Scaling solar for Africa: Zambia's 6-cent PV

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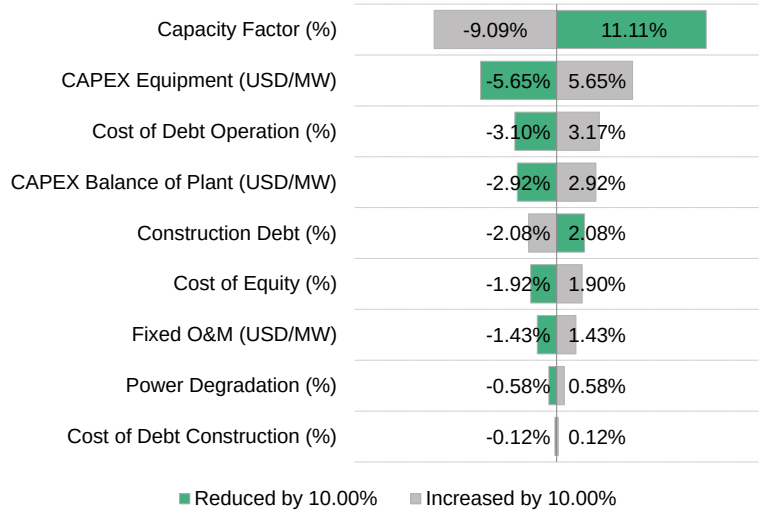
In May 2016, Zambia's International Development Corporation announced that the winning bids in two 50MW PV tenders were below $80/MWh, including (debatably) the lowest bid in sub-Saharan Africa to date. Bloomberg New Energy Finance reports on known details.

- Both the speed and the low price can be attributed to a new World Bank programme called 'Scaling Solar', which provides a template and support for client countries to smoothly and cheaply build privately funded solar. Senegal and Madagascar have now signed mandates for the programme and are expected to be the next two countries to follow this path.
- The entire tender process took just ten months from Zambia signing the mandate to having final bids. These are expected to close financing by September 2016.
- The power deficit in the overall Southern African Power Pool was 8GW in 2015, so it is likely that Zambia's neighbours are taking notice of the results.
- The qualifying bidders were mainly large, well-established companies, with the two winners a NEOEN/ First Solar consortium and Italian giant Enel.
- The World Bank's support will be needed to derisk the financing and achieve the interest rates and equity hurdle rates needed to deliver this project commercially.

By the numbers

- The winning bids in the two 50MW tenders were $60.2/MWh and $78.4/MWh, fixed in USD for 25 years
- This is the first phase of a total 600MW to be built in Zambia
- Of 48 companies which bid initially, 11 were pre-qualified and 7 submitted project bids

Figure 1: Sensitivity of project levelised cost of electricity to assumptions



Source: Bloomberg New Energy Finance. Note: Sensitivity around assumptions in Table 2.

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1. WORLD BANK SCALING SOLAR PROGRAMME

In January 2015, the World Bank's International Finance Corporation (IFC) launched a package of services to help small countries get privately funded grid-connected solar projects operational within two years. The package includes advice to assess the technically feasible size and location for PV power plants in a country's grid, a standardised tendering process, templates of project documents, competitive financing and insurance attached to the tender and available to all bidders, and risk management.

The aim of the Scaling Solar programme is to help countries learn from the mistakes that others have made and run a smooth process, which is standardised to allow large companies to participate without having to re-learn new details every time. These properties should help client countries avoid the sagas played out in some tender processes. For example, Namibia's national utility NamPower began a tender process in August 2013, which after awarding a 35MW project at NAD 88.8 ($56.70)/MWh in December 2015, cancelled the tender after reportedly being sued by Enel Green Power for changing the tender specifications (details here). Jordan has been discussing solar tenders since 2012 and only started to build anything in 2015.

Many countries of sub-Saharan Africa have many gigawatts of projects in the pipeline of developers, insufficient grid capacity to incorporate them all, and no clear path to differentiate between them and assign power purchase agreements to the most suitable.

Zambia was the first country to sign a mandate for the Scaling Solar programme in August 2015. Senegal and Madagascar have followed in 2016.

Table 1: Pre-qualified bidders which submitted final proposals in Zambia

	Description
NEOEN / First Solar	French developer NEOEN and US thin-film manufacturer partnership
Enel Green Power	Italian development spinoff of utility Enel. Has bid aggressively in Peru and Mexico.
Access / Eren Zambia 1	Dubai-French consortium
EDF EN	Development spinoff of French utility EDF
Mulilo Zambia PV1	Unknown consortium
Globeleq	London-based, Africa-focused developer
Shanghai Electric Power / AVIC	Chinese consortium of utility and (presumably) aviation firm

Source: Zambia's IDC

2. ZAMBIA'S PROCESS

Landlocked Zambia has a population of 15.5m and power capacity of 2.5GW, mostly hydropower. At present, severe drought means the hydropower is operating at a third of normal capacity, and there are rolling 8-hour blackouts. Power prices for households are subsidised, and are around $0.06/kWh, according to the country's energy regulator -- below the cost of generation.

