WORK PROGRAM
Ground-Mounted Solar Power Project

Introduction

A Solar Energy Service Contract (SESC) is awarded to a qualified applicant that passes legal, technical and financial evaluations on its proposed solar power project (SPP) for commercial purposes. SESC has duration of 25 years extendible one time for another 25 years. It has 2 stages namely: pre-development stage (PDS) and development/commercial stage (DCS). PDS has a maximum duration of 2 years while the remaining years of the SESC are for DCS.

The PDS generally aims to develop a detailed feasibility study (DFS) on the proposed SPP. The DFS aids in making the decision on whether to declare commerciality and eventually convert the SESC from PDS to DCS upon confirmation by the Department of Energy (DOE). The PDS is covered by a Work Program that enumerates in detail how the different activities towards the development of the DFS are to be attained.

On the other hand, DCS covers the construction, commissioning and commercial operation of the SPP. It is covered by a 5-year Work Plan, submitted upon declaration of commerciality, which will be regularly updated until the end of the SPP's economic life.

Objectives of the Work Program

Generally, the Work Program serves as a blueprint in the development of a DFS of a proposed SPP. Specifically, it aims to:

1. Specify the major activities and sub-activities for the development of a DFS; and
2. Discuss in detail the strategies and financial requirements to attain the Work Program.

The SPP Work Program

The SPP Work Program (SPP-WP) has three major activities, namely; Milestone, Detailed Feasibility Study and Declaration of Commerciality (DOC). The strategies to attain the minimum sub-activities under each major activity are enumerated below:

1. Milestone Activities

Milestone activities are mandatory activities to be accomplished within the first six months of the SPP-WP reckoned from the effectivity of the SESC. Any challenges that impede the timely completion of these activities shall be immediately officially reported to the DOE together with the possible options on how to address it, if any.

Failure to timely accomplish these activities shall lead to automatic termination of the SESC.

The three milestone activities are:

1.1. Public consultation and acquisition of LGU Resolutions of Support (Barangay and City/Municipality or Provincial)

These activities shall require DOE endorsements of the SPP to the LGUs. Public consultations shall be undertaken in close coordination with the concerned Sangguniang Barangay, Bayan/Panglungsod or Panglalawigan. A detailed presentation of the SPP shall be made during the public consultations. The attendance of a DOE representative during the public consultation will be requested, if needed. The public consultations must be properly documented by at least attendance sheets, photos and detailed report.

The filing of application for the issuance of the LGU Resolutions of Support must be properly documented. It must be regularly followed-up thru official means such as letters and email messages.

The LGU Resolutions of Support shall be sufficient in form and substance and shall explicitly imply that the LGU fully supports the development and implementation of the SPP.

The physical outputs of the activity are the acquired LGU Resolution of Supports and the abovementioned documentation on public consultations.

1.2. Land class identification and land rights acquisition

The applicable production area for the SPP shall be identified within the SESC contract area and the corresponding land rights shall be acquired.

Ideal lands for SPP are those that are not used for agricultural production, un-irrigated and un-irrigable. ***These ideal lands reduce or minimize the risk on the land conversion issue of "food versus energy".***

As an industry practice, it is best to prioritize public lands. Applicable rights for public lands are Forest Land-use Agreement (FLAG), Special Land-Use Permit (SLUP), Foreshore Lease Agreement (FSLA) and similar agreements.

On the other hand, private land acquisition can be done thru purchase, lease and similar agreements. ***In extreme cases, private land acquisition can be***

undertaken through expropriation. However, this is subject to certain mandatory pre-conditions.

The identified production area with corresponding land rights shall be the basis in the determination of the SPP's capacity and annual energy production.

Physical output/s of the activity is/are the acquired land right/s on the use of the production area of the SPP.

