

2 MW Karaleti Solar Power Project Feasibility Study Parameters

Project Overview

The project represents USD 1.1 million renewable energy investment for 2 MW Solar power station in, Gori municipality, Georgia.

Developer, LKS Solar LLC is Georgian resident company, established in 2018. It is jointly owned by Georgian and Polish entities, 50–50%, which are involved in the developing and operating of solar and wind power generation. The Polish shareholder company “Polwind” operates in more than 5 countries, has implemented more than 400 projects, with a total installed capacity of over 1000 MW.

Project Outline

Project Size: 2MW

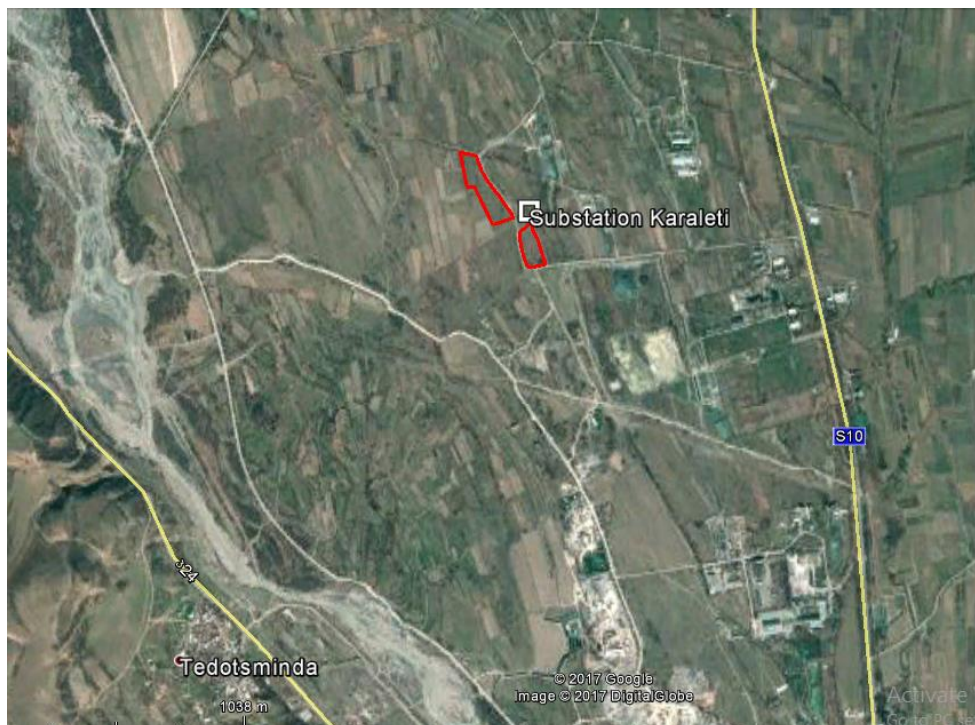
Generation per year: 2,873,400 kWh/year

Tariff per kWh: USD 0.06

Total Investment Cost: USD 1,066,464

Project Location Details

Located in Gori Municipality, in Shida Kartli region (Coordinates: 42° 02' 26.95" N, 44° 05' 5.74" E), on two distinct territories – 2.24 ha and 1.13 ha. The transformer connected to the power grid is located in 800 m.



Technical Details

The project involves 2 MW solar farm in Gori municipality. The estimated annual output is 2,873,400 kWh/Year. The estimated lifespan of the project is 25 years. The Capacity factor of the project expected to be 14.50%. The project envisages a connection to the distribution network with 10 kV substation. The initial interconnection conditions were proposed by the distribution system operator “Energo-Pro Georgia”.

Environmental Impacts

Selected site is not within or immediate vicinity of Protected Area and/or Emerald Site and/or habitat for threatened or endangered species.

Main impacts of the project in the construction and operation phases include emissions of carbon monoxide, nitrogen oxide, particulate matter, also suspended dust due to transport, construction equipment and generators; land use change and land degradation, soil contamination with oils, petroleum; intensive water use and deterioration of surface water quality; waste generation, including hazardous; noise. All the stated impacts can be mitigated/ minimized with proper measures. The project will reduce carbon emission (CO² equivalent emission reduction) by 22,200 tons.

Permitting and Timing

Memorandum of Understanding is expected to be signed by 2021, planned date of commencement of operation is 2023.

Priority will be given to the employment of local people during the construction phase. During the operation phase, it is expected to employ up to 25 people.

Parameters for Feasibility Study

| Technical, Economic and Environmental Parameters | | |
|--|--|---------------------------------|
| General Information | | |
| 1 | Project Name | Karaleti |
| 2 | Project Installed Capacity (MW) | 2 MW |
| 3 | Project Location (Region) | Shida Kartli, Gori Municipality |
| 4 | Investor/Developer (Company Name) | LKS Solar, LLC |
| 5 | Estimated Total Initial Investment (USD) | 1,066,464 USD |
| 6 | Distance to the Transformer (km) | 0.8 km. |
| 7 | Project Development Stage | Initial |
| 8 | Status of Feasibility Study | In the Process |
| 9 | Date of signing MoU/Estimated Date | 2021 |
| 10 | Planned Date of Commencement of Operation | 2023 |
| Technical Parameters | | |
| 1 | Installed PV plant Capacity (kWp) | 2,000 kWp |
| 2 | Type of PV modules | Same |
| 2.1 | Type 1 | Monocrystalline Silicone (c-Si) |
| 2.2 | Type 2 | N/A |
| 3 | Type of Mounting System | Fixed Mounting, Free Standing |
| 4 | Estimated Annual Output (kWh/Year) | 2,873,400 kWh (2873.4 MWh) |
| 5 | Estimated Lifespan (Years) | 25 Years |
| 6 | Certification and Tests – Modules and Inverter | N/A |



