STANDARD OPERATIONAL PROCEDURES FOR SOLAR PARKS

VOL. II
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THE EUROPEAN UNION'S FOREIGN POLICY INSTRUMENTS (FPI) PROGRAMME FOR INDIA

GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY

SECI सेकी
सूर्य सदैव SUN FOR EVER

This project is funded by the European Union

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“Standard operational procedures for solar parks” is a technical brochure developed by the consortium IBF International Consulting, EQO-NIXUS (OCA Global) and IDOM.

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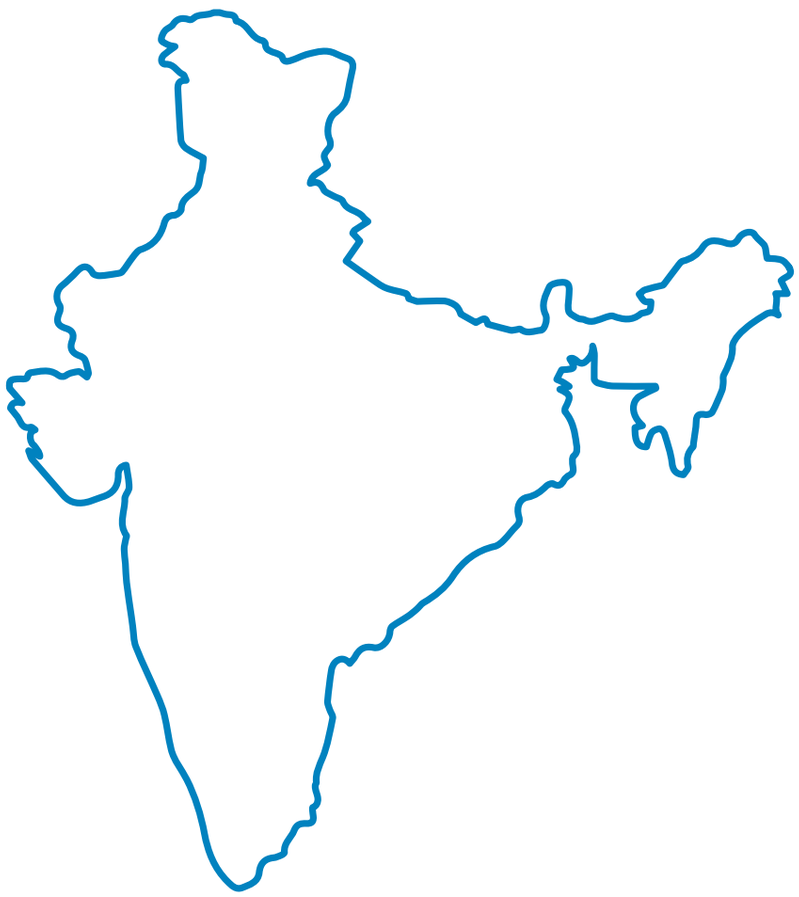