1.3. Initial modeling and annual energy production estimates

The minimum physical output of the activity shall be the preliminary layout, single line diagram, general specifications and annual energy production (AEP), capacity in megawatt peak (MW_p), of the SPP and shall be based on the results of the following activities:

1.3.1. Solar resource assessment

Solar Resource Assessment (SRA) refers to the analysis of a prospective solar energy production site with the end goal being an accurate estimate of the proposed SPP's annual energy production (AEP). That is, the systematic collection of "ground truth" meteorological data for the purpose of lowering the uncertainty of the AEP estimates.

Solar data on the SPP site may be acquired from reliable sources like the National Aeronautics and Space Administration (NASA), Vaisala, and Meteonorm, among others.

Whenever possible, on-site data shall be considered in the estimation of the AEP. Contrary to a few short years ago, the routine collection of site-specific solar resource data has quickly become standard practice in the utility-scale solar PV industry, just as it is in wind. When properly installed and maintained, site-specific SRA campaigns provide an accurate context from which long-term satellite-derived irradiance data can be corrected. Together this combination of short-term "ground truth" and long-term satellite-derived data provide the lowest possible uncertainty for a prospective SPP, making it the preferred methodology by leading financial institutions. This uncertainty reduction translates to improved financial terms and faster returns on investment.

The physical output of the activity is the resource database of the SPP.

1.3.2. Solar data processing, analysis and interpretation

Based on the information gathered during the SRA, simulations on the AEP shall be estimated using industry standard modeling software like PVsyst.

The activity needs the services of an industry expert. Thus, hiring of the services of an industry expert shall be undertaken if the SPP Developer has no capable manpower.

The physical output of the activity shall be included in the resource database of the SPP.

2. Detailed Feasibility Study

The minimum activities under the five major aspects of the DFS are enumerated below, namely:

2.1. Market Study

2.1.1. Supply and Demand

Currently, the "70%-20%-10%" policy is the general market guiding for SPP. The policy dictates that supply must be segmented into 70% base load, 20% mid-merit, and 10% peaking. Any type of resource can target the three supply segments as long as it is technically feasible and financially viable and mandatorily pass the competitive selection process (CSP) or any related acts/laws, rules and guidelines in the future.

The demand of the target supply segment must be extensively analyzed in order to define the optimum SPP capacity. The demand impact of the different mechanisms under R.A. 9513 such as the Renewable Portfolio Standard, Feed-in Tariff, Green Energy Option, and Distributed Generation, among others, shall also be included in the analysis, if any.

2.1.2. Negotiation for the energy/power supply contract

Upon identification of the optimum market of the SPP, negotiations with the concerned stakeholders such as National grid Corporation of the Philippines (NGCP), Retail Electricity Suppliers (RES), Distribution Utilities (DU), and Rural Electric Cooperatives (REC) shall be immediately undertaken.

2.1.3. Acquisition of energy/power supply contract

Once the negotiations were fully settled, the corresponding energy/power contract shall be finalized and duly signed. ***The supply contract must be applied for the required Energy Regulatory Commission's approval which is normally provisional at initial stage.***

The physical outputs of the activity are the acquired energy/power supply contract and the corresponding ERC approval, if needed.

The market study shall factually define the optimum market of the SPP as well as other possible market options. It must at least address the following basic questions:

- Is there a real demand for the target energy/power?
- Can the marketing program effectively meet this demand?

2.2. Technical Study

2.2.1. Access & Transmission Line (TL) Right of Way (ROW)

Right of way (ROW) is the strip of land over which facilities such as roads or power lines are built. Similar with the acquisition of the SPP site, applicable rights for public lands for ROW acquisition are Forest Land-use Agreement (FLAG), Special Land-Use Permit (SLUP), Foreshore Lease Agreement (FSLA) and similar agreements.

On the other hand, private land acquisition for ROW can be done thru purchase, lease and similar agreements. ***In extreme cases, private land acquisition can be undertaken through expropriation. However, this is subject to certain mandatory pre-conditions.***

The physical output of the activity is/are the TL layout and acquired agreements/contracts on access and TL ROW.

