GAF-RE Financing Programme: PV Power Plants with a capacity of up to 5 MW

Photovoltaic Power Plants – Minimum technical requirements

1 Codes and Standards

The Developer shall ensure that the engineering, design, construction, testing, etc. of the Plant are according to internationally recognized standards and codes in their latest edition and follow all applicable requirements of the national and local regulations.

Local building codes of Armenia shall be followed with respect to civil works and buildings. The latest editions of the standards, codes, regulations, recommendations and directives issued by the following organizations shall apply, as a minimum, to the design, construction, testing, commissioning, operation and maintenance of the Plant.

Compliance with individual standards will not guarantee an integrated fit-for-use solution. Therefore, it is the responsibility of the Developer to propose and realize a solution that is suitable for the site conditions and requirements.

International Standards (shall prevail)
ISO International Standardisation Organisation
IEC International Electrotechnical Commission

National Standards
ANSI American National Standards Institute
BSI British Standards Institution
DIN Deutsches Institut für Normung
EN European Standards

Recommendations
ASTM American Society for Testing Materials
IBC International Building Code
IEEE Institute of Electrical and Electronics Engineers
UBC Uniform Building Code
VDE Verband Deutscher Elektrotechniker (German Society of Electrical Engineers)

The design of the Plant shall meet all requirements of the latest version of the Transmission Code.

Deviation from this Section **Codes and Standards** and the use of any codes and standards which are not issued by one of the organizations listed above is not acceptable.

Amongst others, the following international standards shall apply for the installation, testing and operation of the Plant and the Switching Station. Latest versions shall be considered. The Developers should consider without limitation the following codes and standards including all other reference norms and standards mentioned in these norms (normative references):

General

- IEC TS 63049:2017, Terrestrial photovoltaic (PV) systems – Guidelines for effective quality assurance in PV systems installation, operation and maintenance
- IEC 60364:2021 (all applicable parts), Low-voltage electrical installations
- IEC 61936-1:2021+AM1:2014 CSV, Power installations exceeding 1 kV A.C. – Part 1: Common rules
- IEC 60071:2022 (all applicable parts), Insulation co-ordination
- IEC 60068:2022 (all applicable parts), Environmental testing

PV installation

- IEC 60364-7-712:2017 RLV, Electrical installations of buildings – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems
- IEC 62852:2014+AMD:1:2020, Connectors for DC-application in photovoltaic systems - Safety requirements and tests
- IEC 60228:2023, 60364-1, 60332-1-2, 60754-1 and -2, 61034-1 and -2
- EN 50618:2020, Electric cables for photovoltaic systems
- IEC 62548:2023, Photovoltaic (PV) arrays - Design requirements
- IEC 62894:2014+A1:2016, Photovoltaic inverters - Data sheet and name plate
- IEC TS 62910:2015, Utility-interconnected photovoltaic inverters - Test procedure for low voltage ride-through measurements
- IEC 62109-1:2010, Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
- IEC 62109-2:2011, Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
- IEC 61727:2021, Photovoltaic (PV) systems – Characteristics of the utility interface
- IEC 61683:2016, Photovoltaic systems - Power conditioners - Procedure for measuring efficiency

PV Modules

- IEC TS 62804-1:2015, Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon
- IEC 61215-1:2016 (all applicable parts), Terrestrial photovoltaic (PV) modules - Design qualification and type approval
- IEC 61215-2:2016, Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures
- IEC 61701:2011, Salt mist corrosion testing of photovoltaic (PV) modules
- IEC 61730, Photovoltaic (PV) module safety qualification
- IEC 60068-2-68:2012, Environmental testing – Part 2-68: Tests – Test L: Dust and sand
- IEC TS 62782:2016, Photovoltaic (PV) modules - Cyclic (dynamic) mechanical load testing

Commissioning and documentation

- IEC 60364-6:2016, Low-voltage electrical installations – Part 6: Verification
- IEC 62446-1:2021, Photovoltaic (PV) systems - Requirements for testing, documentation and maintenance - Part 1: Grid connected systems - Documentation, commissioning tests and inspection

Power transformers

- IEC 60076:2021 (all applicable parts), Power Transformers

HV+MV switchgear

- IEC 62271:2021 (all applicable parts), High-voltage switchgear and control gear
- IEC 60376:2018, Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment

HV+MV cable

- IEC 60183:2015, Guidance for the selection of high-voltage AC cable systems
- IEC 60287:2015 (all applicable parts), Electric cables
- IEC 60502:2020 (all applicable parts), Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV)
- IEC 60840:2011 RLV, Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) – Test methods and requirements
- IEC 62067:2011 RLV, Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um = 170 kV) up to 500 kV (Um = 550 kV) – Test methods and requirements

LV system

- IEC 61439:2020, Low-voltage switchgear and control gear assemblies
- IEC 60947-1:2020, Low-voltage switchgear and control gear – Part 1: General rules

Grounding and lightning protection

- IEC 60364-4-41:2015+AMD1:2017 CSV, Low voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock
- IEC 60364-5-54:2011, Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors
- IEC 61140:2016, Protection against electric shock - Common aspects for installation and equipment
- IEC 61936-1:2010+AMD1:2014 CSV, Power installations exceeding 1 kV A.C. - Part 1: Common rules
- IEC 62305:2022 (all applicable parts), Protection against lightning
- IEC 60099:2022 (all applicable parts), Surge arresters
- IEC 61000:2022 (all applicable parts), Electromagnetic compatibility (EMC)

Buildings and housings, inverter protection

- IEC 60721-3-3:2018, Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at weather protected locations
- IEC 60721-3-4:2018, Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations

Instrumentation and Control Systems

- ISO/IEC 27000:2018-02, Information technology - Security techniques - Information security management systems - Overview and vocabulary
- IEC 62443:2022, Industrial communication networks - Network and system security
- IEC 62351:2018, SER Power systems management and associated information exchange - Data and communications security (all parts)
- ISO 9060:2018, Solar energy – Specification and classification of instruments for measuring hemispherical solar and direct solar radiation

2 Project

2.1 General Requirements

The PV plant shall be designed in such a way that it will efficiently and competitively supply solar energy and maximize the energy generation from the given surface area. All parts of the PV plant shall be suitable for the site-specific climatic conditions.

Plant equipment and systems shall be built to Armenian and appropriate internationally recognized standards and shall comply with all the applicable national codes and statutory requirements.

The PV plant design in all phases shall apply a well-established classification and identification system. The international SI system of units shall be used for the design, drawings, diagrams, instruments and all technical documentation. All warning and safety labels shall be in Armenian and English.

The PV plant shall be designed to operate under the climatic conditions found at the site during the entire design lifetime.

The PV plant shall be operated in full compliance with all technical and environmental requirements and according to local codes and regulations.

All facilities and equipment of the PV plant shall be arranged and spaced sufficiently to enable satisfactory operation and maintenance.

The PV plant shall be equipped with the facilities required to control and transmit all necessary measurements and data over communication links between the PV plant and the Load Dispatch Center.

The PV plant shall be provided with emergency power supplies to ensure the safe and controlled operation and shutdown of the PV plant in the event of loss of all electrical supplies without damage to any equipment.

The PV plant shall comply with the following plant performance requirements:

- The PV plant must be capable of maintaining zero transfer of Reactive Power at the Transmission Entry Point at all Active Power output levels under steady state voltage conditions.
- The Rated MW of the Generating Unit output shall be available for a power factor of 0.95 (lagging) up to 0.95 (leading) subject to the paragraphs below.
- A continuously acting automatic control system is required to provide control of the voltage at the Connection Point without instability over the entire operating range of the PV plant.

The Developer shall optimize the plant layout and detailed plant and operation arrangements to fulfill the minimum agreed power production. The overbuilt (ratio of total module power [kWp] to total inverter power [kVA] in each sub-system) should not be higher than 1.2. For every transformer, the installed transformer capacity [MVA] shall equal the installed inverter capacity.

The general layout shall show the implementation of the balance of plant in respect to local site conditions, existing infrastructure facilities and units, long term operation and required maintenance works on site.

In addition, detailed design drawings shall be developed showing cutouts in different scales and complemented by details where required, layouts developed for infrastructure, civil, mechanical, electrical and other special fields of design and construction.

Temporary site installations and laydown areas are envisaged to be located on Site. Labor camps shall comply with the Armenian regulations regarding technical requirements and location.

