This is a new section of the Public-Private Partnership Resource Center website and is currently in draft form. Your feedback is welcome: If you would like to comment on the content of this section of the website or if you have suggestions for links or materials that could be included please contact us at ppp@worldbank.org.

Photo Credit

Rooftop Solar Installation Model for ERP, view of a green roof on a modern building with solar panels

Rooftop Solar Installation Model for ERP

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On this page: *Rooftop Solar Installation leveraging a New-Build-Bulk-Fees model - Model 4 in the ERP Project Guidelines. Read more below, or visit Strategic Guidance for Country System Assessments, Guidance for Countries in Assessing ERC Projects, or Mobilizing ERC Finance.*

Project Type: Renewable Energy

Sector: Power

Applicable Project Methodology: AMS-I.F.: Renewable electricity generation for captive use and mini-grid

This project type involves setting up Solar Photovoltaic (PV) Panels on the rooftops of various locations. The project can help to generate adequate energy supply that can primarily meet the energy needs of the buildings themselves, with any surplus electricity being supplied back to the grid. This helps to reduce greenhouse gas (GHG) emissions through reduced consumption of fossil fuel power supply.

Proposed Structure of this Public Private Partnership (PPP) Model

The project will be leveraging a **New-Build-Bulk-Fees** model. This will involve the grantor, potentially a municipal government or state-owned entity, creating a new entity to coordinate and manage the installation of rooftop solar systems across participating buildings in the region. The new entity will also be managing the emission reduction credit (ERC) project, for which it will receive the ERCs issued to the project for the avoided emissions. To recover the installation costs, the new entity will be collecting fees from the building owners benefiting from the energy efficiency savings through a 10-year period.

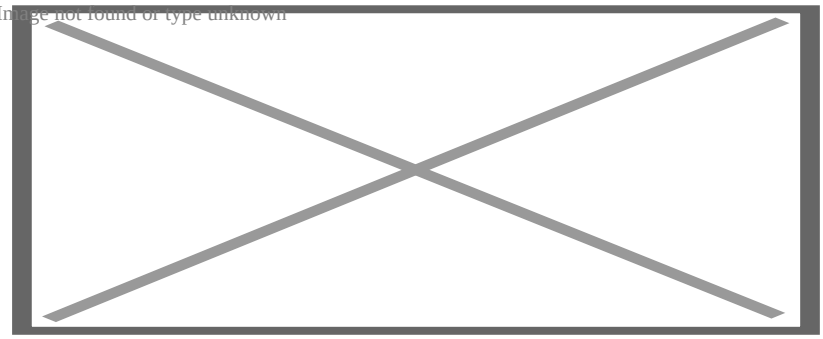
Table 1: Model Attributes

Dimension	Attribute	Description
Business	*New*	This model assumes that a new state-owned entity will be created to manage the project
	Existing	
Construction	*Build*	The model involves the government or state-owned entity engaging a service contractor to install the rooftop solar systems in the participating buildings
	Refurbish	
Private Funding	*Finance*	The government or state-owned entity will provide initial financing for the project development in this model

Dimension	Attribute	Description
Service	*Bulk*	The government or state-owned entity will collect payments from the participating buildings
	User	
Revenues	*Fees*	The revenues in this model will be pre-agreed fees based on the savings to be incurred by the participants
	Tariffs	

Proposed risk allocation of the Public Private Partnership Model

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Key features of PPP structure

- Government or state-owned entity engages private sector entity to design, build and maintain solar PV rooftop project
- The government or state-owned entity provides financing of the project and earns the tariff paid by domestic consumers for electricity consumption
- Any ERC proceeds will also go to the government or state-owned entity as additional revenue stream

