

# Solar PV Rooftop Implementation Guidelines: Thailand



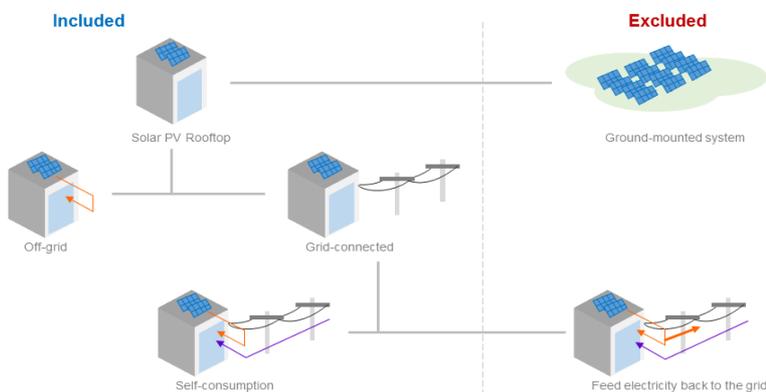
## Background, Objectives, and Scope

Thailand's energy policy has shifted to a greener path and the adoption of renewable energy technology is leading the way. While there is interest from consumers to adopt solar energy, Thailand still faces many challenges with the implementation of solar PV systems due a lack of knowledge about installing PV systems and a lack of tools to self-evaluate. Specific challenges faced by project developers, investors and engineering, procurement, and construction contractors include an unclear regulatory framework, complex licensing procedures, and difficulty in bank financing of smaller rooftop systems.

These guidelines were developed using the ASEAN renewable energy guideline approach, applying international best practices. The partnership with USAID Clean Power Asia in creating these comprehensive guidelines provided the necessary tools including a power purchasing agreement template and a financial model that allows for accurate assessment and analysis of a project.

The objectives of the solar PV implementation guidelines are assist Thailand to overcome existing challenges and contribute to the ease and greater adoption of RE technology by facilitating the rooftop PV market with easy to follow step-by-step guidelines. Specific objectives of the guidelines are to:

- Create a practical guideline as a handbook for PV rooftop project implementers in Thailand
- Make tools publicly available, including a technical + financial tool and PPA templates
- Propose and outline possible implementation models that may open new market segments



- Covers all installed capacity
- Business model: Self-financed project & Third-party Ownership

The scope of the guidelines includes PV systems installed on roofs and does not cover all ground-mounted solar PV systems like solar farms. The guidelines cover off-grid solar PV rooftop systems, and for grid-connected solar PV systems, the guidelines are applicable only when there is no feeding back of electricity to the grid. Under the current regulatory framework (*subject to change*), this type of solar PV rooftop system is not yet allowed. The guidelines cover small installations to large-scale solar PV rooftop systems and include two types of business models: self-financed (facility owner develops a solar PV rooftop system with personal investment) and third-party ownership model (solar service company invests in a system to be installed on a roof, with the generated electricity then sold to facility owner at a rate cheaper than grid electricity).

# Visualisation of Steps in Guidelines



The Gantt chart gives a sense of a time frame required to complete each stage and the flow chart provides more clarity in terms of relationship between different stages. The Gantt chart and flow chart above provides an overview of a solar PV project development, consisting of several stages (shown in different colors). The guidelines also provides more details for each stage, such as Stage 1, Site Evaluation, which consists of eight steps.

## Tools to Support Project Implementation

**POWER PURCHASE AGREEMENT**

THIS POWER PURCHASE AGREEMENT (the "Agreement") is made on 10-Aug-17, 2017.

BY AND BETWEEN:

(1) [Solar Power Producer Name], a company registered and existing under the laws of Thailand, having its registered office at \_\_\_\_\_ (the "Seller"); and

(2) [HOST Name] a company registered and existing under the laws of Thailand, having its registered office at \_\_\_\_\_ (the "Purchaser").

The Seller and the Purchaser shall be collectively referred to as the "Parties" and individually as a "Party".

**WHEREAS:**

A. The Seller desires to develop, design, construct, own and operate the solar PV system (the "System") located on Purchaser's property.

B. The Purchaser desires to make a portion of such property available to the Seller for the construction, operation and maintenance of a solar powered electric generating project.

C. The Seller intends to sell to the Purchaser and the Purchaser intends to purchase from the Seller all of the power generated by the System (as defined below) pursuant to the terms and conditions of this Agreement.

**NOW, THEREFORE,** the Parties agree as follows:

**INPUT** → Project Setting, Electric Information, Technical Specification, EPC Information, New Capex, O&M Expense, Source of Fund, BOR Incentive, Go

**INPUT** → Self Financing Model, Solar PPA Fixed Price, Solar PPA with Annual Escalator, Solar PPA Retail Price Indexing

**OUTPUT** → Self Financing Model, Solar PPA Fixed Price, Solar PPA with Annual Escalator, Solar PPA Retail Price Indexing

**Cash Flow** → Self Financing Model, Solar PPA Fixed Price, Solar PPA with Annual Escalator, Solar PPA Retail Price Indexing

**Key Assumption**

Project Information	
Project Name	Text
Start Date	dd-mm-yy 10-Aug-17
End Date	dd-mm-yy 10-Aug-42
Project Life	years 25
Location	
Province	Select กรุงเทพมหานคร
District	Select บางนา
Sub-District	Select บางนา
Radiation (kWh/m <sup>2</sup> /a)	1,856.63

**Electricity Information**

Electric Consumption	kWh/year	5,793,682
Type of Tariff	Select	TOU Rate
Type of Electric User/Rate	Select	Large General
Voltage/Transmission Line	Select	22-33 kV
Electric Retail Price		
Service Charge	THB	312.34
TOU Rate		
Peak	THB/kWh	4.2097
Off Peak	THB/kWh	2.6295
Ft of May - Aug 2016	THB/kWh	-0.1399
Demand Charge	THB	132.93
Retail Tariff Escalation	%	1%
VAT	%	7%
Corporate Income Tax	%	26%
Currency Unit	THB	1,000,000

A private PPA template has been developed to facilitate investment in distributed solar PV electricity generation systems in Thailand. This is a standardized agreement that aims to support market players by providing neutral clauses as a starting point for negotiations between sellers and buyers of solar PV systems, and it is expected that this agreement can help reduce soft costs and negotiating time for all parties. The Financial Model (MS Excel) will allow for accurate financial assessments of solar PV projects, as several key decisive parameters can be quickly calculated, such as internal rate of return, payback period, etc.

## Contact

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