

# **Clean and Sustainable Energy Supply for Africa leveraged with PPM**

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## **1. Introduction**

Clean and sustainable energy supply could be obtained from renewable energy sources such as Geothermal, Hydropower, Biomass, Wind and Solar. Africa is rich in a lot of these energy sources. The World Bank reports that the renewable energy potential for Africa could provide more than 170 gigawatts of additional power generation capacity; this is more than double the current power-generation capacity in the continent. Such renewable projects could avoid the production of some 740 million tons of carbon dioxide annually. The total cost of such projects is estimated at \$157 billion. The projects are said to be economically viable if carbon revenues are added, explains Massaba Thioye, World Bank senior energy specialist [1].

The natural question that should follow is whether Africa needs the renewable energy supplies and also their off-grid small scale implementations. Where and how does project management come into this vision for helping to solve Africa's energy problem?

Answers to these questions are to be explored in this paper. Its main sections are as follows:

1. Introduction
2. Abundance of renewable energy sources in Africa
3. Necessity for the renewable energy supply
4. Problems
5. Some- Developments
6. Suggestions
7. Concluding Remarks

## **2. Abundance of renewable energy sources in Africa**

A few examples of the abundant renewable energy sources in Africa are listed in the next paragraphs:

- Africa's economically feasible hydropower potential of 45 GW is nearly one-tenth of the world's total capacity, says Lucio Monari, the World Bank's energy sector manager for sub-Saharan Africa. "Less than 10 percent of this potential is being used at present. He explains: "More than 60 percent of Africa's hydropower potential is concentrated in the Democratic Republic of Congo and Ethiopia, but alone they cannot afford the multi-billion-dollar investments needed to unlock it".
- The geothermal potential in the Rift Valley covers 10 countries from Ethiopia to Mozambique. It has the capacity to provide more than 15 GW, enough to electrify 150 million households.
- Wind and solar energy will deliver affordable and dependable electricity across the continent on large grids and micro-grids, in large cities and in small rural villages [2]. Mr Leggett of IRENA considers solar energy vital to Africa's future; along with wind, it is the continent's most abundant renewable resource, and currently supplies less than 1 percent of Africa's electricity.

### **3. Necessity for Renewable Energy Supply**

African nations are chronically short of power. The installed electrical generating capacity for sub-Saharan Africa – excluding South Africa – is said to be about the same as that of Spain. This shortage represents one of the most severe constraints on growth and economic development across the region [3].

A factor that should drive investment is the need to expand access to electricity. In sub-Saharan Africa, an estimated 585 million people do not have electricity; they account for 40 percent of the world's 1.3 billion without access. And four out of every five people in the region rely on wood-based biomass fuels for cooking. If South Africa is excluded, the other 48 countries reportedly generate just 30 GW of capacity combined on a continuous basis. The power generation is not actually continuous and reliable. In effect, 770 million people share the same amount of electricity as Norway, which has a population of only 5 million [3].

Other factors driving the rise in sustainable energy investment in Africa include the following:

- Advances in technologies and greater confidence in them,
- More government backing for renewable power initiatives, support from international organisations and falling costs.

- “The rising demand for electricity, the inability of governments to afford an expensive nationalised infrastructure and the rapidly rising cost of fossil fuels make renewables more and more attractive,” says Ryan Hammond, managing director of Solairedirect Southern Africa. This is echoed by Camco’s Mr Cohen, who says that “capital is flowing in and it’s now very feasible to build projects” [3].