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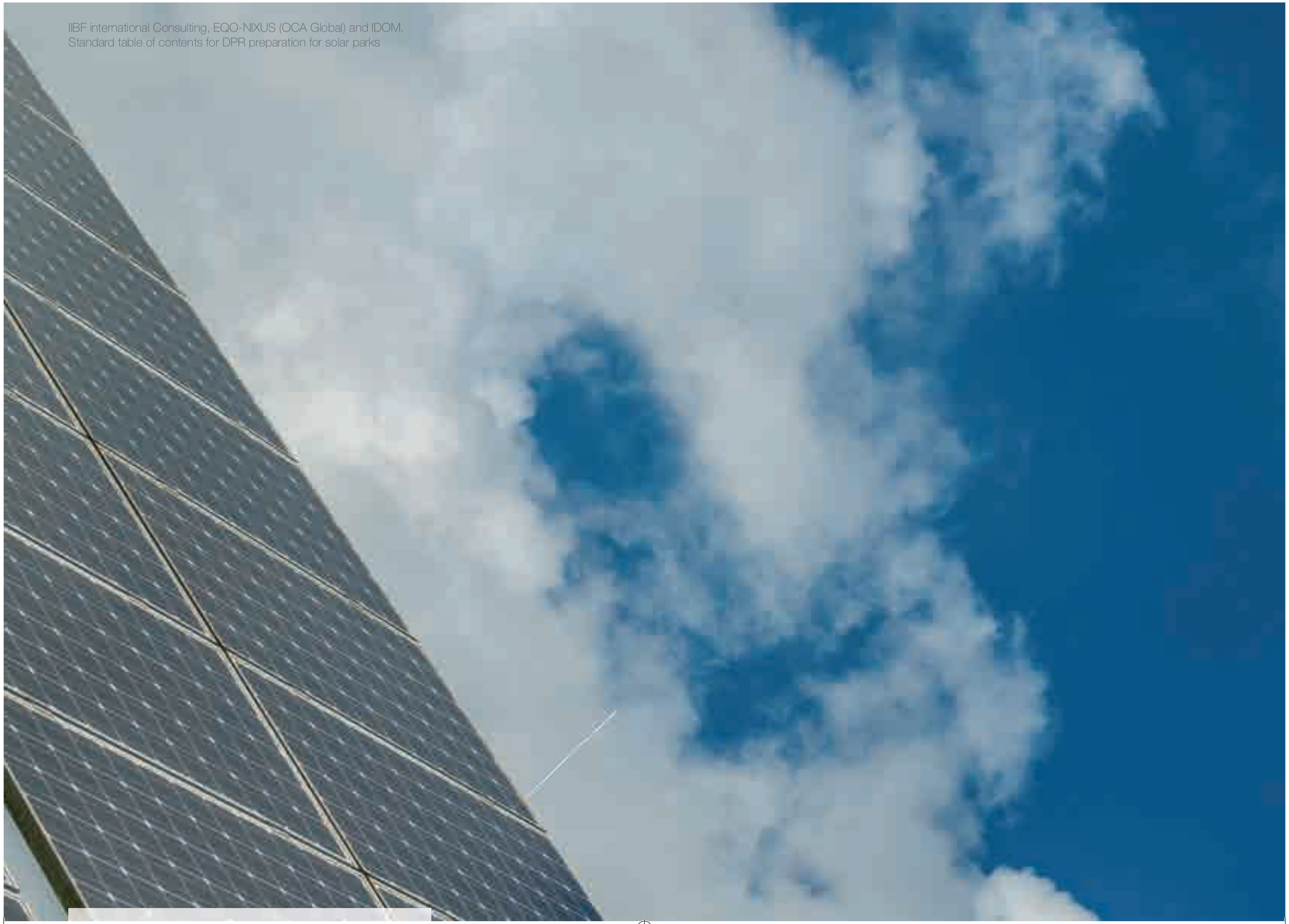