Expected ERC end use

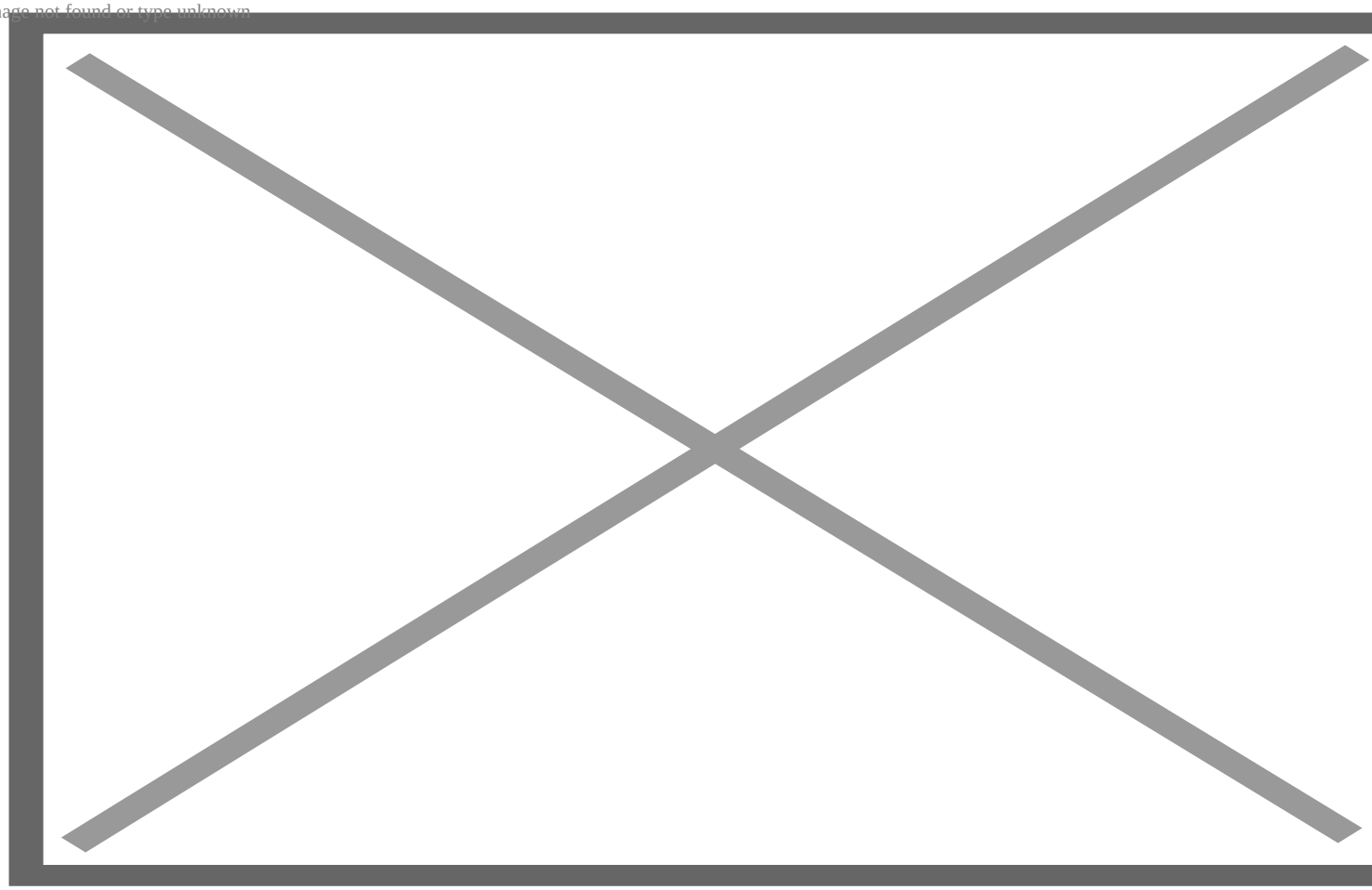
- End use can belong to the government or state-owned entity as part of additional revenue stream

Key considerations/risks for proposed project

- Extensive stakeholder engagement required to ensure buy-in from local stakeholders
- Will need receive necessary approvals for development and commissioning for each solar PV plant
- Need to work with grid operators to ensure stable good energy grid capabilities to connect rooftop solar with grid
- Partnering with a service provider for the project's marketing, sales and pricing is needed to identify potential offset buyers, negotiate contracts, and secure good target price per tonne to enable the financial viability of ERC generation
- Contracting a monitoring, verification and reporting (MRV) service provider with experience in conducting MRV and preparing the necessary documents for generating ERCs in a voluntary carbon market standard will reduce risk of registration and issuance delays or bottlenecks, and strengthen credibility of project's carbon integrity quality

Figure 1: Financing and Activity Flows for the Model

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Case study: Grouped Rooftop Solar Project, India

