

# Unpacking Investment Banking

## Development and Implementation of a Solar Power Plant Project



BY RICHARD MANGI

### Introduction

In our previous articles, we discussed various aspects relating to project finance which include the structuring of project finance transactions, the parties and legal relationships as well as raising funding for project finance transactions. We have also discussed the risks, the potential pitfalls as well as the possible mitigation measures for these risks. In this week's article, we will tie all these aspects together by exploring the development of a typical solar photovoltaic (PV) power plant project in the Zimbabwean context.

Due to a critical shortage of electricity, Zimbabwe has been importing part of its power needs from member countries in the Southern African Power Pool ("SAPP"). The country's electricity generation mix currently consists of hydro power and coal based thermal generation from Hwange Power Station and smaller thermal power stations in Bulawayo, Munyati and Harare. More recently the Dema Diesel Power Plant also came on stream in 2016. Independent Power Producers (IPPs) are also operating small hydro stations. Solar PV power plant projects are yet to come on stream to assist in alleviating the power shortages.

#### Scope for solar projects in development

Due to the global push towards greener energy and power generation, African countries have seen a surge in the development of solar PV power plants. A solar PV power plant is essentially a large scale electricity generating plant that uses solar to generate electricity. The plant uses solar panels and invertors to convert the solar energy into electricity which is then fed onto the national grid.

Technological improvements coupled with a surge in demand for green energy has led to a significant decline in the cost of solar PV technology. The International Finance Corporation estimates that costs have gone down substantially since 2008.

In Southern Africa, South Africa is leading in the implementation of solar PV power plant development. According to the National Energy Regulator of South Africa ("NERSA") Renewable Energy Performance Assessment Report of July 2016, the phased Renewable Energy Independent Power Producer Procurement Programme which was introduced in 2013, has licensed 31 solar PV power generation projects that achieved Commercial Dates of Operation ("CDO") as of February 2016. Zimbabwe has various solar PV power plants that are at different stages of development.

Solar power project development in Zimbabwe can either be public or private sector driven. The public sector driven route entails Government initiated projects which however due to inadequate capital, are usually implemented with private funding partners or grants. Projects of this nature normally follow a public tendering process where public utilities are part of the process. For instance ZPC invited tender bids for a Funding, Engineering, Procurement and Construction ["FEPC"] in 2013. Private projects, on the other hand are driven by IPPs who seek to generate power for on-selling the generated electricity to the national grid or private off-takers such as mines.

#### Policy Framework

In Zimbabwe, the National Energy Policy (NEP) provides the overall context for energy development planning, with the National Energy Policy Implementation Strategy (NEPIS) detailing broad measures put in place to achieve set objectives and targets.

The key objectives of the NEP include, but are not limited to:

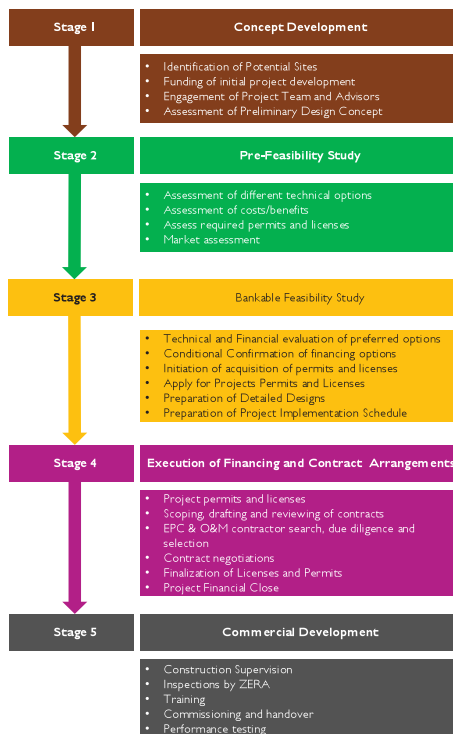
- Increasing access to affordable energy services to all sectors of the economy;

- Stimulating sustainable economic growth and social development; and,
- Developing the use of renewable energy resources to complement conventional sources of energy and power supply.

Despite an abundance of renewable energy resources in Zimbabwe (e.g. solar, biomass and hydro), most of these remain relatively untapped. There is therefore a need to exploit these opportunities in a sustainable manner, maximising far reaching benefits for the country, ranging from socio-economic to environmental benefits. In an attempt to maximise on the country's renewable energy potential, the Government through the National Energy Policy, has mandated the Zimbabwe Energy Regulatory Authority (ZERA) to establish cost reflective Renewable Energy Feed in Tariffs (REFIT), with appropriate mechanisms and other incentives to promote grid and off-grid power generation using solar and other renewable energy resources. The availability of land at low prices, the high irradiation rate and an environment promoting renewable energy augurs well for Independent Power Producers (IPPs) to enter the Zimbabwe market and the establishment PV Solar projects in Zimbabwe.

