

Summary of Solar Pv Plant project

1. Introduction

In order to:

- reduce the annual expenditure for the purchase of electricity;
- reduce the total CO₂ emission and therefore the carbon footprint;
- increase the stability and the reliability of electricity supply;

Tanzania Portland Cement Public Limited Company is designing a new photovoltaic plant connected to its cement factory “Twiga Cement”, in Dar Es Salaam (Wazo Hill), located within the quarry areas of the cement factory itself, to cover a significant part of its electricity consumption with renewable energy.

The new PV plant will have a peak power of 15 MWp and it will produce about 24 GWh/year, standing on an area of approximately 19 ha inside the quarry adjacent to the Twiga Cement factory. The baseload of the cement factory is well above the AC nominal power of the new PV plant (12 MWac), therefore all photovoltaic energy will be 100% consumed by the cement factory, avoiding injections into the public grid.

The new PV plant will be ground-mounted on a fixed-tilt structure, without solar trackers and with an optimal orientation of the PV modules in terms of tilt and azimuth. It will be equipped with PV modules in crystalline silicon and string inverters for a distributed DC/AC conversion. The AC outputs of the string inverters will be collected in AC combiner boxes and connected to dedicated LV/MV step-up transformers, located within the PV plant area, through which the power produced is evacuated.

The PV plant will be connected to the cement factory via a new MV overhead power line, approximately 3 km long and whose route is entirely contained within the area of Twiga Cement quarry, which originates from the mentioned LV/MV step-up transformers of the PV system and reaches a new step-down MV/3.3 kV transformation cabin to be built next to the existing HV/MV electrical substation.

The cement factory is in fact connected to the public electricity grid operated by TANESCO (the Tanzania government company vertically integrated operating the Tanzanian national power system) through a HV line (132 kV) and has its own step-down electrical sub-station (132/3.3 kV) to whose medium voltage bars, at 3.3 kV, the new photovoltaic system must also be connected. The 3.3 kV connection between the two adjacent substations, the new one and the existing one, can be created using the in-feeders already existing at the 132/3.3 kV substation itself.

The control system of the photovoltaic plant (SCADA) will be interfaced and coordinated with the control system of the cement plant and all monitoring, control, and alarm signals, including those relating to security (CCTV, anti-intrusion, etc.) and fire and safety systems, will also be reported to the Control Room of the cement plant, via optical fiber connections.

In case of a power-cut, the operation of the photovoltaic system as an island in parallel with the generators of the cement plant will be coordinated with the latter, to guarantee maximum safety conditions for the power supply of the cement plant itself. In the future the PV system may eventually be equipped with battery energy storage systems (‘BESS’) and the necessary spaces will therefore be foreseen from now on, both in terms of areas and in terms of electrical connections. In short, the PV plant will be “storage-ready”, but for the moment there are no plans to install any storage system. Even without batteries, anyway, the new photovoltaic power plant will not worsen in any way and will actually significantly improve the power quality at the point of connection with the cement factory and with the public grid (TANESCO).

2. Current situation

2.1. Reason of Expenses :

The aim of the PV project is to to **decarbonize the cement factory’s energy system** and to increase the power quality, reducing power cuts and the related costs. The lifetime of the solar farm can reach 25 years and more.

2.2. Current Condition / Challenges :

Currently the power supply from TANESCO is affected by a poor quality service, with relatively frequent power cuts, and it costs more than the Long Term Marginal Cost of the solar farm.

Furthermore, the power mix in Tanzania includes Natural Gas (and in the near future probably also coal, according to TANESCO masterplan) so the self-consumption of the photovoltaic energy will reduce the emission factor of the cement factory.









3. Proposed solution

To install a new solar farm to feed Twiga Cement factory, with a nominal power below the factory baseload and therefore without any battery energy storage system.

Project Scope

To erect a new 15 MWp solar farm within the quarry area of Twiga Cement factory approx. 3 km far away from the factory itself and connected to the factory's power system, through a turn-key EPC (Engineering Procurement Construction) contract with guaranteed performances, including one year of maintenance and spare parts.

Please refer attached technical documents for detail understanding.

-  8. Cable GTP_Twiga Cements_20240508.pdf
-  7. Methodology for 100% redundancy_Twiga Cement_20240508.pdf
-  6. PV Syst Report_15MWp_Twiga Cement_20240508.pdf
-  5. Single Line Diagram_15 MWp_Twiga Cements_20240508.pdf
-  4. Structure Design & Staad Report_Twiga Cements_20240508.pdf
-  3. Storm & Drainage Design_15 MWp_Twiga Cements_Rev 03_20240...
-  2. Solar Array Layout_15 MWp_Twiga Cements_Rev 03_20240508.pdf
-  1. Detailed Scope of Work_15 MWp_Rev 3_20240508.pdf

4. Financial breakdown

S.No.	Head	Amount (in USD)
1	Project Value (Offer Received)	7,959,983
2	Synchronisation	50,000
3	Plant Pv Solar-Technical Consultance	45,121
4	Plant Pv Solar-Technical Consultance	30,000
5	Geotechnical Survey Study For Solar Pv Plant	20,194
6	Topographical Map For Solar Project Area	4,043
7	Solar Project - Dust Monitoring At Quarry (Additional)	1,101
8	Solar Project-Dust Monitoring At Quarry	550
9	Registration Fee For Solar Project-Nemc	5,503
	Total	8,116,494
	Contingency	397,999
	Duty & Taxes	853,507
	Grand total	9,368,000

6. Project Time schedule

- Stage 1 :WEEK 34.....Statutory approval (03 weeks)
- Stage 2 :WEEK 36..... Management approval
- Stage 3 :WEEK 40.....Final offer & negotiation
- Stage 4 :WEEK 18 (2025).....Equipment manufacturing and delivery (30 weeks)
- Stage 5 :WEEK 30 (2025)Project execution & commissioning (12 weeks)
- Stage 6 :WEEK 34 (2025).....Compliance of punch points, stabilization and handing over for operation (04 weeks)