Developer is free to optimize the system design of the PV plant in such a manner as deemed most appropriate to competitively maximize the solar energy generation on the proposed Site.

2.2 ESHS Requirements

The Developer shall design, construct, commission, operate and maintain the PV plant in accordance with all applicable environmental regulations and standards of the Republic of Armenia, and in compliance with comprehensive and pro-active health, safety and environmental procedures, in terms of which the Developer will incorporate into the design and construction of the PV plant, such equipment, processes and facilities, as will facilitate the operation of the PV plant, in accordance with environmentally sound and sustainable policies, practices and procedures. The Developer shall demonstrate during the design and construction phase and during the testing and operation phase that the PV plant is able to comply with all applicable environmental regulations and standards.

In line with the applicable requirements of Republic of Armenia, an environmental impact assessment (EIA) must be conducted, including development respective environmental management plans for construction and operational phase, if applicable by Law.

In case the project is subject to an EIA according to RA legislation, it may happen that at the application stage the Investor has not yet received the **Positive Conclusion on EIA** issued by the corresponding state authority. The GAF-RE team will start processing the application received from the Investor, provided that the latter can demonstrate that the EIA report is under evaluation by the corresponding state authority and that the Conclusion is pending. The Conclusion shall be delivered to the GAF-RE team as soon as it is available and in any case **prior to** the **Final Monitoring** inspection by the GAF-RE team. Failure to submit the Positive Conclusion before the Final Monitoring may result in a loan call back procedure by GAF.

The Developer further shall take note of and respect all applicable health, safety and environmental regulations and guidelines including personal protective equipment, housekeeping and other guidelines for workers and visitors at the PV plant during construction and operation of the plant.

In addition to the requirements of Republic of Armenia, the plant shall be categorized according to the KfW Sustainability Guideline, 2021 and assessment and management of impacts respective of the assigned category shall be implemented.

Definition of Environmental & Social Categorization (KfW Sustainability Guideline, 2021)

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed project is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the environmental and social impact assessment are commensurate with the significance of the potential impacts and risks. The environmental categorization as per KfW Sustainability Guideline, 2021 is defined as follows:

- **Category A (high risk).** A proposed project is classified as category A if it is likely to have significantly adverse environmental impacts and risks that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental and social impact assessment (ESIA), including an environmental and social management plan (ESMP), is required.
- **Category B+ (substantial risk).** If it is expected that a Category B has single significantly adverse environmental and social impacts and risks, it is included under Category B+. An ESIA and an ESMP are requested.
- **Category B (moderate risk).** A proposed project is classified as category B if its potential adverse environmental and social risks and impacts are less adverse than those of category A projects. These impacts are site-specific, in most cases reversible, and can usually be mitigated through standard, best available mitigation approaches. The need for, scope, priorities and depth of an ESIA are determined on a case-by-case basis.
- **Category C (low risk).** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

The categorization of projects with regards to magnitude of impacts will be evaluated based on impacts on environmental aspects and social aspects, if any.

Environmental, Social, Health, Safety and Management

The Developer shall prepare and implement a comprehensive ESHS policy and associated procedures, that will govern the EPC Contractor's an Operator's actions at all times during the design preparation and construction of the PV plant, as well as during the operating phase of the PV plant.

In addition to the other requirements relating to the standards to be adopted by the Developer in the overall design of the PV plant, the Developer shall submit a detailed Construction Environmental, Social, Health and Safety Plan and a detailed Operation Environmental, Social, Health and Safety Plan, that will demonstrate the Developer's commitment to the highest standards of personnel and general safety, as well as health and occupational health standards during construction and operation of the PV plant, as well as the concept of an accident and injury free project.

All guidelines and limitations set forth in the Environmental, Social, Health and Safety Plans shall be considered in detail for all works on the PV plant project.

2.3 Main components

PV Modules

The PV plant shall be deployed by implementing proven technology PV modules as further detailed in the following. The PV modules shall be selected according to the following minimum requirements:

The PV modules can be either of the crystalline silicon type or the thin-film (TF) type. For each project a maximum of 3 different module power classes of a maximum of two different module brands can be used.

The design of one typical PV power block connected to an LV/MV transformer station with one PV module type shall come with the same inverter and mounting structure type. Further mixing of PV modules, inverters, and mounting structures is not allowed. All PV modules shall be from a single manufacturer.