#### Framework for Solar Projects Development

The figure below generally shows the stages in developing a solar PV power plant in Zimbabwe.



#### Stage 1: Concept Development

A solar PV power plant requires access to significant amounts of land that will be used to lay the solar panels. A site survey is typically conducted to determine the locations of the site property best suited for solar PV arrays. Due to this significant land requirement, solar PV power plants are also referred to as Solar Farms. The World Bank generally estimates that approximately one hectare of land is required to generate one Megawatt of solar PV energy.

In addition to the need to get access to sizable land, determination of solar irradiance, which is the amount of power received from the sun per unit area (watt/m<sup>2</sup>) in a particular geographical location, is important in this developmental stage of the project. Naturally, solar PV power plants thrive better in locations that receive higher solar irradiance. Optimal PV array locations maximize the available solar energy and minimize solar obstructions to reduce shading on the PV arrays.

Zimbabwe is privileged by being located in the southern hemisphere, where solar irradiance is generally higher than other places in the world. Although the general location of the country suggests that solar PV power plants can thrive, for optimum output, further solar irradiance investigations are required in a feasibility study of a particular project location. For purposes of the preliminary site identification, solar irradiance estimations can be obtained from United States National Aeronautics and Space Administration ("NASA").

The preliminary stages of establishing the project up to Bankable Feasibility stage are mainly the responsibility of the project promoter. Costs associated with this phase will usually make up the promoter's sweat capital in the project. Sweat capital, in addition to any future capital contributions, often determines the promoter shareholding in the project. It is paramount that these initial project development costs are well documented as any future interested equity partners would want to audit them to verify the resultant shareholding accruing to the project promoters.

A solar PV power plant project, because of the high technical, financial and legal arrangements involved, will require a team of advisors which will include financial, legal and technical advisors. Funding arrangements for

initial project development is also of interest to the various advisors, as it determines capacity of the promoter to fund the development stage of the project, including meeting initial engagement fees up to financial close. The promoter should also have the capacity to fund preliminary processes such as EIA and feasibility studies for which debt financiers are not usually willing to provide funding. In circumstances where the promoters have presented a convincing preliminary project concept, negotiations with advisors for providing services at risk whereby settlement for services provided will be at financial closure, can be negotiated.

In the development phase, substantial funding is required to finance Feasibility Studies and EIAs, which private promoters in Africa may not have the capacity to fund. Some private financiers and DFIs do provide funding for the concept development phase up to financial close. Funds such as the Sustainable Energy Fund for Africa ("SEFA") administered by the African Development Bank, provide grants and technical assistance to private project promoters under the Project Preparation Financing Window, from feasibility up to financial close. The target projects should have a total capital investment range of USD30 million to USD200 million.

#### Stage 2: Pre-Feasibility Study

Once the preliminary project concept has been developed, the project team will proceed to assess various project development issues in a Pre-Feasibility Study. These assessments will involve the review of different aspects of the project such as technical design options, markets, off-takers and all the requirements for obtaining relevant permits, licenses and control over the project site and the land.

Market assessment under the prefeasibility study is paramount as it establishes uptake of electricity produced. In circumstances where ZETDC is the off-taker of electricity produced, discussion with ZETDC and securing letters of undertaking to purchase the electricity to be produced would best be secured at this stage. Draft Power Purchase Agreement (PPA) can also be secured if available. The market assessment will also include evaluating some technical components such as grid connectivity and access to transmission infrastructure. These assessments will inform the project development team on whether there will be further investment required in constructing substations and grid connection infrastructure. Ideally, a solar PV power plant located near an existing substation and transmission infrastructure, assists in minimising additional project costs.

Once the pre-feasibility study is complete, the financial advisor will at this stage carry out market canvassing to potential investors to determine appetite for a project of the target magnitude. Securing Letters of Interest from potential investors will assist in determining the level of participation, cost of funds, and risk areas to the investor that require mitigation during the feasibility stage of the project development.

#### Stage 3: Bankable Feasibility Study

An independent Bankable Feasibility Study ("BFS") is a prerequisite for the financiers, equipment providers and O & M partners. The BFS stage will entail an independent evaluation of all aspects of the project which were identified in the pre-feasibility study stage. The technical designs of the project enters a detailed design stage. Irradiation data will at this stage be carried out based on exact coordinates of the target project location. Usage of various softwares which incorporate ten to thirty years historical weather data from the specific locations are used to estimate the amount of solar irradiation received for a given site and the amount of energy produced for a given target solar technology.

Utilising the actual data for the site, the preliminary financial model will be adjusted accordingly to fully factor the actual data. Various assumptions relating to economic factors such as cost of funds, inflation and equipment assumptions such as PV cell performance degradation, inverter life, solar panels replacement time, are taken into account.

