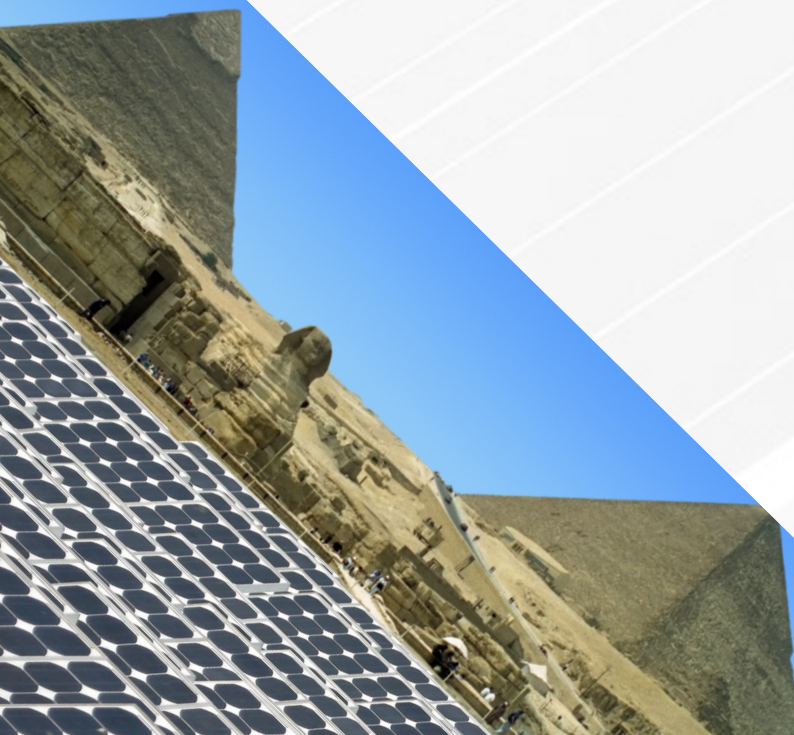


Module Outline

POWER PROCUREMENT AND TRADING





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Relevance and Background

Solar power is procured by utilities, traders and consumers. The objective of procuring solar power is to meet the self-assumed or government-imposed green mandates and reduce the cost of energy. Procurement of solar energy is generally carried out on a long-term basis (15 years and above, and ideally 25 years). Therefore, solar power procurement is important for mobilizing private capital for solar PV deployment, as it assures long-term returns.

First-come-first-serve and competitive-based procurement are the two most commonly used procurement methods.

It is important to understand the key aspects of the procurement process before planning and designing any solar PV system.

Theme – Project Management

Competency – Procurement

Code of the Module – To3Co8M22

Learning Outcomes

At the end of the presentation, the participants will be conversant with the:

- Key solar power procurement methods
- Key aspects of the procurement process

Method of Delivery

Duration	Resource Code	Resource Delivery
60 min.	M22 L01	Lecture on Power Procurement and Trading

M22 L01: Lecture Presentation

The MS PowerPoint presentation first introduces the participants to various legal and liability issues that can arise in a solar project and discusses the importance of addressing these. These issues arise at different stages in the project cycle and the participants will be made aware of the typical stages of a solar project and the legal and liability issues arising at each stage. A PPA is the bedrock of a solar project, so the presentation discusses the concept of a PPA and its benefits to the signing parties and stakeholders. Finally, the presentation identifies possible legal and liability issues that can arise in the case of non-compliance with the PPA.



Key topics to be covered

1. Solar Power Procurement Methods
2. Delivery Point, Metering and Billing
3. Site Location of Generating Plant
4. Quality of Supply
5. Quantum of Procurement
6. Installed Capacity
7. Technical Standards
8. Penalties
9. Documentation
10. Aggregated Procurement
11. Short-Term Procurement
12. New and Upcoming Procurement
13. Seller's Perspective



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1 Introduction

Various entities engage in the purchase of solar power, encompassing utilities, government organizations at different levels, power exchanges, businesses, non-profit organizations, and individual bulk and retail consumers. In the past 15 years, the solar energy market has evolved, offering different options for electricity consumers to acquire solar power through verified transactions. This document provides an overview and detailed insights into various solar power procurement methods.

The procurement of solar energy typically spans long-term agreements, usually 15 years or more, ideally extending to 25 years. Hence, it is crucial, during the design of new solar systems, to identify the energy buyers and cater to their specific requirements, including grid connections, local regulations, and electricity codes. It's important to differentiate between "procurement," where energy buyers secure power, and "buying," where they receive and pay for energy as per the contract. Both these actions can be carried out by the same entity or different ones. The key entities involved in procurement include:

- Entities that intend to use solar power for their operations. Here the User is the Procurer as well as the Buying Entity; the User can be a Utility or a Consumer.
- Traders, for the purpose of selling solar power to their clients. Here the Trader is the Procurer as well as Buying Entity.
- Bidding/Empanelling Agencies are involved to support Users with solar power procurement if the latter lacks the capacity to carry out procurement themselves, and if the aggregation model is used. Here the User is the Buying Entity, and the Bidding/Empanelling Agency is the Procurer.