The chosen PV module model or series shall have been installed and successfully operated for at least one (1) year preceding the Proposal Submission Date in at least two (2) PV plants with an installed capacity of at least 10 MW (DC) each and shall have an accumulated installed capacity of at least 50 MW (DC).

Information about reference projects shall contain at least the following information:

- Name
- size
- owner and
- commercial operation date of the project.

Prior to issuing the PV module purchase order, a module manufacturer confirmation letter shall be provided for the proposed PV modules confirming that the PV modules shall comply with the most recent version of the following IEC standards, including valid certificates issued by accredited testing institutions according to valid IEC and other standards, including but not limited to:

- IEC 61215 (all applicable parts): Terrestrial photovoltaic (PV) modules – Design qualification and type approval;
- IEC 61730-1, -2: Photovoltaic (PV) module safety qualification, Part 1: Requirements for construction, Part 2: Requirements for testing;
- IEC 60068-2-68: Environmental testing – Part 2-68: Tests – Test L: Dust and sand;
- IEC TS 62804-1: Potential Induced Degradation (PID) free tests for crystalline silicon-based modules;
- IEC 61701: Salt mist corrosion testing of photovoltaic (PV) modules;
- IEC TS 62782: Photovoltaic (PV) modules - Cyclic (dynamic) mechanical load testing.
- IEC TS 60904-1-2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices.

The chosen PV module shall have the following minimum warranties, starting with the Project Commercial Operation Date:

- product workmanship warranty of at least 10 years
- power output warranty for 30 years of operation based on the nominal peak (nameplate) power and annual linear power degradation warranty with a maximum power output degradation of 20% (from the initial nominal module output under STC) over 30 years.

All modules shall have only positive power tolerances (-0% / +5%). The PV modules of new projects that were not yet under construction at the time of application shall have a minimum efficiency of 20.5% at Standard Test Conditions.

DC Cabling

The DC cables (main and string) shall be selected and mounted in a way to withstand the external influences on site, such as temperature, UV irradiation, wind, sand, strain and any other mechanical loads. All DC cables shall be single-core cables and double insulated.

All cables must be laid according to manufacturer's recommendation. Cable shall not be immersed permanently in waterlogged condition and conduit must be properly sealed. Conduit ends, connectors and terminals must be out of areas where water collects.

DC Connectors

DC connectors for string interconnection shall be of the same brand and type as used by the PV module manufacturer. DC Connectors of different brands or types shall not be paired in the same connection (male-female).

DC Combiner Boxes

DC combiner shall fulfill the following requirements:

- Protection of PV strings: DC fuses on each pole. The maximum fuse rating shall not exceed the PV module maximum fuse or reverse current rating;
- An all-pole main DC load break switch with sufficient capacity for disconnection of all PV module strings under load conditions shall be provided;
- Overvoltage and lightning protection;
- The DC combiner boxes shall be protected from direct sunlight or adequate measures shall be taken to ensure the DC combiners functionality during the design lifetime.

Inverters

The inverters shall be suitable for the PV plant Site conditions, have a track record of proven successful operation in PV plants, and be procured from bankable suppliers with appropriate bankable references. The inverters can be of string or central inverter type. The inverter manufacturer and the inverters shall comply with the following requirements.

The inverters shall:

- be suitable for the climatic conditions at the PV plant Site, or an enclosure or canopy roof shall be provided to assure that the inverters stay within the tolerable temperature range at all times;
- have proven track record of successful operation in utility-scale PV plants.
- Outdoor central inverters shall be at minimum rated IP 54 with sufficient cooling provisions.
- Inverters installed inside a compact station with a minimum rating of IP 54 shall be rated IP 20 at least and must provide adequate active or passive cooling. String inverters shall be of IP 65.
- The inverters shall be designed to operate at all local conditions, for example, high temperature, soil or dusty atmosphere and heavy rain. The inverters shall be equipped with temperature control and, in case of central inverters, moisture content control.
- The inverter should allow system configurations with functional grounding of the PV strings' negative poles to counter potential induced degradation (PID). In this case, the safety requirements shall not be jeopardized at any time and the monitoring of the isolation resistance shall be possible in automated form according to IEC 62109 Standard Part 1 and 2. This refers especially to the capability to automatically disconnect from the grounding grid and test the isolation resistance before the daily start of inverter operation (IEC 62109-2; 4.8) as well as to any other requirements regarding electrical safety described in this standard.
- Even if grounding the negative pole of strings is not envisaged in the system design, the inverters shall have the required features to perform grounding and to install an automatic isolation Resistance tester if required in the future.
- The inverter shall have a product warranty of five (5) years minimum.