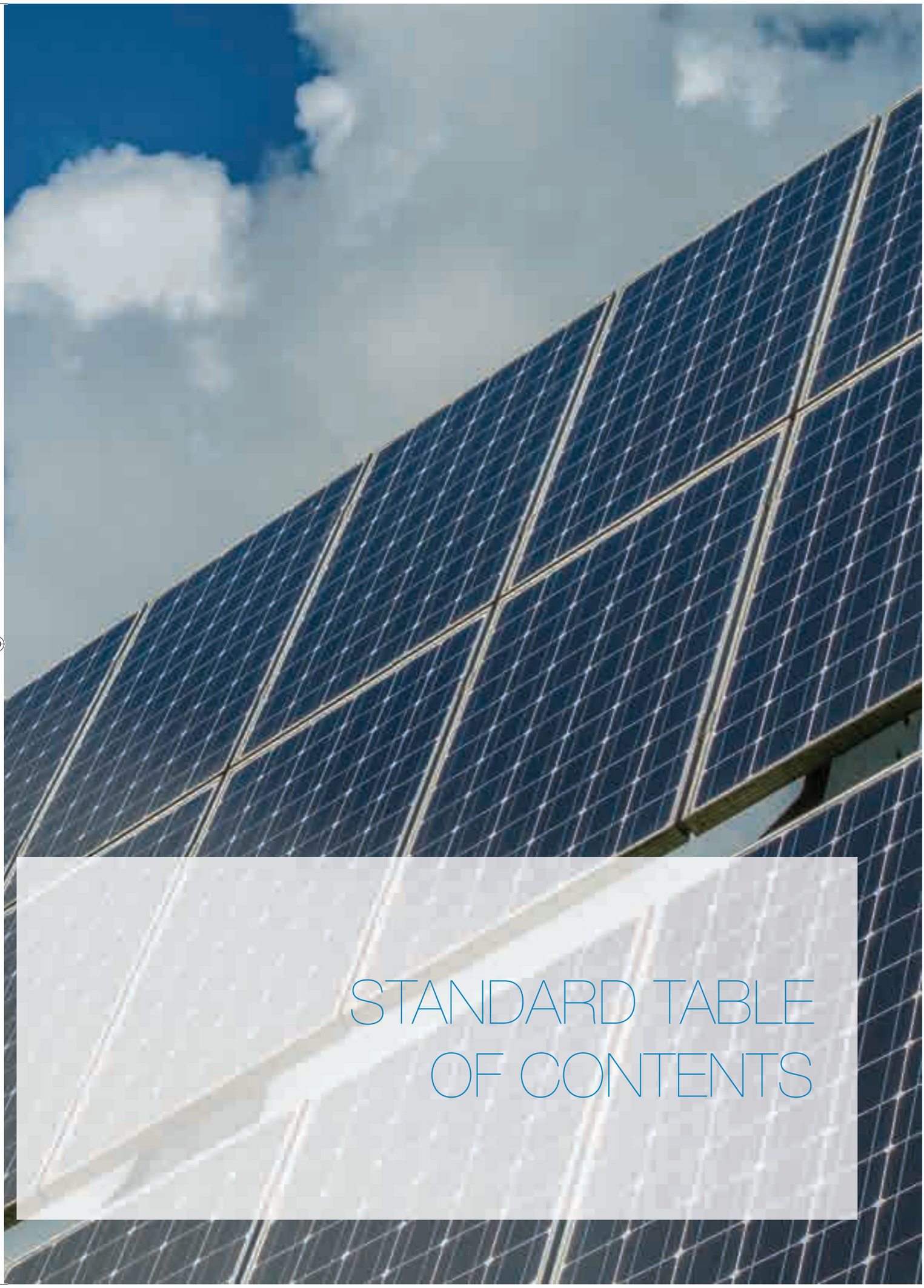

STANDARD TABLE OF CONTENTS

EXECUTIVE SUMMARY

- Solar park developer and ownership (shareholders). (Under mode 7 only SECI is allowed to be a SPPD)
- Location and approach roads.
- Solar irradiation and weather data (temperature, wind speed, wind direction, humidity and rainfall).
- Land area.
- Total solar power to be developed (MWac), plot sizes and capacity per plot.
- Grid connectivity of the plant and transmission infrastructures to be constructed (existing infrastructures and required upgrades, additions, if required).
- Road infrastructures to be constructed (existing and upgrades and/or new ones).
- Water source and infrastructures to be constructed.
- Green belt to be planted.
- Common facilities to be developed.
- CSR activities.
- Environmental settings (potential impacts such as forest, fauna, flora, etc.) and social setting (potential impacts such as livelihoods).
- Total costs envisaged.
- Value requested as a grant (include the limit per scheme, if any).
- One time charge for the solar power developed and annual charges to be levied on SPD.
- Estimated cost of solar power (per kWh) in the park.
- Time schedule for the execution of the solar park (internal infrastructures, bidding, solar power developers, commissioning of the park and of the plants).
- Likely off-takers and/or under which scheme the park is going to be allotted.
- Socio economic value (number of jobs to be created during the construction of the solar park and maintenance; number of jobs to be created during the construction of the solar plants and during the Operation and maintenance; potential GDP impact of the project at the state level; avoided CO_2 emissions).

PROJECT BRIEF DESCRIPTION

- Introduce the concept of solar park.
- Brief description of the solar park being planned.
- Purpose of the DPR.

SOLAR SECTOR

- Include briefly the PV technologies (2 pages).

Installed solar capacity in India

- Capacity installed and under construction per state (may not be exhaustive).
- Schemes available and capacity per scheme.

Installed solar capacity in the state

- Capacity installed and under construction in the state.
- Schemes being used.
- RPO obligations and current status.

Solar parks scheme in India and the rationale for the solar park

- Briefly include a description of the solar park scheme.
- Include how the intended solar park meets the requirements (presented as a check list).

