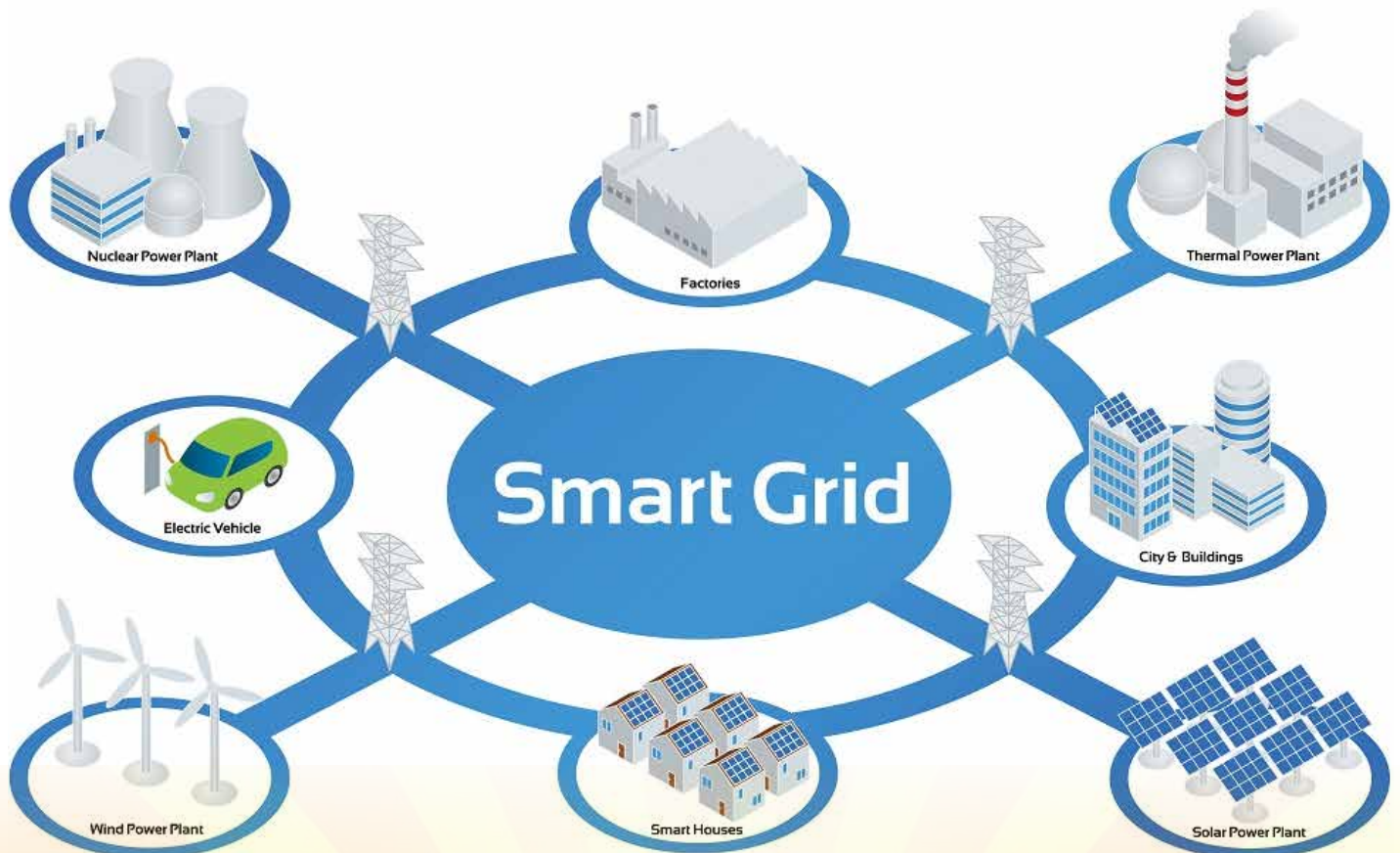


Etango

Namibia's Leading Renewable Energy Technologies
Magazine

January- February 2018



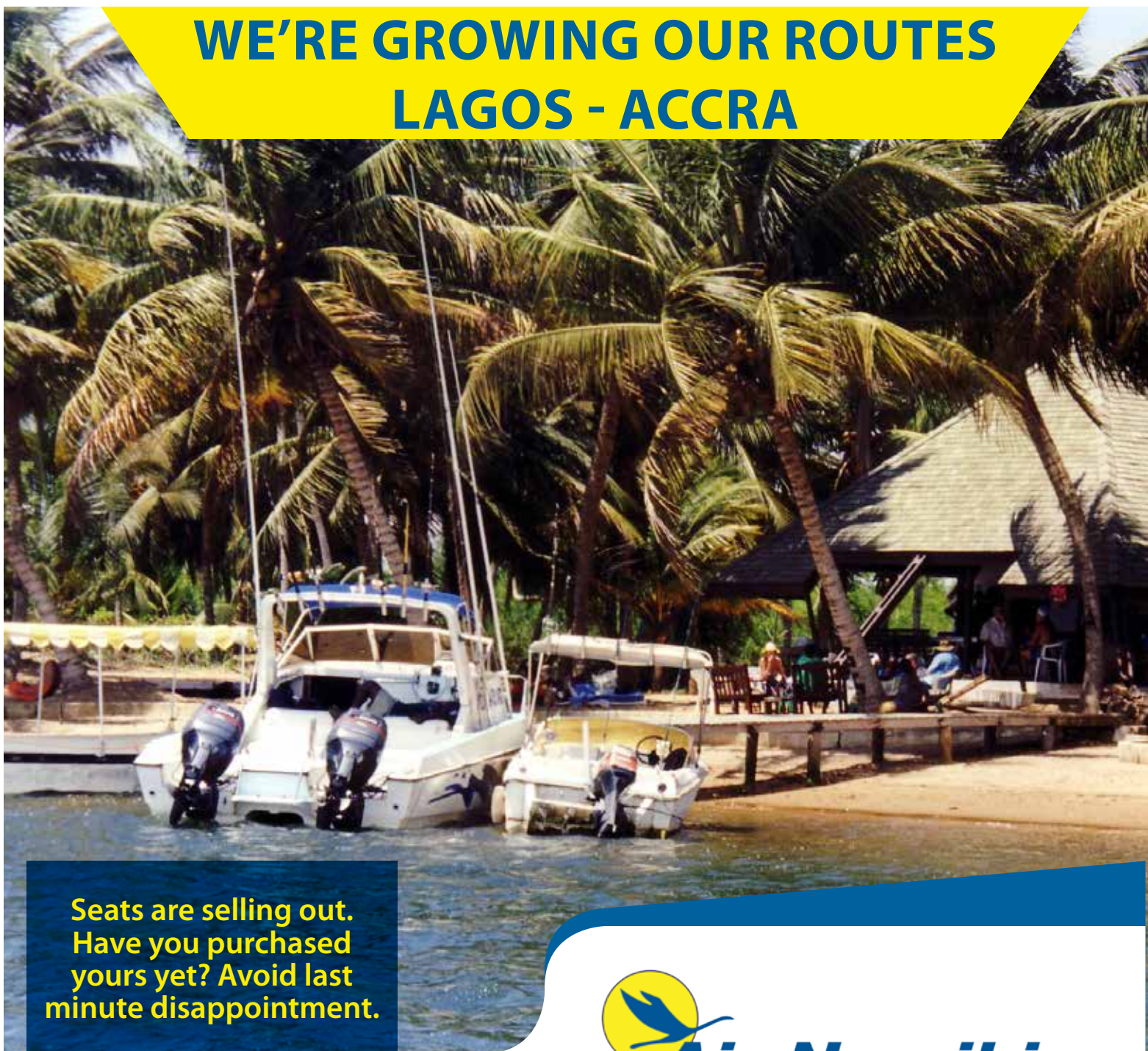
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- Windhoek to set up 5 x 5MW solar farms
- NEI explores PV solar water heating
- NamPower PPA breathes life into Diaz
- Ejuva solar plants add 10MW to grid

Game Changing Smart Grids



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Renewable Energy rollout steps into high gear

Clear regulations and the fall in the prices of renewable energy technologies has seen an upsurge in the adoption of RE technologies throughout Namibia. Local authorities, tourism establishments, mines and several business entities have turned to renewables, mostly solar, in order to safeguard their electricity supply, reduce costs and their carbon footprints.

Namibia is now well on course to reach, and even exceed, the Harambee Prosperity Plan (HPP) target of increasing local electricity generating capacity from 400 megawatts to 600 megawatts by 2020.

Under the Renewable Energy Feed in Tariff (REFiT) programme, which aims to add 70MW of electricity from renewables, at least nine Independent Power Producers (IPPs) have so far commissioned their plants in the country adding over 40MW to the grid from solar

and wind generation stations.