PV Mounting Structures

The Developer is free to choose fix-tilt and/or tracked PV mounting structures. If the mounting structures shall be founded by pile foundations (pre-drilled and concreted or rammed), local pile tests on the site shall be carried out in sufficient number, but no less than four (4) per MW (DC), as basis for the structural analysis of the foundations. Pile tests shall be carried out for axial and lateral forces including bending moments.

The Developer shall have soil investigations performed and gathered all necessary information for the Project in sufficient detail to ensure that all foundations are most suitable and safe and are properly designed with regard to soil conditions of the PV plant Site.

Design and Construction shall incorporate appropriate measures against high wind speeds and, as required, to protect the structure and foundation against corrosion due to corrosive soil conditions, salty air, dust, and chemical aggressiveness for the expected lifetime of the Plant.

The Developer shall be aware of and consider the potential corrosion on site due to severe weather conditions, especially with equipment installed outdoors and underground.

As part of the detailed engineering, the Developer is required to provide a detailed corrosion protection concept for all structures and facilities installed on site prior to start of construction.

The concept shall cover required corrosion protection measures and details for design as well as required maintenance programs over the plant design lifetime.

Mounting structures shall be made of construction grade aluminum alloy or stainless or galvanized steel, with a product warranty of at least 25 years in the relevant climatic conditions (RA Construction Standard II-7.01-2011).

The mounting structures used shall be products well established on the market, designed for the use in PV solar plants with a proven track record:

- The mounting structure shall be suitable for the PV modules. The PV module manufacturer is required to confirm the adequacy of its modules for the (either fixed or tracked) mounting system.
- Mounting structures manufacturer shall have supplied mounting structures for at least 500 MW (DC) of accumulated capacity.

Regardless of the system selected, the Developer shall consider the following:

- The PV plant Site shall be prepared (levelling, compaction and grading as required) considering hydrological and geotechnical studies to ensure required bearing capacity.
- The preferred foundation solution(s) shall be verified by local tests before start of construction. The test setup shall be planned in close coordination of the findings and limits set in the structural calculations and geotechnical investigations. The test loads shall be defined considering adequate safety factors for impact loads as well as foundation resistance, the same applies for the deflection and deformation limits.

Emergency Diesel Generator

Emergency diesel generator(s) for the essential services of the PV plant including supply of the HVAC shall be provided. The essential services shall include:

- Switchgear control and protection
- Communication and monitoring systems
- DCS System
- Surveillance and security systems
- Water supply and sewage systems
- Firefighting systems
- Operation rooms and buildings
- Gate House

- Any other consumer or installation the Developer deems necessary for a safe and reliable operation of the Plant.

The emergency diesel generators shall be of protection class IP 54 und shall be installed indoors. Emergency diesel generators shall be designed for class F insulation and shall be operated with class B temperature rise.

Earthing and Lightning System

The earthing system shall be designed according to IEC, VDE, or IEEE standards.

Pairing of dissimilar metals should be avoided.

Instrumentation and Control (I&C) Requirements

This specification does not relieve the Developer of its responsibility for the basic design and execution of the instrumentation and control system. The rules of Good Utility Practice and the relevant approved standards and regulations shall be observed.

No single I&C failure shall:

- Cause any danger to personnel or the Plant;
- Invalidate protection by inhibiting a trip;
- Shut down more than one major plant item;
- Simultaneously trip a plant item and invalidate its auto-changeover.

A consistent instrumentation and control philosophy shall apply throughout the PV plant and shall be implemented in terms of a range of equipment exhibiting a minimum diversity of types and manufactures. The objective shall be to standardize all measurement and control equipment throughout the PV plant in order to rationalize operation and maintenance and reduce spare parts holding.

Every safety-related loop must be verified according to the standard IEC 61508, IEC 61511 to ensure that the requested and necessary Safety Integrity Level (SIL) is fulfilled for the individual loop. The Developer must assess all safety-related loops to ensure compliance with the related requirements and must provide a protocol about these studies.