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| 7 | Module Warranty (Years) | 10 Years |
| 8 | End-of-life Recycling | Yes |
| 9 | Type of Battery (if any) | N/A |
| 9.1 | Battery Storage Total Size (kWAC) | N/A |
| 10 | Availability (%) | 99% |
| 11 | Capacity Factor (%) | 14.5% |
| 12 | PV modules Conversion Efficiency (Average) | Max 19.3% |
| 13 | Performance Ratio (%) | 82% |
| 14 | Average Annual Irradiation (kWh/m ²) | 1,742 kWh/m ² |
| 15 | Average Annual Sunlight (hours) | 1,437 Hours |
| 16 | Type of Inverter | String Inverter |
| 16.1 | Inverter Euro Efficiency (%) | 97.5% |
| 16 | DC/AC Loss (%) | 4.5% / 1% |
| 17 | Access to road (yes/no) | Yes |
| Grid Connection | | |
| 1 | Connection | New |
| 2 | Preliminary Response of TSO/DSO on availability of free capacity for connection (Yes/No) | Yes |
| 3 | Preliminary Response of TSO/DSO on possibility for connection (Yes/No) | Yes |
| 4 | Connection to Distribution Network (yes/no) | Yes |
| 4.1 | Deep Connection to 110/ 35/ 6-10 kV Line (yes/no) | Yes |
| 4.2 | Overall Connection Route Length from Plant to Connection Point (km) | 0.8 km. |
| 4.3 | Cell Arrangement in 110/ 35/ 6-10 kV Substation | 10 kV |
| 5 | Connection to Transmission Network (yes/no) | No |
| 5.1 | Standard Connection (yes/no) | No |
| 5.2 | Deep Connection to 500/ 400/ 330/ 220/ 110/ 35/ 6-10 kV Line | N/A |
| 5.3 | Cell Arrangement in 500/ 400/ 330/ 220/ 110/ 35/ 6-10 kV Substation | N/A |
| 5.4 | Non-Standard Connection (yes/no) | No |
| 6 | Access to road (yes/no) | Yes |
| Economic Parameters | | |
| 1 | PV System Cost (USD/kWh) | 400 USD/kWh |
| 3 | Total Cost of Grid Connection (USD) | 2,500 USD |
| 4 | Battery Storage Cost (USD) | N/A |
| 5 | O&M Cost (% of total capital cost) | 3% |
| 6 | Land Cost (USD/kW) | 2 USD/kWh |
| 7 | IRR (%) | 10% |



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| 8 | Type of Financing (Loan/Grant/Equity/etc.) | Debt & Equity |
| 9 | Financial Structure – Debt vs Equity (%) | 30%/70% |
| 10 | Debt Term (Years) | 10 Years |
| 11 | Interest Rate (%) | 6% |
| 12 | PPA Price (USc/kWh) | 5.108 USc/kWh / 6 USc/kWh * |
| 13 | PPA Term (Years) | 10 Years |
| 14 | PPA Term (Months in a Year) | 12 Months / 8 Months * |
| Environmental Parameters | | |
| 1 | Area of the project (m ²) | 40,000 m ² (4 ha) |
| 2 | GIS coordinates and description of the project area alternatives | X Y 42.042691- 44.083885 42.042817- 44.083073 42.040221- 44.084727 42.040425- 44.085683 42.039898- 44.086066 42.040297- 44.086627 42.038759- 44.087326 42.038724- 44.086466 All alternative locations are in Gori Municipality with the nearest settlement within 1km distance, alternative sites are free of forest cover, though land use category prioritization is subject to further analysis |
| 3 | Proximity to the Protected Area and/or Emerald Site and/or habitat for threatened or endangered species | Selected site is not within or immediate vicinity of Protected Area and/or Emerald Site and/or habitat for threatened or endangered species |
| 4 | Water use (Yes/No) | Yes |
| 4.1 | If YES, Specify the Source of Water | Reservoir |



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| 5 | Environmental impacts for project phases - Construction, Operation and Maintenance and Demolition (Please provide your description) | Main impacts of the project in the construction and operation phases include emissions of carbon monoxide, nitrogen oxide, particulate matter, also suspended dust due to transport, construction equipment and generators; land use change and land degradation, soil contamination with oils, petroleum; intensive water use and deterioration of surface water quality; waste generation, including hazardous; noise. All the stated impacts can be mitigated/ minimized with proper measures. |
| 6 | Carbon emission reduction (CO2 equivalent emission reduction) | 22,200 Tons |
| 7 | Screening decision | Have not applied |
| 8 | Environmental decision | Have not applied |

*PPA Price and terms: 6 Usc/kWh – offtake for 8 months per year, for 10-year period.
 5.108 Usc/kWh – offtake for 12 months, for 10-year period.