Mega energy projects by IPPs which are still in the pipeline include the 44MW Diaz Wind Power project outside Lüderitz, the 45.5MW Hardap solar project outside Mariental and the 5 x 5MW solar parks that the City of Windhoek plans to establish. Other towns like Oshakati, Tsumeb, Grootfontein, Otavi, Outjo and Khorixas are also at advanced stages of setting up their own solar generation plants tailored to their energy demands. The move is also aimed at reducing the prospect of power shortages, by complementing the electricity provided by NamPower.

Regional Electricity Distributors (REDs) warned against a 100% reliance on NamPower for bulk electricity supply and pushed for a diversification of supply as the only way for Namibia to safeguard a reliable, domestic supply of electricity.

B2Gold's Otjikoto Mine is installing a 7MW solar PV plant to reduce its reliance

on a heavy fuel oil (HFO) power plant which is not only expensive to run but also environmentally unfriendly. Other mines in the country are going the same route.

Ohlthaver & List Leisure has turned to solar in order to reduce its energy bill and carbon footprint at its two establishments, namely the Midgard Country Estate and Mokuti Lodge in Etosha.

Etango welcomes these noble efforts aimed at embracing clean and sustainable energy. In this first edition of 2018, we also look at the ECB's Electricity Resale Rules, the benefits of smarter grids and a new project aimed at promoting sustainable bush-processing value chains in the country.

Happy Reading!

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NEW ORDER: Smart grids are vital for Namibia to fully enjoy the benefits of the abundant renewable energy. Smart grids can maximise reliability, resilience and stability by implementing a supply and demand infrastructure. (see story on page 9)

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The ECB has consulted widely on the electricity redistribution and resale rules

ECB in final stages of developing electricity Redistribution and Resale Rules

The Electricity Control Board (ECB) is finalising the formalisation of the framework and conditions under which a reseller may buy electricity from a distribution licensee, and sell that electricity to customers. This followed extensive consultation and input from the energy sector stakeholders which took place during 2017.

A 2008 study on the Redistribution of Electricity in the Namibian Electricity Distribution Industry found that the current regulatory framework did not sufficiently deal with the redistribution due to lack of rules and regulations. The Reseller Rules being formalised now will cover the provision of electricity to consumers by an unlicensed person or entity. The unlicensed status of such entity implies that the activity may be carried out outside the regulatory regime which has been put in place to safeguard the interests of consumers and industry participants.

The new rules will formally allow and regulate the reselling of electricity by registered resellers. They will ensure that the consumer does not end up worse off in terms of tariffs, receives reasonable service and have safe redistribution networks. The licensee will be required to ensure the compatibility of the re-distributor infrastructure and systems and accord the licensee

certain rights regarding the redistribution of electricity.

The two main categories of re-distribution have been identified as follows;

1) Public/Commercial re-distribution: This includes re-distribution in commercial buildings, shopping malls, blocks of flats, restricted areas, on industrial and mining premises and in various residential developments. It also includes the provision of metering, vending and billing services by private companies.

2) Private/Social re-distribution: This includes the provision of electricity by house owners to tenants in flats attached to houses, provision of electricity by farmers to farm workers and other small scale, private and not commercially oriented instances of re-distribution. This also includes illegal practices in informal settlement areas of providing electricity via non-standard cabling to un-serviced households close to households that do have an electricity connection.

The ECB has now incorporated the comments and suggestions made by stakeholders in the revised Reseller Rules. These will now be forwarded to the ECB board for approval by end of March, 2018. After ECB approval the rules will be submitted to the Minister of Mines and Energy for approval.

Legal drafting of the rules is expected to commence



Energy sector stakeholders attending a consultation workshop on the Reseller Rules

“
The Reseller Rules
being formalised
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to consumers by an
unlicensed person or
entity.



ECB General Manager Regulations, Rojas Manyame, right, and Manager: Economic Regulation, Pinehas Mutota discussing the new rules

during April with publication in the Government Gazette earmarked to be done by the end of June 2019.

ECB General Manager: Regulations, Rojas Manyame, said during a stakeholder workshop last year that the regulator was confident that the Reseller Rules will add value to the Electricity Supply Industry.

“The process of consultation is an integral part of the regulation. The ECB is legally required to consult on issues relating to the scope, content and implementation of any rules, codes or guidelines in a manner the ECB considers appropriate,” he said.

According to the proposed Reseller Rules,

redistributors of electricity will be required to register with the ECB and failure to do so would result in a fine of N\$16 000 or a two-year jail term. Resellers billing/vending system must be compatible with that of the supplying licensee, while the meter requirements for the Reseller and licensee and the tariff structure must be the same.

The ECB will be mandated to demand records from Resellers and Redistributors for inspection and may demand the testing of meters at the cost of the Reseller.

A six month period will be given to Redistributors to ensure tariff alignment with the Reseller Rules.

NamPower PPA breathes life into N\$1, 5bIn Diaz Wind Power project

The Diaz Wind Power project outside Lüderitz, which will add 44 megawatts of wind energy to the Namibian grid, has sprung to life following the signing of a power purchase agreement (PPA) with NamPower.

The N\$1, 5 billion Diaz Wind Power project is a joint venture between the United Africa Group and Quantum Power and was one of the pioneer projects in Namibia to be introduced by an Independent Power Producer (IPP).

The 25-year PPA inked with NamPower for the off-take of electricity from the wind power generation plant means that development of the Diaz Wind Power plant can now go ahead. Between 13 and 18 wind turbines will be installed at the Diaz site for the 44 MW Phase 1 project. Developers expect the plant to be up and running by 2019.

The wind plant is expected to deliver an energy output of more than 200 million kilowatt hours per year, which translates to supplying electricity to more than 10,000 households.

The parties also signed two other agreements – the Project Development Connection and Transfer Agreement (PDCTA), which makes provision for the building of the transmission infrastructure that will connect the wind generation plant to the NamPower transmission system, and the Transmission Agreement, which makes provision for the use of the transmission system by Diaz.

The Diaz Wind Power project will include all requisite civil, electrical and mechanical installation works at the site, the

“

The wind plant is expected to deliver an energy output of more than 200 million kilowatt hours per year, which translates to supplying electricity to more than 10,000 households.



POWER DEAL: Quantum Power Investment Director Duncan Bullock, Diaz Wind Power Director Haddis Tilahun and NamPower MD Simson Haulofu sign the deal



ALL SMILES: Quantum Power Investment Director Duncan Bullock, Diaz Wind Power Directors Haddis Tilahun and Martha Namundjebo-Tilahun with NamPower MD Simson Haulofu

construction of a substation and a 27km transmission line to NamPower's 132 kV Namib substation, as well as the upgrade of the Kokerboom and Namib substations.

Diaz Director Haddis Tilahun says the project will be Namibia's first utility-scale wind energy generation project. "We will establish a utility scale power generation plant that will create an opportunity for other investors' confidence to invest in the Namibian economy and in partnership with NamPower," he states.

The cost of power from Diaz will be fixed under the 25-year PPA with NamPower. This, Tilahun says, compares favourably with existing domestic generation from coal or diesel plants, the cost of which varies with commodity prices and the value of the Namibia Dollar.

The total project cost of N\$1,5 billion will be funded by a combination of long term debt and sponsor equity. United Africa Group and Quantum Power, as co-sponsors of the project, will fund all the project equity and arrange the debt funding. No investment will be required from NamPower in the project, which is estimated to generate almost N\$2 billion in tax revenues over two decades.

NamPower Managing Director Kahenge Simson Haulofu says the latest agreement with Diaz is testimony that the power utility is committed to working with IPPs on viable renewable energy projects to develop new generation power plants as part of its short and medium term initiatives to complement conventional power generation sources and add to the current generation capacity.

Measurements at 85.7m high, undertaken in Lüderitz, have predicted a yearly wind speed average reaching 10 m/s, with a stable wind direction. Other areas around Namibia's coastline that also offer good wind potential include, Henties Bay, Terrace Bay and Mowe Bay.

Under the Renewable Energy Feed in Tariff (REFiT) programme, initiated by the Electricity Control Board, NamPower and the Ministry of Mines and Energy, the power utility has concluded power purchase agreements with 14 local renewable energy IPPs.

The programme will inject at least 70 MW of renewable energy into the grid. Of the 14 IPPs, nine have already started to feed into the system, while the remaining five are expected to start operation by mid-2018.



SOLAR PARK: The City of Windhoek earmarks to set up the solar park on virgin land adjacent to the Cimbebasia residential area

Windhoek moves to add 25MW of solar power

The City of Windhoek has moved to engage Independent Power Producers (IPPs) for the construction of five solar photovoltaic power plants, each with a capacity of 5 megawatts (MW).

The Municipality has already issued an Engineering, Procurement and Construction (EPC) and Build, Operate and Transfer (BOT) tender for the solar PV plants.