The instrumentation and control equipment shall have high electro-magnetic and radio frequency interference immunity and shall not be affected by portable radio transmitters operated in the vicinity of the equipment. Any limitations shall be stated.

All I&C equipment shall have enclosure classification no less than IP 54 according to IEC 60529 when mounted in an enclosed building and IP 65 when mounted outdoors. Control cubicles installed in air-conditioned rooms shall be at least IP 32 rated.

Sunshades shall be provided for all cubicles located outdoors and all cubicles shall be adequately ventilated or air-conditioned, if necessary, for operability.

Digital Control System (DCS) / Supervisory Control and Data Acquisition (SCADA)

IEC 61724 must be considered as a guideline for measurement, data exchange and analysis.

IEC 61446 must be considered as a minimum requirement for system documentation, commissioning tests and inspection.

IEC 61850-7-420 communication standard for distributed energy resources shall be considered. Due to the requirements of availability, reliability and function, the control and monitoring tasks of the main Plant processes shall be performed by a state-of-the-art control system.

The DCS shall achieve all functions of:

- data acquisition
- controls
- human machine interface
- alarm signaling
- sequential event recording
- historical data archive and
- management reporting

In order to obtain a high availability and reliability of the Plant, the control system also requires a high availability. This shall be achieved by using a single-fault-tolerant design for the centralized components and important sensors, which might affect plant availability in the event of malfunction or to be used for protection, shall be provided in a redundant configuration.

The system configuration shall be simple and flexible regarding the re-configuration of loop connection and display formats to suit changes in operational requirements. System software security, including database configuration and controller loop tuning parameters shall be accessible by password.

All systems shall require minimum maintenance and shall have comprehensive self-checking and self-diagnostic capabilities, including self-test failure alarms etc.

The PV plant shall be designed to enable control and monitoring of the PV plant from the Armenia LDC and ECC including Automatic Generation Control (AGC).

Studies and Surveys

As a minimum, following studies and surveys shall be carried out in due time as design basis:

- Investigation of subsoil conditions and study of geological formation and seismic conditions of the area.
- Investigation of obstacles at and near the PV plant Site, e.g. MV/HV overhead lines or underground cables.
- Topographical survey.
- Solar resource and yield studies.

- Drainage and water management, including concept for rain and stormwater, freshwater and sewage water, handling of oily and environmentally harmful liquids.
- If required by the regulations of RA, Developer needs to perform an environmental impact assessment (EIA) in line with the applicable requirements and develop respective environmental management plans for construction and operational phase.

Documentation and Information

The Developer or its EPC Contractor must complete all technical data sheets and forms contained in the Bid Forms of the RFP (Request for Proposal) for the Plant. The technical data sheets should be supplemented by additional descriptions, specifications, drawings and all other information necessary for a clear understanding of its Proposal to enable the Advisors to undertake the necessary assessment, evaluation and verification of the technical and performance features of the Proposal.

Plant Technical Concept

Description of major equipment and systems etc. including their auxiliaries, such as:

a) Plant overall concept
b) Main components: PV Modules, inverters, inverter stations, transformers, mounting system
c) Description of interfaces
d) Electrical equipment and systems, such as:
    - Electrical power system philosophy (PV field, MV systems, up to the interconnection
    - Main electrical equipment including auxiliary systems
    - Electrical single line diagrams for the PV plant and subsystems
    - Electrical system calculations
e) Instrumentation and control systems:
    - General description of control system
    - Settlement metering system (for own consumption)
    - Description of meteorological stations and sensors
f) Project drawings and diagrams, such as:
    - Site plan, general layout for on- and offsite facilities, indication of fenced areas
    - Arrangement plan of the PV plant area including cable routing
    - Arrangement plan of the PV plant including access road, security fence, buildings technical plants, roads, as well as proposal for cable routing to the Switching Station connection
    - General layout
g) Yield Reports

The Developer shall be required to submit together with its Proposal yield reports for the Plant, including the performance model and hourly generation values. The yield reports shall be prepared by experienced independent technical consultants.

The yield reports together with the specific PVsyst simulation files (export data with all source files used in the simulations) shall be submitted.