#### 4. Problems

The International Renewable Energy Agency (IRENA) envisages a scenario in which every African country, through the careful exploitation of renewable energy resources, will have electricity access by 2030, but this would cost around \$32bn per year over the next 20 years or so. Some of the limitations include the following:

- **Financing:** Adnan Amin, IRENA’s director general, says financing is one of the two inhibitors to the development of Africa’s renewable energy sector.
- **Infrastructure:** The other is poor infrastructure
- **Wars and political instability**
- **Problem of low investments in Africa:** It is reported that Africa has received poor investment from the annual CDM market. Only 0.02% or 27 out of 1,156 CDM projects were registered in Africa from 2002 to 2008 when European Union began trading “carbon credits” through its Emissions Trading Scheme. Yvo de Boer, executive secretary of the U.N. Framework Convention on Climate Change (UNFCCC), presented this information to the carbon forum. By 2012, it rose to 2.9%; that is 246 out of 8457 projects compared with 81.8% and 6914 projects for Asia and Pacific [4].
- **Uneven investments:** Research from Frost and Sullivan estimates that investment levels into renewable energy across Africa are set to soar to \$57.7bn by 2020, up from just \$3.6bn in 2010. While this sounds promising, Cornelis van der Waal, an analyst with the firm, advises caution because the development of the sector will be slow and uneven, he argues. “The African energy story, or electricity story, is very much a South Africa and North Africa story,” he says, identifying Algeria, Kenya, Morocco, South Africa and Tunisia as leaders. “The bits in between, unfortunately, are falling behind in terms of investment, both overall and in renewable energy in particular.”
- **Poor project management practice:** Some examples are as follows:

- **Desertec:** In North Africa, the Desertec solar initiative to export power to Europe seems to have stalled, with big industrialists Siemens and Bosch both pulling out. This is not quite the case because it has been reactivated as discussed in later sections of this paper.
- **Inga Dams:** The Democratic Republic of Congo provides one of the sad examples of the continent's unrealised potential. The Inga Dams in the country's south west could theoretically produce more than China's Three Gorges Dam, making it the world's largest potential source of hydro power. If it is properly implemented as a part of a proposed collaboration with South Africa, it could power most of the south of the continent. Yet work on the projects has been plagued by delays, with no clear timeline for completion. As Dolf Gielen, the director of IRENA's innovation and technology centre, explains, ambition is one thing, implementation quite another. This is where the skills and discipline of project management are much needed.

## 5. Some Developments

### 5.1 Off-grid small-scale clean energy

"More and more in Africa you hear from key decision-makers about 'jumping a stage', and missing out the centralised grid altogether," says Jeremy Leggett, the founder and non-executive chairman of Solarcentury.

"But the challenge of getting energy to hundreds of millions of people is just too great, and so you'll get disaggregated use of renewables; both at the levels of households and communities, and I think microgrids as well, as you might have in a town or district."

Like Mr Amin and colleagues at IRENA, Mr Leggett considers solar energy vital to Africa's future: along with wind, it is the continent's most abundant renewable resource, and currently supplies less than 1 percent of Africa's electricity.

Small-scale off-grid renewables are gaining ground too. "We see lots of potential in the so-called democratisation of energy production, where consumers of energy become producers in areas such as small-scale solar, wind, biomass and hydro," says Camco's Mr Cohen. "What we really like about these is they provide energy without a need for a grid or to change the landscape of a country. If you have small-scale production in a village, you can bring education and technology to the villagers rather than them having to move to a city."

More than 300,000 solar systems have been installed in Kenyan households since the mid-1980s. Developments in off-grid lighting with long-life light-emitting diode, or LED,

lamps are also having an impact. “The rapid spread of this off-grid green energy solution in a low-income country is all the more remarkable as it is propelled by unsubsidised market demand,” says the World Bank’s Mr Monari.

“Kenya was one of the first – if not the first – African country to start a project using feed-in tariffs.” **Feed-In Tariffs** are payments made to ordinary energy users for the renewable electricity they generate.

## **5.2 IFC Lighting Africa and the Kenyan Govt.**

Kenya’s government has set a 2017 deadline for the country to make significant advances in green power generation. Lighting Africa, a joint IFC and World Bank program, has launched an education campaign targeting businesses and nine million people in rural parts of Kenya to help them change from fuel-based to solar lighting. In Kenya, about 80 percent of the population is off-grid, or without access to a public electricity utility, and must rely on kerosene, candles or wick sticks -- expensive, inefficient and often hazardous lighting sources.

The education campaign, dubbed “Zonga Mble na Solar” (‘Stay ahead with solar’), is one of many initiatives being run by Lighting Africa, which is helping build a market for off-grid lighting products in Africa and aims to help millions switch to solar-powered devices.