An independent audit of these assumptions and structure of the financial model is usually carried out often by an independent Advisor to the potential financiers so as to ensure objectivity of the financial model.

The BFS stage also ensures that all permits and licenses often involving multiple government agencies, would be finalised or in the least, conditional confirmations are obtained subject usually to reaching financial close.

The following permits and licenses need to be secured and will form a major component of the BFS documentation:

- Project land through land lease agreement or acquisition of title;
- Development rights and site access permit of the power plant from the relevant local authority;
- Environment Impact Assessment Certificate from the Environmental Management Agency (EMA);
- Independent Power Producer licence ("IPP") (power generation license) from Zimbabwe Energy Regulatory Authority ("ZERA");
- Tariff from ZERA through the Renewable Energy Feed-in Tariff ("REFIT") mechanism;
- Power Purchase Agreement (PPA) with ZETDC or another legible off-taker; and

- Grid Connection Agreement.

It is also important to know and understand the different regulatory bodies that a project team is required to liaise with in order to obtain the permits and licenses listed above.

#### Stage 4: Execution of Financing and Contract Arrangements

The submission of the BFS heralds the conclusion of financing arrangements as well as drafting and executing various pertinent contracts. Power projects are typically financed on a "back-to-back" basis, meaning that all contracts eventually rely on a bankable PPA. As such, a PPA with ZETDC or another off-taker should have sufficient security mechanisms that adequately cover the revenue risks of the project. Once terms and conditions of the debt or equity funding have been agreed to, and the lenders are satisfied with the project development, financing agreements will be executed, marking project financial close.

Project finance for renewable energy projects in Africa can be sourced from private equity or debt financiers. There are also various DFIs that specifically target to fund renewable energy projects such as solar. A number of the renewable energy funding initiatives are a combination of DFIs and private entities in partnership to give a total solution of concept development funding, technical and legal advice, and access to funding for solar PV equipment and components, usually through partner Original Equipment Manufacturer (OEM) and EPC companies.

SEFA is an AfDB administered multi-donor trust fund with an Equity Financing Window that supports access to early stage capital for small and medium-sized projects often with low managerial and technical capability. It focuses on projects of between 5MW and 50 MW independent power renewable projects including solar.

The African Renewable Energy Fund (AREF), is another renewable energy fund specifically dedicated to Sub-Saharan Africa by targeting IPP projects of between USD10 million and USD30 million. It also sources further funding from co-investors where a larger investment is required.

In light of funding constraints for renewable projects in Africa, the European Union established the Africa-EU Renewable Cooperation Programme (RECP) aimed at providing a platform to secure equity, loan and grant facilities for private renewable energy projects. The programme caters for projects with a funding range of between USD0.1 million and USD50 million.

Initial capital requirements of the project can also be reduced by establishing special purpose vehicles in which other investors can take equity shareholding through participating in some aspects of the project. An SPV that owns the land ("LandCo") can be established, wherein the land owner takes a stake in LandCo in return for rental lease income over the life of the project. The LandCo as a separate legal entity has its own rights, separate from the solar operating company and does not take direct risk in the solar project.

Other contracts also come to fruition at financial close. These contracts include the EPC Contract and the Operation and Maintenance (O&M) Agreements which usually become effective when financial close is a condition precedent to the effectiveness of the agreements.

#### Stage 5: Commercial Development

This stage will entail the actual construction by the EPC contractor. During construction, ZERA and other concerned regulatory bodies such as EMA and ZPC will continuously make inspections to ensure that the project is being constructed to best practices.

Once construction is complete, the EPC contractor as well as the OEM will perform tests on the equipment to ensure that it is functioning according to manufacturing specification. When these tests have been carried out, the plant staff will be trained prior to commissioning. The plant will thereafter be handed over to the O&M contractor for operation. Continuous performance assessments will be made remotely by the OEM and onsite by the O&M contractor.

#### Conclusion

The development of a solar PV power plant requires certain specific activities to be implemented for the project to reach financial close. The project development process highlighted in the article may differ from project to project but certain aspects are inherent in solar projects. According to the National Renewable Energy Laboratory (NREL), one concept developed to summarise the requirement for a successful development of renewable solar energy projects is the "SROPTTC" Framework. The framework is an acronym for Site, Resource, Offtake, Permits: Technology, Team and Capital. As discussed above, a successful project would require that project promoters of solar energy projects to ensure each aspect is dealt with supporting documentation to avoid losing time and capital.

**Richard Mangi is Deputy Divisional Director, Investment Banking, CBZ Holdings Limited. He writes in his personal capacity and is reachable on [rmangi@cbz.co.zw](mailto:rmangi@cbz.co.zw)**