The solar parks, to be set up on virgin land adjacent to the Cimbebasia residential area, will be jointly owned by the municipality and the developers (the IPPs). The solar project will form part of the City's objectives to become less reliant on national power utility NamPower as the sole bulk supplier of electricity.

The City of Windhoek has identified reducing reliance on NamPower as one of its key strategic objectives, and intends cut the supply with quantifiable targets of power generation from renewable energy sources by 2021, mainly from solar and wind. This goal is one of the City's targets contained in the Transformational Strategic Plan for the period 2017-2022, which envisions making Windhoek a smart city by the year 2022.

The Windhoek municipality has previously tried to implement proactive efforts to develop renewable energy sources within the City but these initiatives have been hindered by the absence of a coherent and clearly pronounced policy. The council's Management Committee has now directed that a Renewable Energy Policy for the City be drafted and a renewable energy steering committee be formed in the interim.

The land that the City has put forward for the solar parks is relatively flat and located close to the 66 kilovolt

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The City of Windhoek has identified reducing reliance on NamPower as one of its key strategic objectives, and intends cut the supply with quantifiable targets of power generation from renewable energy sources by 2021, mainly from solar and wind.

(kV) electricity lines for easy integration into the electricity grid.

Due to their non-pollutant nature, solar plants were found to be the more suitable projects for the earmarked land as it is situated above one of the city's aquifers. There would be no risk of radiation emanating from a solar plant. The site is a 310-hectare stretch of protected land, of which 52 hectares would be reserved for the solar plants.

The City of Windhoek also stands to gain additional revenue from leasing the land to the IPPs, while at the same time protecting it.

Smart Grids key to Namibia realising full benefits of renewable energy

For Namibia to fully benefit from its abundant renewable energy resources it is imperative to smarten-up the country's electricity grid, a local energy expert says.

The term smart grid refers to a modern electricity transmission, distribution and supply grid which, by using modern (digital) information and communication technology, is able to coordinate the generation, distribution and storage of electricity.

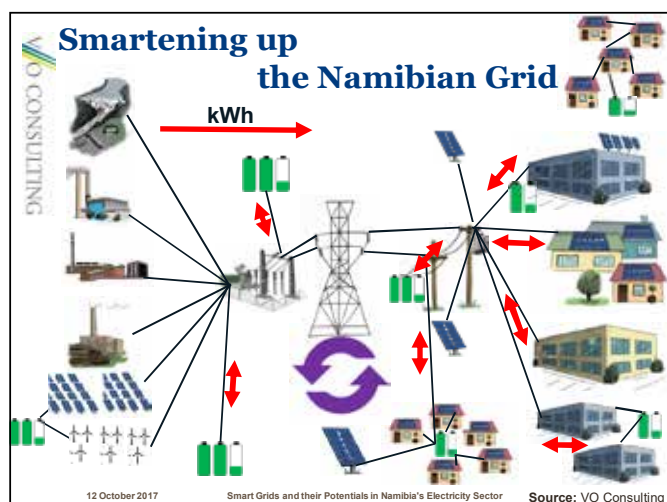
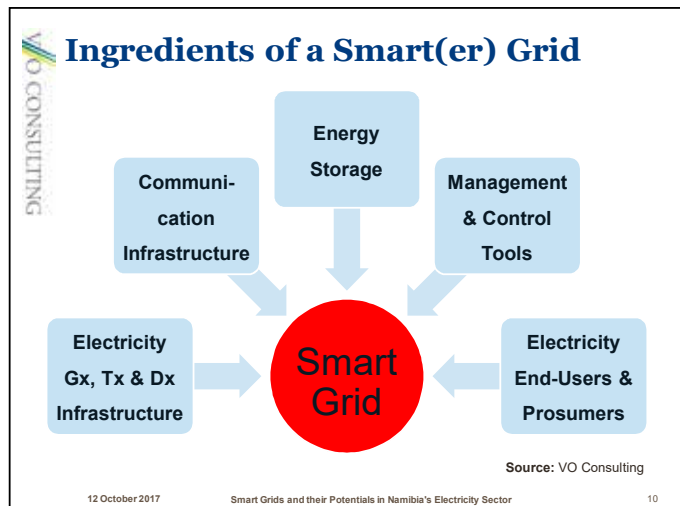
In his paper titled 'Smart Grids and their Potentials in Namibia's Electricity Sector', Dr Detlof von Oertzen says since the utilisation of solar and wind energy is dependent on fluctuations in climate and changes during the course of the day which impact on power supply, smart grids can maximise reliability, resilience and stability by implementing a supply and demand infrastructure.

"Our future electricity mix will consist of a multitude of decentralised electricity supplies, some being non-firm. There is considerable value in a diversified supply mix powered by locally abundant energy endowments, so in order to remain relevant, the grid must be able to offer benefits that stand-alone systems do not offer. A smart(er) grid integrates up-and downstream electricity assets to create value for the entire system," says Von Oertzen.

Rationale for a Smart(er) grid

The energy expert says Namibia's solar resource is immense, while there are also some good wind and biomass resources. However intermittent supply makes it imperative to smarten up the grid in order to manage the intermittency. This entails coming up with innovative methods to store energy, communication technology to detect and react to local changes in usage, as well as other energy network management and control tools.

Von Oertzen says Namibia needs to strategically focus on sector-wide electricity developments that will help establish a smartened-up grid that integrates all main supply- and demand-side assets, and benefitting from multiple distributed generation supplies. A smarter grid, he says, should be able to attract and reward public and private sector investors in the energy sector, while also



ensuring that electricity supplies become and remain secure, increasingly accessible, and affordable, thereby enabling national development opportunities.

In order for Namibia to successfully embrace a smart grid Von Oertzen says there is need to recognise that the business-as-usual approach to development in the electricity sector can no longer be applied and that a value-focused national strategy needs to be developed for the rollout of a smart(er) grid.

"We must include smart grid requisites in all main planning documents shaping the electricity sector, such as the National Integrated Resource Plan (NIRP) and to design transmission and distribution infrastructure which enables successful integration into a smart(er) grid. Legal and regulatory provisions also need to be in place for the entry of smart grid elements across the electricity value chain," says the energy expert.

NEI explores solar water heating using direct current from photovoltaics

The Namibia Energy Institute (NEI), at the Namibia University of Science and Technology (NUST), together with AEE-Intec, have installed the first photovoltaic water heater (PWH) in Namibia using a DC/AC element to heat water. The PWH has been installed for research purposes under the Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) project.

Through SOLTRAIN, a regional project funded by the Austrian Development Agency (ADA) and OPEC Fund for International Development (OFID), NEI installed 62 solar water heaters (SWH) at NHE houses in Windhoek's Otjomuise residential suburb between December 2015 and March 2016.

Measurement and verification systems were installed at six houses of which four houses were using Solar Water Heater (SWH) and two houses using electrical geysers. Data has been collected and analysed at these houses since 2016.

Now the research has been taken further by adding a 1.59kW photovoltaic module to directly power a resistive element for heating a 300L tank using direct current without an inverter. The element is also able to operate with AC electricity from grid as a backup for cloudy periods.

The PWH system was installed at one of the houses monitored which used an electrical geyser before. At another house which was also using an electrical geyser, a 300L solar water heater and 4m² collector area was installed in order to conduct a comprehensive study comparing the SWH and the PWH systems in Namibia.

The systems were designed based on the hot water demand per person in the respective houses as analysed over a period of one year. The first PWH system under the SOLTRAIN project was installed by Stellenbosch University. The only difference between the two systems is that the one installed by Stellenbosch University has a horizontal tank with a capacity of 200L, while the one installed by NEI has a vertical tank with a capacity of 300L.

NEI Centre Head at the Centre for Renewable Energy and Energy Efficiency (CREEE), Helvi Ileka, told Etango that the PWH system was being introduced to test and compare its functionality



A 1.59kW photovoltaic module was installed to directly power a resistive element for heating the 300L tank using direct current without an inverter

with the SWH in order to make information available to players in the energy and housing industry.

She said the pilot project would also explore the possibility of adopting the photovoltaic water heating system in the off grid areas where it could be used to provide basic electricity needs in addition to heating water.

Senior Shimhanda, a Master of Environmental Engineering student at NUST, with specialisation in renewable energy systems, is working with NEI as an intern on the pilot project as part of his final research project to complete his thesis. Shimhanda was involved in the installation of both the SWH and PWH systems at the two houses in Otjomuise. He was also involved in the installation of measurement equipment and will collect and



The beneficiary of the first photovoltaic water heater (PWH) Nicolas Marembo (centre) with Senior Shimhanda, the Master of Environmental Engineering student (left) and Helvi Ileka, Centre Head at the Centre for Renewable Energy and Energy Efficiency at NEI. Marembo, who contributed to the cost of the PWH, was trained on the functionality of the system and is happy with the system so far.