To help convince rural Kenyans to stop using their fuel-based lamps, the campaign is teaching how modern, solar lighting can improve their health, increase their savings (households typically spend about 10 percent of their income on kerosene) and provide them with better illumination in their homes, schools, or businesses. Nana Asamoah Manu, Country Officer for Lighting Africa, said, “The main argument for people to switch from kerosene lamps to solar light is an improvement in their children health and education: the solar portable lights emit no fumes, and provide better illumination for studying. Providing longer productive hours for businesses is also a winning argument.”

## **5.3 Reactivation of Desertec [5]**

In North Africa, the Desertec solar initiative appeared to have stalled when big industrialists Siemens and Bosch pulled out. Not quite, at Roland Berger’s appointment to the board of trustees of the DESERTEC foundation in 2015, he stated that, ‘Developing regions urgently need clean and reliable energy sources as a basis for prosperity, food and drinking water production. Simultaneously we would be able to accelerate the energy revolution of the more prosperous parts of the world by importing power from desert regions.’

He and others got together and produced a memorandum. The authors of the memorandum describe the Sahara as a 'joker' and a 'game changer', able to create prosperity in poorer countries and produce an energy surplus instead of an energy scarcity. In doing so, renewable energies would work against the frequently associated environmental problems and climate issues resulting from growth. Simultaneously millions of jobs would be generated by expanding renewable energies, thereby forging new perspectives for young adults. The new structural stability favours growth and decimates migration causes.

#### **5.4 Morocco's Solar Power**

Morocco has already taken the lead and has started investing massively in clean energy. Until 2030, 52% of the country's energy production is planned to come from renewable sources. According to the study Social CSP from Germanwatch and the Wuppertal institute, the development is also a social gain. With the construction of the world's biggest solar power plant, Noor, which supplies electricity to 1.2 million homes, 2000 jobs were created for the local population. The best part is that thanks to heat accumulators, Noor is able to supply energy, even after the sun has gone down. The newspaper Die Welt stated that 'The future of solar energy originates from Africa' and indeed, the example of Morocco proves: Desert power works. Prince El Hassan bin Tatal, co-founder of the DESERTEC foundation and member of the board of trustees, commends the development to be exemplary.

Morocco is also pursuing the World Bank-backed Ouarzazate concentrated solar power project. This ambitious scheme aims to produce 500 MW of electricity to provide power and jobs to its citizens as well as generating long-term revenue by exporting clean energy to Europe.

#### **5.5 EU and Algeria, Tunisia, and Egypt, Solar Power Projects**

Apart from Desertec, there are other initiatives such as Tunur in Tunisia, and other solar projects in Algeria, and Egypt with the European Union. It is seen that the current political climate in Europe, is an advantage for North African renewable energy aspirations. "The Sahara of North Africa constitutes a region with the highest solar potential in the world and where lands are vastly available to deploy large scales PV or thermal farms," says Nouredine Yassaa, the director of Algeria's official renewable energy body, the Centre de recherche dans le domaine des Énergies Renouvelables.

"In addition to Europe's commitment to reduce greenhouse gas emissions and keep the climate warming below 2 Celsius target, the provision of Europe for gas to supply power



plants from Russia is compromised due to the regional context and [the] Russia and Ukraine conflict,” he explains.

Tensions between Europe and its eastern neighbour have been high since Russia unilaterally annexed a region of eastern Ukraine in March 2014. Russia supplied Europe with 160bn cubic meters of gas in 2013. However, both sides are now seeking to reduce dependence on the other for energy supply and markets, respectively. North Africa’s nascent renewables sector stands to benefit from this rift.

However, Mr Yassaa recognises that the idea of powering Europe with Saharan solar energy has its problems, even at a time when interest in solar projects is plentiful. “The transport of electricity generated by solar energy from North Africa to Europe to cover European demands is facing many challenges related to external project funding, secure long-term market access, and investment,” he says. This is where the skills and processes of project management are in much demand.

