells energy to its clients is rare in South Africa. In the case of bakery optimisations, EP is contracted to supply heat and humidity for 10 years. In the case of the PV systems, EP provides the capital outlay and essentially owns and operates the systems it installs, selling electricity to its clients, who benefit from cheaper, pre-determined energy prices for the duration of the contract, and the absence of a capital outlay on their part. At the same time, EP gains continuous annuity income, which is aligned with its business vision and expansion plans.

Through its partner bank ABSA, AFD contributed 30 M ZAR (2.7 M EUR) toward an initial portfolio of projects, with individual projects identified and defined at time of loan disbursal.

The financial innovation of ABSA’s credit arrangements with EP provides the company with great flexibility in its operations, demonstrating the commercial value that exists in ESCO contracts.
Idwala replaced its coal-fired rotary kilns with vertical kilns consuming half the coal to produce the same amount of lime.

THE PROJECT

Idwala is a large enterprise in South Africa with high energy usage. Its lime production facility in Ouplaas operates across the production chain from mining through the output of limestone, burnt lime and slaked lime. Prior to 2013, Idwala used coal-fired rotary kilns for its lime production. The company used the AFD Green Credit Line to finance an energy efficiency modernisation project, employing a unique clay brick building process on the interior of the kiln for which special bricks were imported from India and technical expertise from Italy and Portugal. Its two oldest rotary kilns were replaced with vertical kilns which have a much higher capacity, while reducing energy consumption by 57%. In addition, the kilns have lower capital costs and produce the same quality lime.

THE IMPACT

The two new vertical kilns will reduce Idwala’s coal consumption by some 38 000 tonnes per year. This translates into an estimated displacement of 51 200 tonnes of CO2 emissions per annum with significant and sustainable cost savings. Idwala is the first company in Southern Africa to use vertical kilns in its production line, providing an example to other mining companies in South Africa of the feasibility of installing energy efficient equipment for their operations. The project helps to ensure that the mine retains its competitiveness. Idwala plans to expand its production, and the savings from this project may motivate the company towards further energy efficient plant modernisations.

THE ROLE OF AFD

Through its partner bank Nedbank, AFD contributed a loan of 105 M ZAR (10 M EUR).

AFD's support will allow the company to maintain a competitive position, while realising significant savings in CO2 emissions. Idwala is also motivated to secure additional energy efficiency benefits and modernize its operations, as it continues to expand.
LVG PLANTS’ SOLAR THERMAL SYSTEM

LVG Plants in Krugersdorp aims to switch their greenhouses, the largest horticultural facility in the country, from using coal-based heat to solar thermal energy.

THE PROJECT

The company operates a greenhouse area of 80 000 m², with plans to expand. The greenhouses require continuous and stable temperature and humidity levels, which LVG currently supplies by means of two 10 MW coal-fired boilers. This results in average annual coal consumption of 3 300 tonnes per year. The company plans to replace most of this coal-based energy with a solar thermal system that utilises a vast solar collector field, which will make it the largest solar thermal collection system in South Africa. Solar energy will be used to heat water, stored in a hot storage tank of 2 100 m³ and distributed across the greenhouses through heat pipes.

THE IMPACT

LVG expects to replace up to 80% of its coal-fired energy with its solar thermal system. Reduced energy costs, owing to reduced utilisation of the coal boilers will cut operating expenditure and fuel costs. The proposed solar thermal system will displace some 2 600 tonnes of coal burnt per year, also reducing the company's carbon emissions. In anticipation of the benefits of the solar thermal system, LVG is already considering further expanding its use of solar energy by installing a rooftop PV system. The plant will serve as a demonstration of the effectiveness and viability of solar thermal energy as an alternative energy source in South Africa.

THE ROLE OF AFD

Through its partner bank Nedbank, AFD contributed 19.5 M ZAR (1.4 M EUR) to the project. The AFD Green Credit line increased the affordability of the total project cost for LVG Plants.

With the use of an AFD grant, LVG will be able to expand its solar system with PV panels for its electricity supply, further reducing its reliance on fossil fuel energy and demonstrating the viability of solar energy for the South African horticultural sector.
Mean Sea Level’s Waste Water Mini Hydro

The Project

Mean Sea Level is an energy services company (ESCO) aimed at finding innovative ways to reduce the energy consumption and increase the efficiency of abalone farms. Abalone is a common name for edible sea snails, considered a delicacy in many parts of the world. The majority of abalone species are found in cold waters, including off the coast of South Africa. Over-fishing and poaching have reduced wild abalone populations so dramatically that abalone farms now supply most of the abalone meat available on seafood markets. Abagold, one of MSL’s owners, is such a farm.