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Through SOLTRAIN, a regional project funded by the Austrian Development Agency (ADA) and OPEC Fund for International Development (OFID), NEI installed 62 solar water heaters (SWH) at NHE houses in Windhoek's Otjomuise residential suburb between December 2015 and March 2016.

analyse the data from the systems.

Shimhanda said it was essential to conduct a techno-economic analysis of the existing water heating systems in the Namibian context in order to determine the best domestic water heating technology between SWH and photovoltaic water heating. The outcome of the research will help prospective Namibian buyers to choose the most efficient and cost effective solution between SWH and PWH.

Research into the SWH and the PWH would aim to answer the following questions:

- Whether existing water heating systems are viable technically and economically
- Their possible impacts on the environment
- The initial capital costs and operation costs of each water heating system
- Which technology is more cost-effective in terms of performance and economic benefits and;
- Which technology is more efficient and less prone to intermittent weather fluctuations.

B2Gold turns to solar power with 7MW plant for Otjikoto Mine

Canada-headquartered local gold producer, B2Gold, is constructing a 7 megawatt solar photovoltaic plant at its Otjikoto Mine to reduce reliance on a heavy fuel oil (HFO) power plant currently used to power the mining facility.

Caterpillar and local Cat dealer Barloworld were selected to construct the plant which is expected to be up and running in the first quarter of 2018. Barloworld is supplying engineering, procurement and construction services for the project. Caterpillar's solar PV system is powered by advanced thin-film solar modules that are setting the industry benchmark with improved performance over conventional silicon solar panels.

Caterpillar supplied the original 25MW of power capacity to the Otjikoto Mine when it opened in 2014 through four Cat 12CM32 HFO medium-speed engines and three Cat 3516B high-speed generator sets.

The new solar PV system is pre-engineered for quick and easy installation and offers reliable and predictable energy in all climates and applications with modules that are independently tested to pass accelerated life and stress tests beyond industry standards.

Caterpillar's solar PV offering is a key component of the Cat Microgrid technology suite, a line-up of power systems that adds environmentally friendly solar panels, energy storage, and advanced monitoring and control systems to Caterpillar's traditional line of reliable power generation equipment, including HFO, natural gas and diesel generator sets, switchgear and automatic transfer switches.

The Cat Microgrid technology suite is designed to reduce fuel expenses, lower utility bills, decrease emissions, and reduce the total cost of ownership while increasing energy efficiency in even the most challenging environments.

A key differentiator in Caterpillar's offering is the Cat MMC, which keeps loads



ENVIRO FRIENDLY: B2Gold aims to reduce its carbon footprint and its reliance on a heavy fuel oil (HFO) power plant with the new 7 megawatt solar photovoltaic plant at the Otjikoto Mine

continuously energised with high-quality power at the lowest cost. It manages the flow of power from every source in the system, including the main grid when connected.

The Cat MMC determines optimum recharge times for the energy storage systems while managing power during times when solar energy is not available.

The MMC also uses Cat Connect technology for real-time collection and communication of on-site performance data that can be monitored and analysed remotely.

Mark Dawe, Managing Director and Country Manager for B2Gold Namibia, says the company embraces environmental stewardship and social responsibility as key corporate priorities in doing business. "As one of the largest solar installations in Namibia, the facility at the Otjikoto Mine will help us to leverage a plentiful, renewable resource while improving the quality of life for nearby communities," says Dawe.

Tom Frake, vice president of the Global Power Solutions Division for Caterpillar, says the economic viability of remote mining operations depends on the cost-efficient generation of power.

"Caterpillar's solar technologies provide a scalable, sustainable power solution that significantly reduces fuel consumption while delivering the reliable power needed to support mining sites," Frake says.

For many years, B2Gold has relied on dependable, high-performing Cat equipment for both power solutions and mining operations at the company's mining sites around the world. Caterpillar is a leader in the power generation marketplace with power systems engineered to deliver unmatched durability, reliability and value.



GRID-CONNECTED: The Ejuva 1 and Ejuva 2, just outside the eastern town of Gobabis, have added 10 megawatts to the national grid since they entered production on 27 September 2017

Ejuva solar farms in Omaheke add 10MW to power grid

Two solar projects in the Omaheke Region, Ejuva 1 and Ejuva 2, have added 10 megawatts to the national grid since they entered production on 27 September 2017.

The two solar farms, located side-by-side just outside Gobabis, produce 5MW each but have an installed capacity to produce 6MW of power each. The solar PV plants are part of the 14 Independent Power Producers (IPPs) entering Namibia's energy sector under the Renewable Energy Feed-in Tariff Programme (REFiT) to supply power to NamPower.

The N\$250 million Ejuva energy project was developed by a partnership of Benzel and Partners Investment, Oka Investment, CIGenCo and Solar 4 Africa.

Deputy Mines and Energy Minister Kornelia Shilunga welcomed the two projects and reiterated that government was committed to ensuring the development of renewable energy solutions to safeguard security of electricity supply.

"It is a well-known fact that the country is still fully dependent on the imports of fossil fuels and more than one half of its annual electricity requirements. Thus it is one of

the primary policy goals of the government and Ministry of Mines and Energy in particular to harmonise the mismatch between Namibia's indigenous energy resources endowment and those that are actually used," she said.

"As net importer of most forms of energy Namibia will need considerable local investments such as Ejuva 1 and Ejuva 2 solar projects to reduce these strategic risks. Creating and sustaining the requisite incentives is a key requirement that necessitates political stability, regulatory oversight and control as well as sustained economic growth. And the same time access to affordable energy remains a major economic empowerment challenge," said the deputy minister.

Developers of Ejuva 1 and Ejuva 2 secured a 25-year land lease agreement with the Gobabis municipality for 35 hectares of land where the solar project has been constructed. The contract to supply electricity to NamPower will also be valid for 25 years.

The developers said the decision to set up the project at Gobabis was motivated and made possible by the abundance of sunshine which the area receives and the availability of land.

Solar heat could produce power and water for Namibia: study

The proposed solar thermal energy would be dispatchable day or night (red and orange thermal storage tanks) and include thermal desalination. Credit: Ernest Dall

A research study from Stellenbosch University finds that a 100 MW concentrated solar power (CSP) plant adapted to also “co-generate” water via multi-effect distillation (MED) would potentially be financially viable for Namibia given a world class solar resource at Arandis, where NamPower plans a solar park close to the demand.

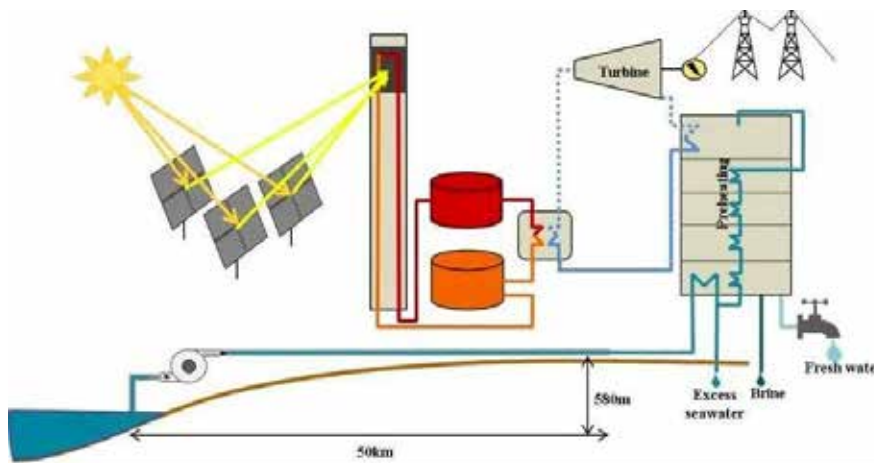
Including multi-effect distillation would add relatively little extra cost to that of a standalone CSP plant in Namibia, the authors of Integrating desalination with concentrating solar thermal power: A Namibian case study find in a study published at Renewable Energy in January 2018.

CSP is the thermal form of solar that makes electricity by powering a conventional power block, but instead of fossil fuel, uses just sunlight. The feasibility study for Namibia comes in the context of much CSP plus desalination research and development by major CSP research centers globally, including MIT and the Cyprus Institute, which successfully demonstrated a prototype for Mediterranean islands in 2008, and CIEMAT in Spain, that leads the IEA/SolarPACES Task VI: where it researches and coordinates international researchers, and Germany’s DLR, which has summarised the range of CSP+desalination technologies explored.

Pros and cons for Namibia

This proposed 100 MW CSP+desalination plant would be more expensive than the existing desalination plant just north of Swakopmund, which uses grid-powered reverse osmosis, the study estimated.