PROJECT

- Land size.
- Solar irradiation and weather data (temperature, wind speed, wind direction, humidity and rainfall).
- Total power capacity to be located within the park.

- Number of solar plots envisaged.
- Transmission infrastructure requirements within the park and up to STU/CTU substations (including any new or upgrades required).
- Road infrastructure requirements.
- Water pipeline/supply/reticulation requirements (include details).
- Common facilities planned.
- CSR activities.

Solar park location and land ownership

- Capacity GPS coordinates (or UTM) of the boundaries of the land.
- Proximity of rail, port, major highways and major cities (indicate current access).
- Land nature (private or government), ownership status (data from the collector's office) including any land to be purchased or leased (clearly marked in the drawing with measurements and scales).
- Land acquisition process and how land will be allocated to the SPD.
- Google image with the boundaries.
- AutoCAD or technical drawing with the topography.

Solar irradiation and weather data

- Include GHI from the nearest met station for the MNRE network of met stations and from one or two other sources (NREL, NASA, etc.).
- Include ambient temperature, wind speed, wind direction, humidity and rainfall.

Land assessment

Geotechnical assessment of site

- Main results of the geotechnical assessment including:

1. Geotechnical Analysis:
   a) Standard Penetration Test (tests to determine the capacity of the soil to bear the structures).
   b) Laboratory testing (testing of the extracted samples in terms of the composition of the soil until at least 3 to 4 meters deep).
   c) Local geologic settings (description of the geological type of the ground and soil).

d) Seismic activity (what is the type of potential seismic activity of the area).

e) Groundwater (depth of the groundwater).

f) Geologic Hazards:

1. Landslides (potential for a landslide in case of a natural disaster).
1. Flooding and erosion (proneness of the site to flooding and erosion).
1. Subsidence (possibility of the soil collapsing downwards).
1. Poor Soil Conditions.
1. Primary ground rupture (possibility of such event in case of a major natural disaster, e.g earthquake).
    - Strong Ground Motion (whether the site is located in less than 50 km of earth faults).
    - Liquefaction (potential for a soil to loose strength and stiffness and collapsing).

2. Foundations (what is required in depth of foundations for the PV mounting structures to hold).
3. Earthworks (how easy or difficult are earthworks, namely earth moving).
4. Soil resistivity analysis (level of corrosiveness of the ground).

Topographic survey

- Provide the topographic survey for the identified land (assess the size of the land before griding the land; the usual method will not work well for a large piece of land like 1000 hect or more: requires a preliminary study using google earth and identifying the flat areas over the non flat areas and thus inform the survey on the needs to reposition the griding according to the results of the preliminary study).

Hydrological study

- Water requirements for the park (PV plants, park, green belt, common facilities, LAD activities).

- Water availability: if boreholes; ground extraction potential to be investigated; if canal, water allocation to be investigated; if other source, to be stated.

Land preparation

- State if the land is ready to be used or requires flattening, removal of objects, soil reconditioning, rezoning, etc.

- Define the activities required for the land to be deemed suitable for solar power development: maximum, minimum and average slope of the land to be indicated.

- If fencing is envisaged, provide the perimeter.

- Indicate where the green belt will be placed and created.

Infrastructure development

Electrical infrastructure

- Existing electrical infrastructure required (load of existing substation and lines).
- New electrical infrastructure required (33/66 kV or 132 kV for solar plant evacuation; 132 or 220 kV pooling stations connected to STU/CTU; if CTU is to be used minimum link is 220 kV).
- Scope of work for the solar park and for the SPD.

Control infrastructure

- Solar park monitoring, forecast and scheduling system (should monitor all solar plants, gather data, submit it to the dispatch center of the STU/CTU and the server of MNRE/SECI; it can be controlled locally and/or remotely).
- Metering point and arrangements (where will electricity be paid).

Road infrastructure

- Existing and/or upgrade road infrastructure required (impact during construction).
- New road infrastructure required (minimum 10m with shoulder for main access roads and 7m for secondary roads).