Common power sale/procurement transactions can take place between:

- For utility-scale projects -
 - A Utility (Buyer) and an Independent Power Producer (IPP) (Seller)
 - A Consumer (Buyer) and IPP (Seller)
 - A Trader can purchase power from IPPs and then sell it to a Utility or Consumer
- Distributed Renewable Energy (DRE) projects -
 - A Consumer (Buyer) and Renewable Energy Service Company (RESCO) (Seller)
 - A Consumer (Seller) and Utility (Buyer) for projects developed under Gross Metering, Net Metering and Net Billing arrangements
 - A RESCO (Buyer) and Utility (Seller) for projects developed under Gross Metering, Net Metering and Net Billing arrangements
- DRE Mini-grids -
 - A Consumer (Buyer) and RESCO (Seller)
 - Utility (Seller) and RESCO (Buyer) under Distribution Franchisee (DF) model

2 Solar Power Procurement Methods

The earlier common method used for power procurement was on a first-come-first-serve basis, with the other method being through competitive bidding. The selection of the procurement method though depends on the depth of the local and national solar markets for the particular solar application. The first-come-first-serve method is still used at times for, (1) new and upcoming solar applications, and (2) sales to a large number of retail consumers like gross metered DRE projects. The competitive bidding method is popularly used for, (1) commercially established applications, and (2) bulk users like large energy customers and utilities.



For competitive bidding, either the utilities directly call for procurement or hire an agency for this purpose. The call includes the following details:

- Solar technology/application for which the procurement is carried out.
- Tariff structure and tariff - This could either be a fixed tariff for the entire tenure of the procurement, tariff increasing/decreasing at a constant rate, or stepped tariff, etc.
- Installed capacity -
 - Maximum capacity to be procured under the call.
 - Maximum and minimum capacity to be procured from each developer.

- Developers and respective capacities are selected through reverse bidding i.e., on the lowest tariff basis subject to meeting the technical and financial qualification criteria. Reverse auctions are also used for selection of the bidders. Under reverse auction, unlike reverse bidding, the bidders are allowed to revise their bids within the reverse auction session.
- The bidding process, milestones, timelines and tender documentation are also included in the call.

It should be noted that the calls for first-come-first-serve basis are usually valid for a longer period (one year and above) vis-à-vis competition-based calls (3-6 months) because longer periods encourage new market players to participate in this evolving sector.





3 Delivery Point, Metering and Billing

The procurement defines the delivery point, which is usually the point of sale. The delivery point for utility-scale solar PV projects can be one of the following two - (1) the interconnection point of the project/generation bus bar with the grid, and (2) the consumption point. For DRE projects, the delivery point is usually the consumer's bus bar.

The energy supplied is measured through energy meters installed at the interconnection point/generation bus bar. The distribution and transmission losses are borne by the buyer in case the delivery point is an interconnection point, while they are borne by the seller if the delivery point is at the consumption end.

Billing is carried out on the basis of the energy supplied, tariff, and other supply conditions. Other important aspects of billing are:

- Frequency of billing
- Due date of payments from the date of billing
- Penalties for buyers (for example, if they fail to pay by the due date)
- Penalties for sellers (for example, if they fail to meet the supply conditions)

4 Site Location of Generating Plant

For utility-scale projects, procurement is usually carried out by the utilities. The procurer generally prefers a project within their control area, and this is specified in the procurement call. Sometimes governments/utilities develop land banks and solar parks for hosting solar PV projects and may then call for the procurement of power from these projects only.

Consumers, as well as traders, consider their needs like project co-location, cost of landed energy, and use of their land for solar deployment, for procurement. These needs will influence the site location.

For DRE projects catering to multiple consumers, like in the case of mini-grids, the location is selected close to the consumers so as to reduce the transmission and distribution losses, and the cost of energy.

5 Quality of Supply

For grid-connected applications, compliance with local grid codes regarding frequency, voltage, and other quality of supply standards is essential. For off-grid applications, procurers define quality of supply based on application needs.

6 Quantum of Procurement

Standard procurement assumes the entire generation from the project is off-taken by the procurer. However, to ensure the quality of the project, the procurer mandates the minimum supply from the project. The methods to calculate the shortfall of supply and therefore the penalty calculations are provided beforehand in the contracts between the generator and procurer. Some projects may define maximum procurement quantum due to the users' limitations. In such cases the provision of either



allowing the generator to sell the excess to other parties is mentioned, or that the generator will have to forgo any excess energy.

7 Installed Capacity

There are several ways of assessing the installed capacity of a solar project - DC capacity of the modules, inverter output capacity, and maximum input at the interconnection point. Installed capacity is defined during the procurement as per the requirement of the procurer.

8 Technical Standards

Technical standards for the equipment to be used are mentioned as part of the procurement. These technical standards are usually the standards adopted by the government for developing solar PV projects in their respective country. There are also mandatory standards to be complied with for grid integration.