While Zambia's state-owned power company ZESCO and ministry of energy have not solved the problem, the government incorporated a new entity, the Industrial Development Corporation of Zambia (IDC), in 2014. This makes strategic co-investments, aiming to catalyse GDP growth of 8% per year (from 6% in 2014), and has a portfolio of investments worth $2bn.

The IDC has been working with the World Bank's Scaling Solar programme, and in October 2015 issued a Request for Qualification process for the first 100MW (two 50MW projects) with suitable sites already selected, in which 48 applications were received and 11 selected as qualified. This is intended to be the first of 600MW, spread around Zambia.

The prequalification process was based on “technical, financial and legal capacity to deliver” according to Jamie Ferguson, Chief Investment Officer and Global Sector Lead for Renewables at the IFC, with “some incentives for local ownership, as financial ratios were somewhat less demanding for local members of consortia”. This should help avoid speculative low bids by small developers, which can result in tendered projects not being built (as has happened in India). Table 1 shows that many of the bidders were well-established companies.

On 30 May 2016, Zambia announced that the two lowest bids were by a consortium of NEOEN and First Solar (Nasdaq: FSLR) at $60.2/MWh, and Italian developer Enel at $78.4/MWh. These are fixed for 25 years in dollar terms, with the assumption that the plant will be decommissioned at the end of this term. The IDC will hold 20% of both projects, which will sign power contracts by the end of June and must close finance by the end of September.

Zambian President Edgar Lungu has said that Zambia will be a net exporter of energy within 18 months, which seems a little optimistic unless it rains hard.

3. HOW IS THIS FEASIBLE?

So far this year, Dubai has awarded a solar bid for $29.90/MWh, and Mexico has awarded one for $35.50/MWh. However, those countries have lower costs of capital, and the bids do not need to be delivered for 2-3 years, while the Zambia bid needs to close finance by September 2016.

Whether this is actually the lowest price in sub-Saharan Africa is open to dispute. South Africa's Round 4 tender, in April 2015, had a lowest winning bid of ZAR 771/MWh from Scatec Solar, which was $64 at the time, but since the rand has fallen against the dollar it is now $49/MWh. It was intended to see financial close in 2015, but has missed this deadline as South African state utility Eskom did not issue certain important decisions.

In April 2016, Bloomberg New Energy Finance estimated a LCOE in Zambia for PV of $275/MWh, so once again we are out of date before we start.

Is the $60.20/MWh price achievable with all parties making an economic return? Not with the $2/W(DC) capex estimated by the IDC, that is for sure. Or with the $2.14/W estimated by Bloomberg New Energy Finance in a levelised cost of electricity (LCOE) note in April 2016. This note estimated a LCOE in Zambia of $275/MWh, so once again we are overtaken by events.

Our benchmark capex for PV projects this year is $1.21/W(DC). This includes $0.12/W(DC) of development and 'other' costs, which can be removed as the Scaling Solar programme locates and supplies suitable sites with land and access to the power grid. If we use the benchmark cost for 2017 instead, this comes down to $1.01/W(DC). A few Indian developers have reported that $0.80/W is possible, but these do not appear to be reliable sources.

However, the main challenge to get a project finance model to agree with $60.20/MWh is the cost of capital. Zambia has a high cost of capital; yields on government bonds in ZMK (Zambia's currency, the kwacha) maturing in 2031 are currently around 14%. Dollar-denominated bonds yield 10-12%. Bloomberg New Energy Finance estimated in the April 2016 note that debt in Zambia needs to pay interest of 11.7%, and projects must offer a return on equity of 14.7%.

Table 2 lays out one set of plausible 'stretch' assumptions which might be used by First Solar and NEOEN. They rely heavily on the cost of capital being brought down by World Bank involvement.

Table 2: Possible assumptions to meet the $60.20/MWh figure

Metric	Assumption	Note
Capex	$1.01/W	Without development cost and assuming 2017 benchmark capex. First Solar 2017 target is $1/W (with development costs)
Opex	$15,000/MW/year	Standard is $21,000/MW/year but we have assumed that management fees are minimal
Tax rate	0%	We have assumed tax will be waived because the Zambian government is paying itself.
Capacity factor	21%	Assumes the site is sunny. If developers use tracking, this could be up to 35% but capex and opex would probably rise.
Debt ratio	80%	
Debt tenor	20 years	
Cost of debt	6%	Assumes highly derisked debt thanks to World Bank support (but currency risk is already reduced by dollar-denominated PPA)
Cost of equity	10%	A 20% stake is held by the IDC, which probably has low cost of equity.
LCOE	$60.26/MWh	

Source: Bloomberg New Energy Finance

If the capex can be reduced to 80 cents per W in Table 2 -- as has been reported in India -- the interest rate can be increased to 8% and the return on equity to 14%.

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