2.2.2. Final modeling and annual energy yield estimates

Final modeling of the initial AEP shall be undertaken as soon as all the required parameters are ascertained.

The minimum physical output of the activity shall be the layout, single line diagram, equipment specifications and annual energy production (AEP) of the SPP.

2.2.3. Geotechnical Study

Ground-mounted PV power plants require two basic foundation design components: geotechnical engineering and structural engineering. Geotechnical engineering focuses on evaluating soil mechanics so that the foundation design can incorporate these characteristics. Structural engineering focuses on modeling the foundation as a supported beam to ensure that it can successfully support the design loads.

Of the factors that determine optimal foundation design, geotechnical site characterization is arguably the most challenging. This is partially due to the fact that feedback from the field about long-term foundation performance invariably lags behind project deployment. Given the risk associated with foundation problems, which can impact both short-term and long-term project profitability, geotechnical investigation is one of the solar industry's most overlooked site-selection criteria. The minimal expense to conduct a proper geotechnical analysis at the beginning of a project far outweighs the cost of an overdesigned foundation system on the back end of the project.

The physical output of the activity is a detailed report of the study.

2.2.4. System/Distribution Impact Study

System/Distribution Impact Study (S/DIS) is an assessment made or conducted by the Transmission Provider/System Operator in addition to the grid impact studies prepared by it in accordance with the Grid Code, to determine: (i) the adequacy of the Transmission System and its capability to accommodate a request for Power Delivery Service; and (ii) the costs, if any, that may be incurred in order to provide Power Delivery Service to a Transmission Customer.

Generally, the application requirements for S/DIS are DOE clearance to undertake the SIS, letter of intent from the Generator Customer; proposed plant details and specifications, target commissioning date, connection scheme to be agreed by both NGCP and Customer, and Customer's BIR and SEC registration.

The S/DIS Report includes the recommended connection scheme, required grid reinforcements, if any, and asset boundary.

The procedures for the conduct of Facilities Study are enumerated in B15 of the Revised Rules, Terms and Conditions for the provision of Open Access Transmission Service (OATS).

The physical output of the activity is a detailed report of the study.

2.2.5. Facilities Study

If the SIS indicates that new Facility or Grid Upgrades are needed to provide the requested services, the Transmission Provider shall tender to the Prospective Transmission Customer an Offer of Service for Facility Study within thirty (30) days of completing the S/DIS, and shall allow the Prospective Transmission Customer fifteen (15) days to respond from the date of its receipt of the Offer of Service.

The procedures for the conduct Facilities Study are enumerated in B14 of the Revised Rules, Terms and Conditions for the provision of Open Access Transmission Service (OATS).

The physical output of the activity is a detailed report of the study.

2.2.6. Bid documents preparation and negotiation of EPC Contract/s

All bid documents required for the procurement of the services of Engineering, Procurement and Construction (EPC) Contractor for the SPP shall be prepared as soon as these are available.

The preparation of the bid documents may require the hiring of an industry expert or consultant if the SPP Developer has no or limited manpower capability.

The physical output of the activity are bid documents and bid proposals.

2.2.7. Engineering Design

The selected EPC Contractor shall develop the detailed engineering design (DED) of the SPP based on the results of the technical study. The DED shall be the basis for the procurement of the SPP facility.

The physical output of the activity is the DED.

The technical study shall factually define the optimum capacity of the SPP. It must at least address the following basic questions:

- Do you have a competitive quality of your product?
- Are the resources available and accessible?
- Are the resources optimally used to produce the highest possible quality at the lowest possible cost?

2.3. Management Study

2.3.1. Negotiation with potential partners

The potential EPC Contractor, Owner's Engineer and O & M Contractor for the SPP shall be identified based from the list of providers in the

solar industry. Providers with local experience/s are given priority in the negotiation.

The physical outputs of the activity are proofs of negotiation with potential partners.