## **6. Suggestions**

### **6.1 Off-grid small scale clean energy supplies**

The climate agreement in Paris in December 2015 makes clear the global consensus that our energy future needs to be green and sustainable. Renewables are the way forward and can compete at market prices. It is being suggested that in the development of telecommunications, Africa has managed to skip a generation of development and has gone directly to mobile networks. The same could be done for renewables. Africa can develop its energy resources using off-grid small scale supplies without having to make investments in older forms of power generation and grids.

The off-grid options could be cost-effective and convenient to operate. In many countries, some of the power supply failure are often caused by problems in the transmission and distribution facilities. For example in Nigeria, in the week ending March 24, 2017, the generation group (GENCO) accused the transmission company (TCN) of inability to transmit the 7,500 MW which they generated. The Executive Secretary, Association of Power Generation Companies (APGC), Dr. Joy Ogaji, stated:

*"There has been a lot of pressure by the GENCOs to convince the nation that we can generate more than what TCN is willing or able to transmit, and this has revealed the long-hidden secret and exonerated the GENCOs of the allegation of inability to generate enough." TCN has no choice but to make improvements or answer to the people why GENCOs' 7,500MW average output can't reach them....."[6].*

In line with the forgoing observations, often, the power failure could be a local action caused by distribution problems such as a damaged transformer caused by overloaded supply system due to illegal power connections by persons who are tapping power illegally, indeed stealing from the public power supply. Such problems and failures may not occur in the simple facilities of off-grid small-scale power supply. This explains why the off-grid small scale supply in Kenya and some other places are reliable. They produce convenient clean power supply to customers which can be harnessed for domestic, business, and education within the locality.

## **6.2 Use of Project Portfolio Management**

Effective project portfolio management (PPM) provides a consistent way to evaluate, select, prioritize, budget, and plan for the right projects—those that offer the greatest value to the company's or a nation's strategic interests. PPM processes are aligned with business or national strategy such that organisations stay on track to achieve their strategies and goals. This is where PPM governance comes to the fore. It is the group of processes that should ensure the effective and efficient use of projects, resources, etc., to achieve its goals. A good governance structure is central to making PPM work.

“Doing the right work” using the Project and Portfolio Management (PPM) approach highlights which initiatives should be approved based on strategy alignment. PPM is a mechanism for allocating resources optimally toward an organisation's objectives, factoring in risk, desired returns, scarce resources and the inter-relationships between the investments. With PPM, renewable power supply projects can be given adequate resources when projects are being prioritised in the nation. They are therefore leveraged to be completed and deliver the benefits for which they have been designed to produce during their initiation. In addition, after the projects have been completed, their deliverables are well resourced such that they will continue to produce the benefits. In this case, the renewable energy generators will continue to produce their clean power supplies.

## **7. Concluding Remarks**

Two points will be focused on in this conclusion. These are firstly, support for small off-grid power supplies, and secondly; the need for training in project portfolio management for project team members on renewable energy supplies...

**The support for the small off-grid clean power supplies:** Given a lot of failures encountered with ageing transmission and distribution equipment such as transformers and circuit breakers which are more often than not over loaded and may explode, a simple manageable power supply off-grid power supply from a renewable source could



be more efficient. The off-grid energy supplies could be designed with appropriate redundancies to ensure constant and reliable power supply to the specified community.

**The need for training in project management and indeed project portfolio management:** A number of failures in renewable power projects in Africa could be attributed to poor project management. These include inability to maintain and operate implemented renewable power supply projects. As Dolf Gielen, the director of IRENA's innovation and technology centre, stated, "ambition is one thing, implementation is quite another". If a country or an international organisation is ambitious enough to invest resources to plan and implement a project, it should ensure that arrangements are in place to complete the project properly. Also, it should be able to operate and maintain the deliverables efficiently so that the benefits can be continually delivered as necessary. Moreover, human and material resources for continual operation and maintenance of the delivered renewable energy generator should be planned for and always made available. If this is not achieved, the efficient operation of the renewable energy supply cannot be guaranteed. Such a project cannot be described as successful.

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