However, co-generation of electricity and water would have additional benefits over the current grid-powered reverse osmosis plant. One advantage of this proposal is that it simultaneously generates electricity,



The proposed solar thermal energy would be dispatchable day or night (red and orange thermal storage tanks) and include thermal desalination. Credit: Ernest Dall

while the current plant consumes Namibia’s scarce electricity.

With thermal energy storage the study’s CSP+desalination plant would provide dispatchable solar to supply 15% of Namibia’s peak demand into the evening, giving Namibia greater energy independence from its neighbors, and reducing its carbon footprint, helping it meet its 2030 70% renewable energy target.

With a small population of less than 2.5 million, Namibia’s peak load was around 656 MW in 2017, of which 347 MW is supplied - albeit seasonally - by hydro power from the Ruacana Hydropower Scheme in the north of the country.

“In 2017, Namibia imported approximately 60% of its annual electricity from surrounding countries. Most is from South Africa’s power utility, Eskom, and that’s mostly coal,” said the research study’s co-author, Ernest Dall.

Dall received a bursary for his Masters in Mechanical Engineering at Stellenbosch in South Africa from NamPower, Namibia’s national electric utility, and is now an engineer in its Power Systems Development division.

“I luckily had the option to choose my research topic and I wanted to do something looking at future issues that do not just affect Namibia, but issues that are global, and that is basically electricity and water scarcity, which if you think about it, go hand-in-hand in desalination,” he related.

Namibia is already water stressed. The United Nations projects it will become vulnerable by 2025.

Adding desalination to a CSP plant

“There is a synergy between power generation and desalination of seawater,” explained Dall. “The desalination plant effectively replaces the condenser in the Rankine cycle, whilst the Rankine cycle in turn provides a ready source of low grade heat for desalination. The concept hinges on utilising that waste heat from your CSP plant and trying to use that as a heating source.”

The profitability of co-generating both electricity and water is equivalent to that of a CSP plant only generating power. The added cost is minor, about 13%. The solar field would be oversized in relation to the power block, and both operations would be simultaneous.

“You can do both at once, generate electricity and desalinate water,” said Dall. “Because the desalination plant functions as the dry cooled condenser - the one is dependent on the other. One in fact cannot function without the other one unless there’s a redundancy added in the system.”



Credit: Solar PACES

Water sales would subsidise electricity production, as water prices are relatively high

“Water is considered a precious commodity in Namibia with prices seen to rise in the past recent years. We experienced a drought now for a few years and I don’t believe that water prices will decline anytime soon.” CSP+desalination could be attractive in similar water-stressed nations, Dall said.

“Feasibility would depend on various boundary conditions like local water and electricity tariffs, solar resource, demand, etc,” said Dall. “Whether water is more or less expensive relative to the price of electricity. This would affect how you would optimise the CSP+desalination plant.”

The Namibian study determined that water from the CSP+thermal desalination with multi-effect

desalination would cost one and a half to two times as much as the existing grid-powered reverse osmosis desalination plant on the coast, with distance from the coast playing a big part. Generation to pump seawater from coast to solar park adds 12% to parasitic load.

NamPower is planning to have its CSP plant set up just outside Arandis, one of the country’s best solar resources with close to 3,000 kilowatt hours of direct normal irradiance per square meter per year. The location benefits from being near much of the electricity demand, and existing transmission, road and rail infrastructure. The existing Trekkopje desalination plant is just north of Swakopmund.

However, the Arandis site is 48 kilometers from the coast and 580 meters above sea level.

“The pumping is quite significant, because of the distance and height difference. It is 12 MW, which represents quite a lot of the electricity generated from a 100 MW CSP plant,” Dall said.

The study erred on the side of caution with very conservative estimates which resulted in a cost of CSP electricity of 13 cents per kWh, assuming a high risk finance cost of 18%. But the study assumed that this relatively expensive electricity from the CSP plant would be used to pump the seawater up from the coast. Pumping would account for almost half the cost of desalination.

PV could reduce pumping cost

Dall suggests that instead, low cost PV could power the pumping⁶. He sees local Namibian businesses going solar, suggesting that even at retail, PV costs less than the grid.

Electricity from PV could run the pumps at almost half the cost, with recent prices in neighboring South Africa ranging from 6 - 8 cents per kilowatt hour. (A Namibian brewery cited its 6-7 year payback for 1 MW commercial rooftop PV, even back in 2013.)

“You could oversize your pumping facility so that you could just pump during the day with PV. I think that could potentially bring the cost down but I’ve not looked into this,” he said, adding, “maybe that is something that someone else can do.”

Dall’s preferred next step would be less academic, a small demonstration plant. Energy use in pumping water can be significant in large water-stressed regions. Almost 20 percent of California’s water-related energy use is pumping it around the state. A Chilean CSP+desalination feasibility study presented at the SolarPACES Conference also contended with a solar resource far from the coast.

But CSP desalination can also be sited close to coasts, for example on small Mediterranean islands like Cyprus, where the Cyprus Institute plans a demo of solar polygeneration (electricity, desalination, plus process heat). - Provided by: **SolarPACES**

Midgard Resort goes Green with solar plant

The popular Midgard Country Estate, owned and operated by Ohlthaver & List Leisure, has become the latest resort in the country to resort to solar energy in order to reduce its energy bill and carbon footprint.

The N\$4 million, 128 kWp solar photovoltaic plant, which was installed by Cronimet Mining Power Solutions as an EPC (Engineering, Procurement, and Construction) contractor on behalf of O&L Energy, will cover the resort's total daytime energy demand.

The plant is partly subsidised by the German Investment and Development Organisation and will serve as a demonstration plant for technical skill transfer, on-the-job training and vocational workshops.

Managing Director of O&L Leisure, Terence Makari, says the power plant is part of the company's journey towards going green. "We are passionately committed to the O&L Group Vision Metric of reducing our carbon footprint by 20% by 2019. The solar power plant at Midgard which has been in operation since 21 December 2017 is only the beginning of our journey towards adjusting our electricity usage to a more environmental friendly system across the O&L Leisure portfolio," he says.

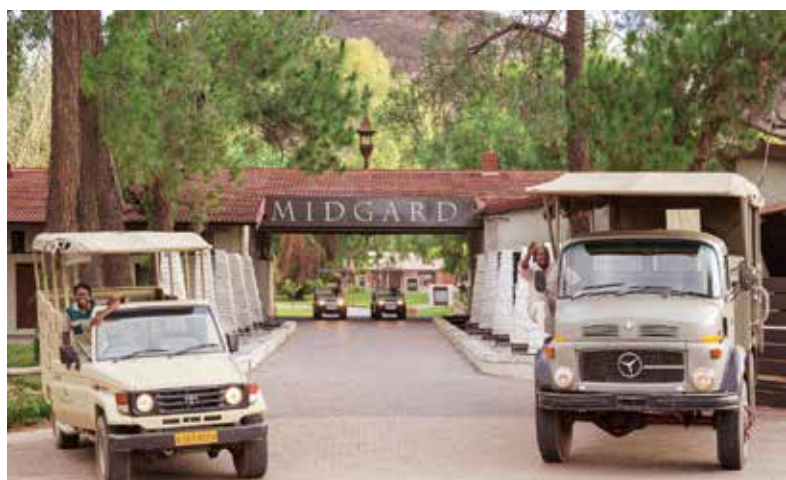
Steffen Kammerer, Managing Director of Cronimet, points out that the completion of the plant at Midgard is a milestone as it is the first project to be realised with a partner from the hospitality industry. "It emphasises our ambition to support the African hospitality industry going green. Our PV plants ensure hoteliers a reliable off-grid and eco-friendly energy supply at a reliably favorable price," Kammerer states.

O&L Energy CEO, Bernd Walbaum, says a significant aspect of the Midgard power plant is the speciality service which includes a Monitoring and Energy Management System designed to optimally manage power consumption of the lodge.

"The production of electricity at Midgard will thus be optimised by the system to suit the demand. The system can also manage energy consumption, thus contributing significantly, and even further to cost-saving on electricity usage," Walbaum says.



The Midgard Country Resort solar plant



Cronimet Mining Power Solutions is currently constructing another larger solar power plant at O&L Leisure's Mokuti Lodge in Etosha, which is expected to be operational soon.

Meanwhile, Midgard Country Estate is undergoing renovations aimed at upgrading and enhancing guest experience. This is the second time the popular estate has undergone a facelift in about five years.

Makari says the latest renovations, which are not disrupting the normal day-to-day operations of the estate, are part of the first phase in the execution of a new master plan crafted for the country resort.

"The renovations are being done to revitalise, upgrade and enhance our guests' experience, and to return Midgard to its former glory where memories have been created amongst friends and family, and to bring the property on par with the others within the O&L Leisure portfolio," says Makari.