2.3.2. Implementation strategy of development and construction of the project

Implementation strategies of commercially operating SPPs shall be studied and will be considered as one of the major basis in the development of the implementing strategy for the SPP. The lessons learned by locally operating SPPs as well as industry best practices will be reviewed and analyzed.

The physical output of the activity is the initial 5-Year Work Plan of the DCS.

2.3.3. Identification and short listing of potential EPC Contractor, Owner's Engineer and O & M Contractor

A short list of the potential service providers will be developed based on the results of the negotiations and analysis of local industry experiences.

2.3.4. Awarding of EPC Contractor, Owner's Engineer and O & M Contracts

The winning service providers based from the bidding process will be awarded with the corresponding contracts.

The physical outputs of the activity are the acquired EPC, Owner's Engineer and O&M Contracts.

The management study must at least address the following basic questions:

- Is the organizational setup optimally effective? (functions effectively carried out at lowest manpower level possible)
- Is the society and economy can derive net positive gains from the project?

2.4. Socio-Economic and Environmental Study

DOE endorsements shall be acquired to facilitate the application and processing of the applicable permits for the SPP, namely:

2.4.1. DENR permits (ECC, CNC, etc.)

2.4.2. NCIP (Certificate of Non-Overlap, Certification Pre-condition

2.4.3. Other applicable permits, if any.

The physical outputs of the activity are all the acquired permits necessary for the SPP.

The socio-economic and environmental study must at least address the following basic questions:

- Is it economically profitable?
- Is the society and economy can derive net positive gains from the project?

2.5. Financial study

2.5.1. Financial modeling

A financial model for the SPP shall be developed to be used in analyzing the viability of the SPP at the base case and related scenarios. Financial indicators such as weighted average cost of capital (WACC), equity internal rate of return (EqIRR), financial IRR (FIRR), economic IRR (EIRR), net present value (NPV), payback period and other related indicators shall be analyzed thru the financial model.

The assumptions must comply with the financing institutions and DOE requirements. All applicable incentives must be considered in the financial analysis.

As a minimum requirement, the DOE requires all scenarios must be analyzed using sensible situations such as 10% cost overrun, 10% benefit shortfall and both.

Minimum physical output of the activity is a detailed report on the different scenarios considered and the corresponding aforementioned financial indicators. The report must include the list of assumptions used in the model, cash flows, incentives considered, among others.

2.5.2. Negotiation and approval of funding

All negotiations towards financial closing must be fully documented and included in the reportorial obligation under the SESC.

The physical output/s of the activity is/are the acquired document/s during the negotiation/s, if any.

2.5.3. Financial Closing

The financial closing will be finalized as soon as all the requirements are completed and submitted to the concerned financial institution.

The physical output of the activity is the document that manifests the final approval of the required financing of the SPP.

The financial study must at least address the following basic questions:

- Is it financially profitable?
- Are the financing arrangements and terms reasonable and viable?

3. Declaration of Commerciality

Declaration of Commerciality (DOC) of the SPP shall be filed with the DOE within the PDS timeline if the result of the DFS is positive. The DOC letter shall state that the SPP is commercially viable with its final capacity in MWp, final off-taker/market, approved rate, and request for conversion of the SESC from PDC to DCS.

The declaration and request for conversion must be supported by the submission of the DFS of the SPP. As a minimum requirement, the DFS must explicitly discuss in details the results of the different component studies. All the physical outputs identified in the Gantt Chart of the Work Program (Annex A) must be included as annexes of the DFS.

On the other hand, if the result of the DFS is negative, the DOE shall be immediately and officially informed on what courses of action/s to be undertaken on the situation.

The physical output of the activity is the DOC letter that declares that the SPP is commercially viable with its final capacity in MWp, final off-taker/market, approved rate and request for conversion of the SESC from PDC to DCS together with the DFS and its aforementioned annexes.

4. Others

Other activities that may not fall under the 3 major components that need to be accomplished in a case-to-case basis shall be undertaken, documented and reported under the item.

Prepared by:

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Approved by:

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Designation