9 Penalties

To discourage the shortfall in meeting the terms and conditions, the procurement call also specifies penalties. The major shortfalls include failure to meet the milestones within the stipulated timelines, poor quality of supply and inadequate quantity of supply. Procurement defines the shortfall, the basis for the calculation of the same, and the monetary and non-monetary compensation for the shortfall.

10 Documentation

The above-discussed topics are usually covered in the documentation provided by the procurer. These documents include the Request for Selection (RfS) and the Notice from the procurers for the competitive bidding and first-come-first-serve basis methods, respectively. A link to a model power purchase agreement (PPA) is given at the end, for reference purposes.


11 Aggregated Procurement

DRE systems are usually small in size (few kW) and are expensive on a per kW basis in comparison with utility-scale projects. Economies of scale are usually used to reduce the cost of DRE. Several projects within a close area are aggregated and power procurement is carried out for the aggregated capacity. Here the procurer will be the aggregator while the buying entity can be the energy consumer. The procurer identifies the individual projects and can carry out competitive procurement for solar power on behalf of the identified energy consumers, thus acting as an intermediary.

12 Short-Term Procurement

Majority of solar power procurement is carried out for the long term, but short-term procurement is also being promoted, similar to conventional power sources in some cases:

- Between the buyers and sellers through short-term contracts with similar methods and processes used for long-term procurement, and/or

- 
- Through the energy exchanges, where the procurement is carried out as per the procedures followed by them.

13 New and Upcoming Procurement

There are some new procurement processes being deployed across the world, such as:

- Bundling of solar power with conventional power, where the minimum share of solar power in the bundled power is defined.
- Procurement from hybrid renewable energy projects, where solar is hybridized with other renewable energy technologies.
- Peer-to-peer sales by the prosumers from DRE projects.



14 Seller's Perspective

Procurement is usually designed and carried out by the Procurer as per their objectives and needs. A well-planned procurement considers prevalent market conditions and Sellers' feedback. To answer procurement calls, Sellers carry out the following major activities:

- Consult the financial institutions to -
 - Understand the bankability of the Procurer and the procurement call.
 - Ascertain the tentative lending terms.
- Carry out basic design and costing as per the requirement of the procurement call.
- Identify the risks of the procurement call.
- Carry out financial assessment.
- Prepare and submit documentation as per the procurement call.

The risk arising from the PPAs plays an important role, apart from the financial viability. Basis the risk profile, the Seller either (1) does not answer the call, or (2) factors the risk premium in the tariff. Major aspects of risk profiling include:

- Credit rating of the Procurer
- Project implementation timelines
- Quality and standards for project implementation
- Tenure of the procurement
- Supply conditions include quality and standards.
- Penalties for not meeting the requirements for the procurement.

For a first-come-first-serve call, the Sellers check the financial viability with the tariff and incentives. For a competitive call, the Sellers bid at a tariff that is financially viable to them.



Case Study

Uganda - A Bundled Approach to Mini-Grid Tendering by GiZ (https://africa-energy-portal.org/sites/default/files/2022-02/Success-in-Rural-Electrification_Case-Study-Uganda.pdf)

Under the GET. transform program in Uganda, procurement has been carried out for 40 mini-grids. This case study captures important aspects of mini-grid development, including procurement aspects.

Reading Material

1. *Uganda Renewable Energy Feed-in Tariff (REFiT) Phase 3 Guidelines* by Electricity Regulatory Authority

(<https://www.getfit-uganda.org/app/download/29325656/Uganda-REFIT-Guidelines-Phase+3-2016.pdf>)

The document can be referred to for guidelines for first-come-first-served basis project allocation.

2. *Overview of the Request for Qualification and Proposals for New Generation Capacity under Sixth Bid Submission Phase of the Renewable Energy Independent Power Producer Procurement Programme* by The Republic of South Africa Department of Mineral Resources and Energy (<https://www.ipp-renewables.co.za/PressCentre/GetPressRelease?fileid=9033fbd2-94cb-ec11-9573-2c59e59ac9cd&fileName=REIPP%20BW6%20%20RFP%20Summary.pdf>)

The document is a useful resource to understand the competitive procurement process for solar PV and other renewable energy.

3. *Model Power Purchase Agreement for Solar Projects* by Energy and Water Utility Regulatory Authority, Tanzania (<http://www.ewura.go.tz/wp-content/uploads/2015/08/Model-PPA-for-Solar-power-generation.pdf>)

4. *Guidebook for Demand Aggregation - Way Forward for Rooftop Solar in India* by Asian Development Bank (<https://www.adb.org/sites/default/files/publication/850646/demand-aggregation-rooftop-solar-india.pdf>)

The document can help to understand the demand aggregation for solar rooftop procurement in India.

5. *Guide to Purchasing Green Power* by United States Environmental Protection Agency (<https://www.epa.gov/green-power-markets/guide-purchasing-green-power>)

The document can be a guideline to understanding the procurement of green power.