Abagold is a substantial power consumer and is looking to reduce its dependency on grid electricity by purchasing power from MSL’s two demonstration projects: a 1 MW Wave Energy Converter (WEC), and a micro hydroelectric plant with a capacity in the order of 100 kW using the farm’s effluent flows – sea water that is constantly pumped from the ocean and circulated within the farm. Of these, the latter was financed by the AFD’s Green Credit Line.

The Impact

The effluent-based hydro project is expected to produce around 840 million kWh per annum. This will offset only a small portion of Abagold’s energy consumption, but will supplement the greater energy supply by the 1 MW WEC. MSL will supply electricity to Abagold from the demonstration plants at breakeven price that is on par with Eskom’s tariff for grid electricity.

The Role of AFD

Through its partner bank IDC, AFD contributed a loan of 4.6 M ZAR (320 k EUR), supporting the clever utilisation of waste water usage to drive turbines.
Mount Carmel (Pty) Ltd is a vegetable farmer situated in Bapsfontein, Gauteng, who has chosen solar PV to ensure continuous power supply to its hydroponic facilities.

THE PROJECT

Mount Carmel supplies around 120 varieties of vegetables to South African retailers, mainly Woolworths. They are a large-scale commercial farm, which recently switched operations to a covered hydroponic, fully automated farming setup over two hectares of its land. The farm now requires approximately 2,500 MWh of electricity annually, which is at present primarily supplied from the national electricity grid and supplemented by several own diesel generators on site. To reduce its consumption of fossil fuel-based electricity, Mount Carmel decided to install a rooftop solar PV system with a capacity of 1 MW, so as not to exceed the size that would require a generation license. The system will comprise 4050 rooftop solar panels and 90 inverters and supply electricity directly to Mount Carmel’s hydroponic greenhouses.

THE IMPACT

The system is designed to meet some 70% of the hydroponic facility’s electricity consumption. This will allow Mount Carmel to reduce its long term expenditure on grid electricity, as well as limiting the use of expensive diesel generators. The hydroponic system cannot survive without electricity and the current constraints in power supply experienced in the country threaten the continuity of the farm’s operation. The solar PV system will mitigate this important risk.

CO2 emissions will be lowered by an estimated 42,000 tonnes over the system’s 25 year life span. This demonstrates Mount Carmel’s desire to align with the sustainability vision of Woolworths, its key client. The company is installing a second hydroponic setup, an operation that becomes feasible owing to a cheaper, more reliable energy supply. In this way, the PV system will contribute to shifting the 600 jobs from a seasonal to a permanent basis, materially improving the economic situation of its workforce.

THE ROLE OF AFD

Through its partner bank ABSA, AFD contributed a loan of 19.4 M ZAR (1.5 M EUR) to the project. The solar system supplier informed Mount Carmel of the favourable ABSA loan conditions facilitated by the AFD Green Credit Line. AFD’s funding support assured the client of the feasibility of the project, and affordability of the loan. This has helped create the potential for Mount Carmel to grow its business with reduced long term energy costs and to safeguard the jobs of its 600 employees.
Netcare, the foremost private hospital group in South Africa, is engaging in an energy efficiency and renewable energy programme spanning all its hospitals with the aim of reducing power consumption by 35% in 10 years.

Owing to the energy intensive nature of hospital operations, Netcare has an electricity bill of 246 million ZAR per year, an expense which, without intervention, would continue to grow with rising electricity prices and the expansion of Netcare’s network of hospitals. Instability in the national power grid has also placed significant strain on Netcare’s back-up generators and power facilities, since uninterrupted power supply is fundamental to ensuring adequate patient care. To address these issues, Netcare began developing its sustainability and energy management strategy in 2012, which aims at significant energy savings and a reduction in the group’s environmental impact. The five-year implementation plan sees three main components: energy efficiency retrofits at 52 hospitals, ranging from small scale light retrofitting to holistic heating, ventilation and air conditioning (HVAC) system replacement, rooftop solar PV installations at 36 hospitals, and energy intensity reductions at 3 newly built hospitals, totalling 91 projects over 52 sites.

The implementation of energy efficiency retrofits and installation of PV systems will materially reduce Netcare Hospitals’ consumption of coal-based electricity from the national grid – up to 35% over the next 10 years. This will result in savings in the order of 1 billion ZAR and 310 000 tonnes of carbon emissions. In addition, the program will generate some 180 000 people-hours of temporary employment. While Netcare itself does not intend to add internal jobs, its program will support skills development and the creation of a nascent industry sector. Public sector healthcare institutions in South Africa will ultimately benefit from the existence of this expertise and from proven operating cost reduction methods. Furthermore, a programmatic nationwide approach of this scale serves as a demonstration for public healthcare and other large energy users.