The 16 000 hectare country estate, located in the Otjihavera Mountains just an hour's drive from Windhoek, is a popular conferencing venue and a weekend getaway, ideal for families with the attractive 'Namibian rate' – many entertainment options for children and attractions for young and old alike. The estate can accommodate up to 102 guests at a time and currently employs 78 Namibians.



Deputy Minister of Mines and Energy Kornelia Shilunga (seated 2nd from left) with some beneficiaries of the solar lanterns

Solar lanterns to light up off-grid schools

Learners in Namibia's remote schools, which do not have access to electricity, often struggle with their school work due to inadequate time to study. For the Itomba-Ikaba Combined School, situated about 90km northeast of Katima Mulilo in the flood-prone Kabbe South area, this is now a thing of the past. This follows the donation of 100 solar lanterns from the Ministry of Mines and Energy.

Deputy Minister of Mines and Energy, Kornelia Shilunga, said the lanterns, which were acquired with the help of the Electricity Control Board (ECB), will go a long way in helping learners during study time at night. "We brought these solar lanterns for you, and you must make good use of them, and make Ikaba Combined School the best performing school in the region and the country at large," she said.



President Geingob attending the 5th Board of Directors' meeting of the Africa Renewable Energy Initiative (AREI)

Geingob wants more investment in renewable energy

President Hage Geingob and other African leaders have called for concerted efforts to boost production of renewable energy as electricity is key to Africa's development.

Geingob attended the 5th Board of Directors' meeting of the Africa Renewable Energy Initiative (AREI) in Addis Ababa, Ethiopia, in January. He serves as a board member of AREI, representing the southern African region. AREI was developed in 2016 and is led by institutions from the continent under a mandate of the African Union.

Other heads of state who attended the AREI Directors

meeting were Uhuru Kenyatta of Kenya and Alpha Conde of Guinea, while the presidents of Egypt and Chad sent representatives.

AREI seeks to achieve at least 10 gigawatts of new energy capacity by 2020 in Africa, and additional renewable energy generation of at least 300 gigawatts by 2030.

The AREI meeting attended by Geingob discussed financing for renewable energy projects and the governance structure of initiative. It was also attended by the African Development Bank President Akinwumi Adesina.

Solar clinics and solar bike ambulances for Namibian villages

The United Nations Development Programme (UNDP) has collaborated with the Global Fund and the Ministry of Health and Social Services on a global initiative called *Solar 4 Health* which has seen the installation of solar energy photovoltaic (PV) systems at five remote clinics across Namibia.

The remote clinics that have been equipped with solar PV systems include Okaukamasheshe Clinic and Uutsathima Clinic in the Omusati region, Eiseb Clinic, Klein Aub Clinic and Kalkrand Clinic in the Hardap region.

The global *Solar 4 Health* initiative is aimed at supporting governments in improving access to quality health services. These systems provide constant and cost-effective access to electricity, thus assisting vulnerable communities in mitigating climate change and poverty conditions. It is envisaged that the beneficiary clinics will effectively use solar energy to assist in providing rural communities with cost effective, reliable and sustainable power solutions.

Namibia is inching closer to meeting the Sustainable Development Goals (SDG's) 17 as set out by UNDP Global. SDG's 3, 7, 13 and 17 that being good health and well-being, affordable and clean energy, climate action and partnerships respectively are specifically achieved in relation to the *Solar 4 Health* project.

The World Health Organisation's (WHO) Operational Framework for building climate resilient health systems highlights the need to take a broad approach mediate the challenges of climate change, including a focus on renewable energy in health facilities and utilising innovative technologies.

Solar bike ambulances

Meanwhile, the Bicycling Empowerment Network Namibia (BENN) will soon start building 30 solar-powered electric bike ambulances for villages in Namibia and Zambia which will help thousands of rural women, men and children to gain access to healthcare in medical emergencies.

The fleet of electrically assisted bicycle ambulance trailers



SOLAR-POWERED CLINIC: Installation of solar energy photovoltaic (PV) systems at remote clinics will improve access to quality health services in Namibia



TEST RIDE: Hilya Ekandjo testing one of the solar-powered electric bike ambulances at Okafitu, in the Omusati region

will be designed for the thick sand and thorns of Namibia and charged by solar-powered recharging stations. They will be managed by local healthcare facilities, and provide emergency health transport in areas that have never before had access, therefore saving many lives in childbirth and treatment of illnesses such as malaria, HIV-AIDS and tuberculosis.

BENN's head Mike Linke said the first bicycle ambulance prototype was built in 2005 and turned into a project where the design and build of a bicycle-pulled ambulance trailer improved. BENN has since built 120 non-motorised bicycle ambulances that are working well, and saving lives.

"Namibia's maternal mortality rate of 200 deaths per 100 000 live births is 20 times higher than that of the UK. The dire lack of transport to access healthcare is similarly urgent in many sub-Saharan African countries, and few affordable, sustainable solutions are currently being tested or implemented," said Linke.

BENN has teamed up with local Namibian partners, SunCycles, for the solar-powered electric bike ambulances project.

Promoting sustainable bush-processing value chains in Namibia

The Ministry of Industrialisation, SME Development and Trade (MITSMED), in partnership with the Embassy of Finland and the United Nations Development Organization (UNIDO) has launched a project titled “Promoting sustainable bush-processing value chains in Namibia” (“Bush Value Chains Project”).

This followed an inception workshop held in Windhoek in October last year attended by over than 50 participants from MITSMED, Embassy of Finland in Namibia, UNIDO, the German Development Agency (GIZ), public and private sector representatives, experts on value chain development and industrial food processing and agriculture, farmers, academia and other project stakeholders.

Deputy Permanent Secretary at MITSMED Michael Humavindu and Johanna Unha-Kaprali, Chargé d’Affaires of the Embassy of Finland, both emphasised the relevance and market oriented approach of the new initiative contributing to both national sustainable development objectives of Namibia and the United Nations Sustainable Development Goals.

The inception workshop reflected on research findings on bush biomass utilisation opportunities and challenges, technical and business related prerequisites for building a successful project for bush value chains, including animal feed production in Namibia and discussed the source of feed for animals, foodstuffs, biomass and other marketable produce in Africa and internationally, among other topics.

The UNIDO project aims at reducing bush encroachment, a phenomenon that describes the occurrence of high densities of woody species which grow at the expense of grass and herbs, thereby reducing the carrying capacity for livestock and hampering agricultural activities. By stimulating utilisation of invasive bush species, such as in the animal feed, food and pharmaceutical industries and energy production sectors, important sources of jobs, food and income are generated.



Promoting sustainable bush-processing value chains in Namibia

The promoted bush-processing value chains contribute to the inclusive and sustainable industrial development of Namibia. The project is funded by the Ministry for Foreign Affairs of Finland and is supported by a number of national counterparts, including the Walvis Bay Corridor Group, the Ministry of Agriculture, Water and Forestry of Namibia, the University of Namibia (UNAM) and the Namibian Meat Board.

It is estimated that between 26 and 30 million hectares of Namibian farmland are affected by bush encroachment. This phenomenon severely degrades rangelands and hampers agricultural productivity. At the same time bush encroachment creates unique opportunities for the Namibian economy if biomass is recognised as a valuable resource for existing and new value chains.

Bush encroachment severely reduces biodiversity and the formation of groundwater that lowers the productivity and livestock capacity of pasture land by up to two thirds. This in turn causes economic losses of over N\$1, 4 billion annually due to reduced meat production.

A bilateral cooperation project between the Namibian Ministry of Agriculture, Water and Forestry (MAWF) and the Government of the Federal Republic of Germany, titled “The Support to De-bushing Project” ran from 2014 to 2017 and was aimed at triggering large-scale bush thinning activities. A demand-driven approach was pursued, focusing on the identification and testing of potential bush based biomass value chains. The Project selected three value chains to be supported during the course of its project lifetime, namely the value chains of charcoal, animal feed and biomass energy.

Spotlight on 5 of the biggest planned renewable energy projects in the world

As renewable energy is no longer considered a niche technology, countries and energy companies have embarked on a race to impress the world with majestic clean energy projects of all kinds and demonstrate their true potential.

Some projects are destined to meet increased national energy needs in the wake of phasing out fossil fuel power plants. Others are seeking to use a country's competitive advantage and create energy export opportunities. After all, the charm of renewable energy sources is that they have the ability to change the world energy landscape, and give prominence to the new 'energy exporters'.

Here are some of the world's largest proposed renewable energy projects which demonstrate that the energy transition is well underway and renewable energy is nothing but the future.