Water infrastructures

- Water needs (consider 2 to 3 liters per m^2 of modules to be installed; 1 washing per month,12 months per year; for states/regions that are water starved or water depleted, reduction of the value above should be considered and described; higher number of washings must be thoroughly justified).
- Existing water sources (quantities and sustainability of the extraction potential).
- If extraction from public canal, allocation for power sector and solar power to be mentioned.
- Planned water reticulation (this is always recommended and if not followed, it must be justified).
- Planned water harvesting, storage (if considered).
- Scope of work for the solar park and for the SPD.

Green belt

- Determination of prevailing winds (directions and speeds)
- Plan for the green belt (indicating its location, suitable types of trees, number of trees, water needs

and maintenance needs).

Common facilities

- Solar park building with a visitor center (minimum 20 persons), accommodation for staff.
- Solar measurement station (should be installed immediately if no station is available within 10 km: consideration to include it within the network of solar stations of MNRE/SECI).
- Road lighting (required).
- Fencing (optional).
- Medical facilities (required).
- Training Institute (required).
- R&D center (optional).
- Warehouses (optional).
- Storm water drainage system (required).
- Liquid sewage treatment plant (required).
- Solid waste collection, recycling and storage (required).
- Any other envisaged.

LAD activities

- Proposed budget for LAD activities.
- Scope for the LAD activities.
- Impact in the local livelihoods.
- Schedule of implementation.

SOLAR PARK DEVELOPMENT

Solar park development company

Under mode 7 only SECI can be the SPPD

Time schedule of implementation

- Date for the detailed DPR.
- Date for the tender for the electrical infrastructures.
- Date for the tender for the road infrastructures.
- Date for the tender for the water infrastructures.
- Date for the tender of the green belt.
- Date for the completion of all works.
- Date for the allotment of the solar plots to the IPPs.
- Date for the commissioning of the solar plants.

Solar park development framework

- How will the solar park be implemented.
- How will it be financed.
- How will it be rolled out (offtakers, schemes, etc.).

INDICATIVE ENVIRONMENTAL & SOCIAL SETTINGS

Environmental settings

- Environmental settings (10 km radius around the site: water bodies, forest areas, fauna and flora being affected, etc.).
- Potential environmental impacts (both positive and negative).
- Analyse whether the state pollution control board raises no objections to the solar park development or requires a EI to be submitted.

Social settings

- Social settings (in a 10 to 20 km radius: population, gender, livelihoods, etc.).
- Potential social impacts (both positive and negative).

Mitigation measures

- Environmental action management plan.
- Recommendations on Environmental Impact Assessment.
- Social action management plan.
- Recommendations on Social Impact Assessment.

STATUTORY & LEGAL FRAMEWORK

- Relevant solar policy from the state.
- Compliance of the solar park with the solar policy.
- Licenses/permissions/clearances required for the solar park and timeframe (list them and the agencies issuing them).
- List of licenses/permissions/clearances to be obtained by the SPD and issuing agency.

PROJECT FINANCIALS

Explain the methodology to be followed:

Solar park - cost estimates

- Cost of the land.
- Cost of the electrical infrastructure.
- Cost of the road infrastructure.
- Cost of the water infrastructure.

- Cost of the green belt.
- Cost of the common facilities.
- Any other costs.
- Total and summary of project costs under the main headings.
- Assumed equity returns for the solar park development (maximum of 16%).
- Determination of the one time charges and the annual charges.
- Determination of the costs for water and any others.

Projection of the cost of solar power in the solar park

- Projected costs of solar power based on the schedule, quantity and recent trends in India (determine the LCOE using the IEA definition and assuming certain values for equity and interest rates of the loan).
- Determination of expected cost of solar power.

Sensitivity analysis

- Determine the potential variation by changing the capex (+ and – 10%), opex (+ and- 20%), maturity of the loan (8,10 and 12 years), interest rates (prime/based interest rates + 1% and -1%).
- For solar parks developed under the World Bank facility sensitivity analysis on the loan parameters versus the upfront fee is required.

SOCIO-ECONOMIC IMPACT

- Estimates of the job creation potential during the solar park construction.
- Estimates of the job creation potential during the solar park operation and maintenance.
- Estimates of the job creation potential during the solar plants construction.
- Estimates of the job creation potential during the solar plants operation and maintenance.
- GDP impact in the state.
- Estimated reduction of CO_2 emissions.

ANNEXES

- Layout plan of the solar park (CAD drawing).
- SLD electrical system.
- State grid map with identification of the concerned substations.

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