The AFD contributed 500 M ZAR (36.4 M EUR) towards the total 647 M ZAR required for the implementation of the 91 projects. Making direct use of the AFD investment grant, Nedbank connected Netcare with international expertise to ensure that state-of-the art equipment will be installed. Netcare, Nedbank and AFD took a leap of faith that the necessary skills and expertise can be developed in SA to ensure the success of a programme of this scale and it looks like all parties will be rewarded for their confidence and boldness.

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Sustainable Heating (Pty) Ltd (SH) is an energy services company who develops and operates biomass-based heating solutions. SH is planning to roll out over one hundred projects in the coming years.

Through its partner bank IDC, AFD contributed 11 M ZAR (1 M EUR) towards the project. With the financial support provided through this loan, Sustainable Heating has been able to successfully implement its first biomass fired boiler and demonstrate the viability of this business model. As a result of this success, SH has followed up the Shakaskraal project with a second boiler installation/operation contract at another industrial bakery in Cape Town. Furthermore, the company plans to roll out another 5-6 biomass-heated boilers during 2015, and up to 150 boilers over the next five years.

Sustainable Heating has signed a 15-year agreement with a new industrial bakery in Shakaskraal for the supply of low pressure steam from biomass fuelled boilers. The boilers are heated through the combustion of wood chips, bringing the temperature of the water to ±185°C to generate steam, which is then supplied to the bakery via isolated pipes. The system is capable of providing 2.8 tonnes of steam (at 100°C) per hour, 24 hours per day, six days per week. Wood chips (up to 1 100 m3 per month) are provided by a company manufacturing wooden door and window frames, where they are generated as a waste from the production line.

The wood chips heated boiler is able to supply 80% of the bakery’s steam demand, at a substantially lower cost compared to oil heating. In 2013, wood chips were approximately 15% cheaper than oil. Applying this model of using a cheaper, more sustainable fuel source gave SH a competitive advantage for supplying its client with steam. In addition, the company, which owns the bakery benefited from being able to ‘outsource’ its steam supply, allowing it to reserve its own capital for investments into additional machinery and equipment for its bakeries. This will allow the bakery to continue to expand its operations, and in so doing will increase the demand for steam produced by SH. The project showcases a new concept of outsourcing steam supply that allows the client to optimise its business operation while providing the ESCO the opportunity to generate an annuity income.
With its capital expansion project, UPM will nearly double production capacity, while reducing its energy intensity significantly.

### THE PROJECT

UPM specialises in the production of tissue paper, paper towels and serviettes for household use and currently holds a 10% market share in this sector in South Africa. With demand for its products growing, the company’s four nearly obsolete paper rolling machines were no longer sufficient. The machinery, dating back from the 70s, is also significantly more energy intensive than today’s equivalent machines. UPM decided to invest in new machinery to increase capacity while reducing the energy intensity of its production process. Four old machines were replaced with a single new one housed in new premises. The new plant has smaller, more efficient motors for pulping, refining and paper rolling, with a total electricity rating of half the size of the old plant.

### THE IMPACT

The new plant is able to generate an 85% increase in output, while reducing electricity consumption by 27%. In addition, the use of coal, that is needed to fuel the steam-heated can dryer system employed in the production process, has been reduced by a quarter. Together, these interventions have brought the energy intensity of UPM’s paper production process down by 50%. Reduction in grid-supplied electricity and coal usage also reduce the company’s CO2 emissions by 3 650 tonnes per year.

The reduced energy and operating costs of the company will improve its competitiveness. The investment in the new plant safeguards the company’s sustainability, and allows it to expand its market share. It also ensures its employees retain their jobs and continue the distribution of ‘factory rejects’ in the community, which relies on them as a form of informal economic activity.

### THE ROLE OF AFD

Through its partner bank IDC, AFD contributed a loan of 93 M ZAR (6.8 M EUR) towards total project costs of 216 M ZAR. This project would not ordinarily have been eligible for AFD funding due to its size. AFD and its German counterpart KfW recognised UPM as a significant player in SA’s pulp and paper industry, with considerable energy savings potential. Without concessionary funding from AFD and KfW, this project would not have been implemented. The co-operation between these two DFIs and the flexibility shown, allows UPM to continue to expand providing jobs and opportunities for the local community in Ga-Rankuwa.