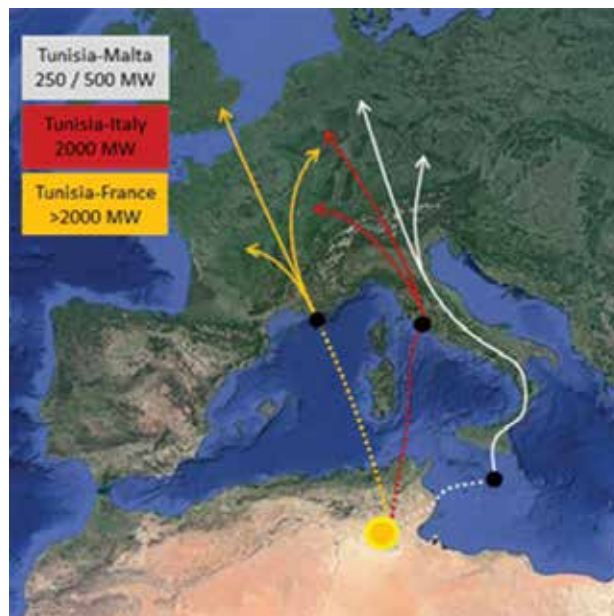
The TuNur project- 4,000 MW solar – Tunisia

TuNur is a solar power project in Tunisia aiming to exploit the country's competitive advantage in solar radiation and available space in order to power Europe. Located in a newly established solar complex in Southwest Tunisia, the project will use the Concentrated Solar Power (CSP) technology deploying parabolic mirrors connected to molten salt energy storage in a surface of more than 5,000 hectares- an area almost 3 times the size of Manhattan.

Submarine cable systems will then transfer clean electricity to Europe via 3 different routes which represent the correspondent phases of the mega project.

The endeavour is attempting to revive Europe's plans to import cheap clean energy from North Africa to further its Energy Union vision. It builds upon the Desertec initiative, the first ambitious initiative led by German investors to import immense amounts of solar electricity from Tunisia to Europe.

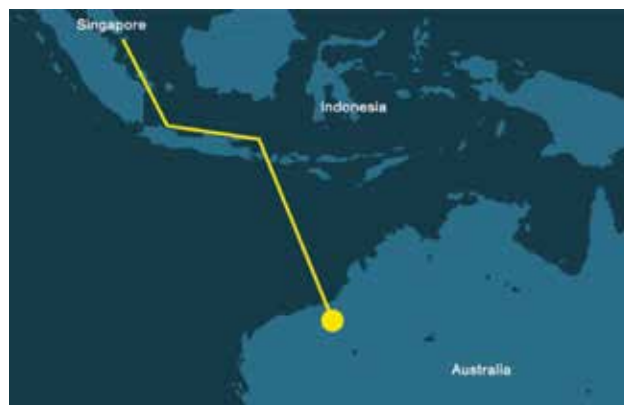
Desertec was abandoned mainly due to political instability in the Middle East and Northern Africa (MENA) region. TuTuNur Ltd already filed a request to the Tunisian Ministry of Energy, Mines and Renewable Energy for authorisation to build the project last July. If everything goes well, the first phase could be running by 2020.



Asian Renewable Energy Hub (AREH) – 6,000 MW solar/wind – Australia

An international consortium of energy companies has recently presented its plans to export colossal amounts of solar and wind energy from Western Australia to Southeast Asia via Indonesia and Singapore.

The hybrid power plant would be spread over 14,000 square km in flat desert land on the Northwest coast of Australia. It would comprise approximately 1,200 wind turbines supplied by Vestas, and 10 million solar panels with an aggregated capacity of 6,000 megawatts (MW). 4,000 MW would be supplied by wind energy, and 2,000MW from solar. It is estimated that this amount of power will be enough to supply electricity to more than 7 million households.





Grand Inga Hydroelectric Project- 40,000 MW hydro – DR Congo

Located in the Democratic Republic of the Congo, the Inga Project is the world's largest proposed hydropower scheme. If completed, it will be double the capacity of the Three Gorges Dam in China, which is 22,500 MW and currently holds the record. The proposed location is on the Congo River, the world's second largest river in terms of flow which due to its location close to the equator provides an excellent source of hydropower. Due to its potential to cover Africa's significant energy deficit, the project has been on the agenda of many international development banks and energy companies worldwide for many years. The organic competitive advantage of the location can offer cheap energy across the continent spurring economic development across the whole region.

However, the project is also shadowed by several concerns. For example, given the particular political circumstances of the country potential investors are constrained by fears over corruption. In addition, many have stressed the environmental and social impact of such a big hydro project including biodiversity loss and affected communities.

The river already accommodates Inga I and Inga II, of 351 MW and 1,424 MW installed capacity respectively.

Tidal Lagoon Cardiff- 3,400 MW tidal – Wales, UK

Tidal Lagoon Power (TLP) is the power project developer for this innovative renewable energy project to be located in between Cardiff and Newport. Once completed, the project will be able to provide electricity to every single household in Wales, which is more than 3 million people, by only using the powerful tides of the UK's west coast.

The development process began in 2013 and the project received approval for grid connection last September. The impressive element of the project is that it attempts to scale

up a relatively niche technology. If completed, it will harness the second highest tidal range in the world and will change the global landscape of tidal energy once and for all.



The project will comprise of around 108 tidal lagoon turbines. For its completion, it is estimated that more than £8 billion will be needed.

Gansu Wind Farm Project- 10,000 MW wind – China

The Jiuquan Wind Power Base, also called Gansu Wind Farm Project, was approved by the Chinese Government in 2008 and epitomised China's ambition to become a global leader in renewable energy. It comprises a series of large wind farms- either in operation, under construction or planned, located in the western Gansu province in China.

The project will be completed in several phases. Currently, at an installed capacity of more than 6,000 MW, Gansu Wind Farm is already considered the biggest wind farm in the world. The aim is to grow to a total of 10,000 MW, requiring investments of US\$16 billion.

The first 3,800 MW phase consisted of 20 wind farms of 200MW and 100MW. The second 8,000 MW phase consists of 40 additional 200MW wind farms.

However, the almost 7,000 wind turbines that are currently commissioned operate at low capacity. Because of strong dependency on coal, China still underutilises its renewable energy projects wasting a significant amount of clean electricity. Local officials show persistent favouritism toward the coal industry, while transmission lines across the country are still weak.



PROTECTING THE ENVIRONMENT: Celebrating the first successful Windhoek Recycle Day in October last year

First ‘Recycling hub’ for Windhoek

The first recycling hub in town, offering a central point where residents can drop off a variety of recyclables as well as correctly dispose of other items, has been launched in Windhoek.

The Dagbreek School for the Intellectually Impaired, winner of the Recycle Namibia Forum’s (RNF) Annual Schools Recycling Competition over the past few years, was the first choice for the RNF as a “one stop” collection point in Windhoek.

Anita Witt, RNF Coordinator, says the enthusiasm and commitment displayed by the school – both from the learners as well as teachers and the school principal, made this an obvious choice to expand recycling efforts and awareness. “The school and its learners are also very involved with, and are supported in their efforts by their local communities, with regular clean-ups hosted in the suburbs surrounding the school. It has also become evident that residents of Windhoek are keen to do the right thing - thus offering a one-stop solution for a variety of items at Dagbreek School will be well received by residents in the Klein Windhoek / Avis and Ludwigsdorf areas,” says Witt.

Apart from the usual recyclables such as paper, plastic, glass and cans, Witt says Dagbreek School now offers collection points for e-waste, as well as used household batteries. It is envisaged to expand the project with the implementation of a collection point for used fluorescent light bulbs during the course of 2018.

Philip Barnard, Financial Manager at Scrap Salvage Namibia says his company is committed to assist in insuring a cleaner and brighter Namibia.



LEADING BY EXAMPLE: Principal of Dagbreek School Paul du Plessis, Philip Barnard from Scrap Salvage and RNF Coordinator Anita Witt, launching the Windhoek recycle hub.

“We have committed to assisting Dagbreek School with their Go Green policies, by donating a skip to the school. All proceeds of the e-waste will be donated back to the School to show our support with cleaning up Namibia,” he says.

The household battery collection bin was sponsored by Varta Consumer Batteries Namibia, and to this end Harald Bartsch from Varta indicated that the company decided to also place a bin at Dagbreek School. Bartsch says see Dagbreek School and the RNF as strategic partners

Principal of Dagbreek, Paul du Plessis, says the school aims to involve the entire public in eco-friendly activities.

Residents are reminded that all electrical appliances, including household items such as kettles, washing machines, fridges etc. all resort under e-waste and can be deposited at skip at Dagbreek. Other partners in the project include Rent-A-Drum with the schools recycling project (collection and weighing of the recyclables) and the City of Windhoek’s Waste Management Division, with assisting in disposing of the used batteries at the hazardous waste section at Kupferberg landfill.



TIME TO GROW: (from left to right) Edda Bohn (Director of Programmes Quality Assurance in the Ministry of Basic Education, Arts and Culture), Ingridt Hendicks (Khoekhoegowab teacher), Selma Ndafoluma (Oshindonga teacher), Hedwig Kauaria (Otjiherero Advisory teacher), Viktoria Keding (Director of NaDEET) and Roderick April (Secretary General of Namibian National Commission to UNESCO)

NaDEET launches sustainable development educational material

The Namib Desert Environmental Education Trust (NaDEET), in partnership with the UNESCO Participation Programme, officially launched the It's Time to Grow educational material for Education for Sustainable Development (ESD) in three local languages, namely Khoekhoegowab, Otjiherero and Oshindonga.

The project was primarily funded by the UNESCO Participation Programme through the Namibia National Commission to UNESCO and with support from the Hanns Seidel Foundation Think Namibia Project and the Ministry of Education, Arts and Culture.

It's Time to Grow was officially launched by the Director of Programmes Quality Assurance in the Ministry of Basic Education, Arts and Culture, Edda Bohn and the Director of NaDEET Viktoria Keding. The event was attended by representatives from different schools, high level officials from the education ministries as well as various stakeholders and partners of in the ESD field in Namibia.

Roderick April, Secretary General of Namibian National Commission to UNESCO, emphasized the importance of Education for Sustainable Development as one of the key focus areas of UNESCO.

The books and memory games which cover the

environmental themes of Biodiversity, Energy, Water and Waste are aimed for lower primary teachers and learners and they aim to incorporate these important themes into the minds of young Namibian citizen to ensure the sustainability of Namibia's future. Translation of the books from English into the three local languages was done through workshops held at NaDEET Centre on the NamibRand Nature Reserve in Hardap Region with the help of language teachers from the different regions of the country. Participants from each of the language translation workshops at the event shared their experiences of personal growth and environmental awareness developed during the translation of the books.

Bohn highlighted the importance of developing educational materials in mother tongue which was identified as one of the educational needs in Namibia. She further explained the importance of equipping lower primary teachers with the right materials for the development of children and called on the teachers receiving the material to share and make good use of the material.

For more information about the It's Time to sustainability series, visit:

<http://www.nadeet.org/its-time-to-series>



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LIST OF APPROVED & REGISTERED INSTALLERS AND SUPPLIERS WITH NTCRE / TC1

As of February 2018

Category: PV INSTALLERS		
No	Name	Contact details
1	Diogenius Daniel	Cell no: 0812498707, Office: 061 2842509, ddaniel@met.na;
2	Kasita Simon Homateni	Cell no: 0812389085, Email: skasita@yahoo.ca; Tutungeni, Rundu, Kavango Region
3	Kauaria Tjazupi	Cell no: 0812536188, Email: tjazupi@hotmail.com; Erf 460, Falkenweg, Hochlandpark, Windhoek, Khomas Region
4	Kuutondokwa Vitalis	Cell no: 0812399622, Email: vitaliskuutondokwa@yahoo.com; Ongwediva, Onawa, Oshakati, Oshana Region
5	Lubinda Josty	Cell no: 0812061280 or 0855575185, Email: ljostylubinda@yahoo.com OR katimasolar@yahoo.com; Erf No: 156 Choto Compound, Katima Mulilo, Caprivi Region
6	Namadhila Sackarias Nangolo	Cell no: 0812565008, Office: 061 225648 / 2087652; 74 Columbia Street D/Park, Windhoek; Khomas Region
7	Naminga Epafra	Cell no: 0812818091, Email: epafra@yahoo.com ,
8	Ngololo Johannes	Cell no: 0812576633, Email: ngololo@yahoo.com; Onamutoni, Oshakati, Oshana Region
9	Nguuo Jackson	Cell no: 0811296337, office: 061 0608038736;75 Black Rock Street, Rocky Crest, Windhoek, Khomas Region
10	Nyambali Mathew Ukongo	Cell no: 0812432192, Office: 065 245882, Onamulunga, Oniipa, Ondangwa Oshikoto Region
11	Sakaria Leonard	Cell no: 0812809497, Email: lonnysack@yahoo.com; Ohangwena, Onekwaya-East, Main Road, Ohangwena Region
12	Shikokola Letisia	Cell no: 0812893208, Office: 065 220689 / 220688 Email: shikolola@yahoo.com; Mwatale E Street, House No: 8219, Oshakati, Oshana Region
13	Siyemo Blasius Hamutenya	Cell no: 0813170920, fax: 066-255685, House No: 131/1178, Tutungeni, Rundu, Kavango Region
14	Tjamburo Prescott	Cell no: 0811287168, office: 061 222649, Email: futuresolar@iway.na; Osler Street 17, Windhoek West, Windhoek, Khomas Region
15	Helvi Ileka	Cell no: 0811288028, Office: 061 215809, Email: helvi@solarage.com, c/o Solar age, 2 Jeppe street. Northern Industry, Windhoek
16	Williams Ngupahua	Cell no: 0812714406, Office: 061 211463, Email: wngupahua@yahoo.com, c/o Speedy Solar Solution, Erf 10515 Hans-diertrich Gensher street, Katutura, Windhoek
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18	Jan Hendrik Hanekom	Cell no. 0811291816, Office: 063 222442, Email: johnnyh@iway.na c/o Jonny Auto Elektries, 83 Cathedra Street, P O Box 4, Keetmanshoop.
19	Eduard C. Drotsche	Cell no: 0811299062, Office: 063 223399, Email: hpseng@mweb.com.na , c/o HPS Engineering, 101 Stapelia Street, P O Box 924, Keetmanshoop.
20	Mark Riehmer	Office Tel: 061 236336, Fax 061 256726, Email: info@conservcc.com c/o ConServ Engineering Services CC, 24 Parson Street, Southern Industrial Area, Windhoek. P.O Box 6422
21	Martin U.J. Ndjavera	Cell: 0813766786, Tel: 062-173818, c/o Rainbow Solar Systems cc, TransNamib Complex, P. O. Box 10. Gobabis,
22	Erens Awene	Cell: 0811247707, Tel: 065-241795, c/o Century Measure Graph, P. O. Box 2500, Ondangwa.
23	Hapera Unanisa	Cell: 0812979206 / 0812177484, c/o Wombi Solar Solution cc, Okatuuo, Okakarara, Otjozondjupa Region
24	Heinrich J. Kassen	Cell: 0811276557; Tel: 062-524001 or 0812001477; Email: heinrich.kassen@mtcmobile.com.na , Smartt Solar Energy cc, Rehoboth. P.O.Box 4574 Rehoboth, Namibia
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27	Kalla Matheus	Cell: 0811275598/ 0812878000; Tel: 061-260338, P.O box 21410 Windhoek, Email: kukukalla@gmail.com ; 9 Bach Street Windhoek
28	Niclas Ngutjinazo	Cell: 0812494521; Fax: 0886545670, Email: info.niclas@iway.na , 59 Pasteur Street Windhoek West- Windhoek
29	Alfons Kaendo	Cell:0816279085; Email: AlfonsoK43@gmail.com , P.O Box 142, Opuwo
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5	Solar Age cc	SWH, Photovoltaic, SHS	Rehab Kaavela	Tel: 065 240849, Cell: 081 3997154, P O Box 2873, Ondangwa, Olunkono Industrial Area (behind M & Z Motors), Email: solarage@iway.na
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12	ConServ Engineering Services CC	SWH, Photovoltaic, SHS, Energy Efficient appliance	Mark Riehmer	Telephone no: 061 236336, Fax no: 061 256726, 24 Parson Street, Southern Industrial Area, Windhoek, Email: info@conservcc.com
13	LED Lighting and Solar Warehouse	SWH, Photovoltaic, SHS, Energy Efficient appliance	Mark Anthony Walsh	Telephone no: 061 302516, 3 Mathem Street, Hochland Park Windhoek
14	SolTec	SWH, Photovoltaic, SHS, Energy Efficient appliance	Heinrich steuber	Telephone no: 061 235646, Fax no: 061 250460, 51 Marconi Str, South Industrial, Windhoek
15	Solar Plus Renewable. E	SWH, Photovoltaic, SHS, Energy Efficient Appliances, gas stoves, solar freezer	Leonard S. Sakaria	Cell: 0812809497, Fax: 065-260038, Onekwaya East, Ohangwena- Main Road, P. O. Box 449, Ohangwena.
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19	FLA Trading cc	Photovoltaics, SHS, EE appliances	Lucky Namupolo	Tel: 061 222092 Cell: 0811290045 or 0811240882; P.O. Box 11554 Windhoek
20	SkyPower Namibia cc	All listed products, plus fridges and wind except stoves.	Chris King	Tel: 064-209952, cell: 0812720508, Fax: 064-209952, P.O.Box 1861 Walvis Bay.
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 SWH Solar Water Heaters
 SHS Solar Home Systems
 PVP Photovoltaic Water pumping



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