Project description

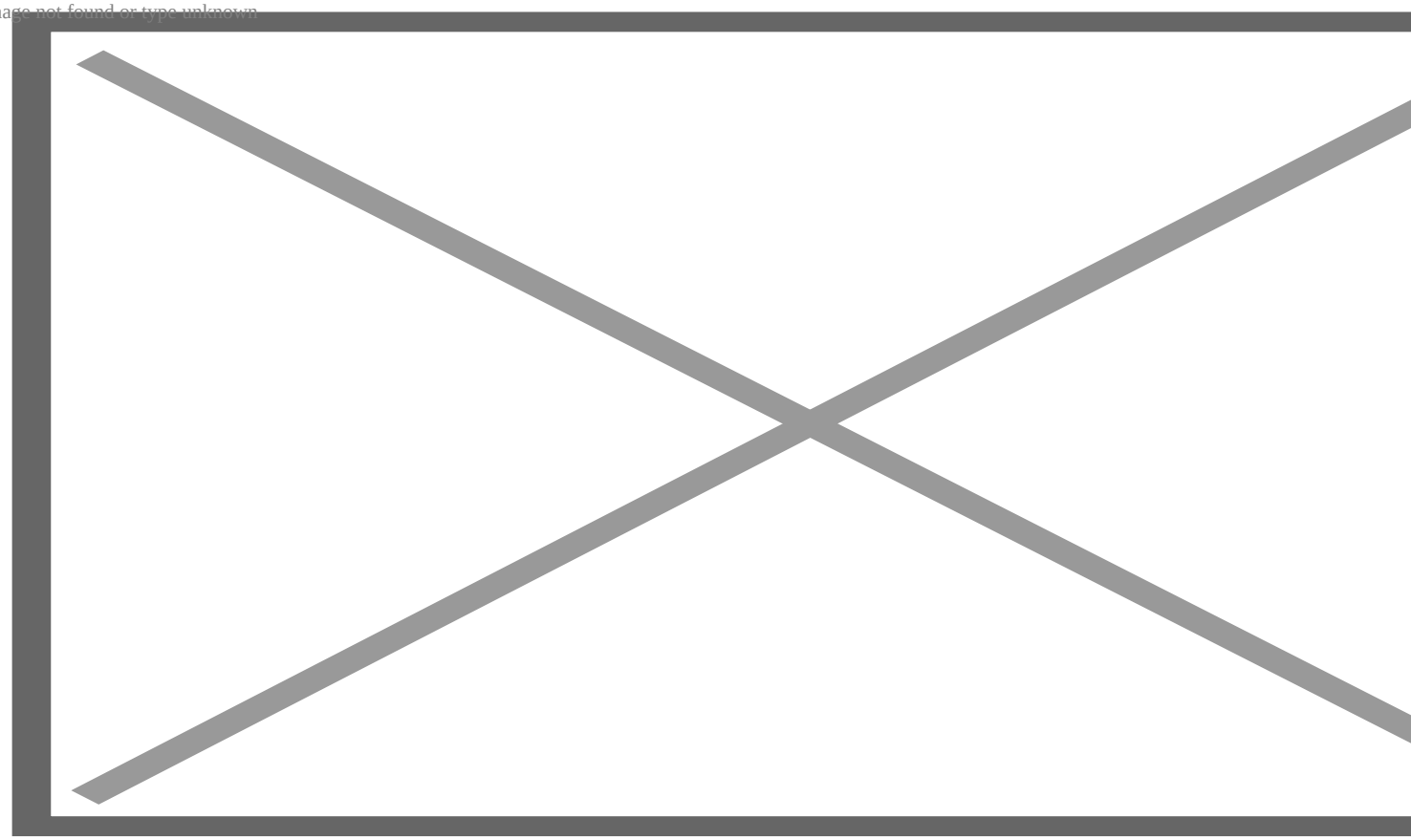
The project entails the installation of Solar Photovoltaic (PV) Panels on rooftops across multiple states in India. The purpose of this project is to set up solar power plants primarily for self- consumption, and any excess electricity generated can be supplied to the grid. To achieve this, a net metering arrangement will be established with the state electricity board, allowing for the consumption of equivalent energy from the grid when necessary.

Targeted results

The annual average estimate of GHG emission reductions is 17,764 tonnes over a crediting period of 7 years.

Figure 2: Structure of Case Study PPP

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The installation of Solar Photovoltaic (PV) Panels on rooftops in various Indian states is the focus of the project. Tata Power Renewable Energy is the project proponent for the various solar power plants grouped in this project. Through a net metering arrangement with the state electricity board, customers will consume equivalent energy from the grid, and they will only be charged for the net power they consume over a particular period. Excess electricity generated from the solar PV panels will be sold to the grid under the net metering agreement. Tata Power will also benefit from the payments received from consumers as well as any ERCs generated from this project.

Summary of the model financials

Assuming a similar project parameter as the case study, the project's Net Present Value (NPV) without ERC in- and outflows – only considering non-ERC inflows through other revenue streams or cost savings enabled by the project – is negative at $ 0.7 million (M)[1]. With ERC cashflows, the project will improve to have a positive NPV of $ 0.6M, demonstrating the effectiveness of ERCs to enable the financial viability of such a project. Moreover, NPV of project may improve beyond project period as income from electricity sales recurs.

Table 2: Summary of sources of inflows and outflows and key assumptions

Value component	Assumptions	Sources

ERC revenues or inflows	• Three issuances across the project's 7-year crediting period, at year 3 and year 7 • $4.71 per tonne today for 62,174 estimated tonnes of ERCs likely generated in the first issuance • 10% price increase to $5.18 for 62,174 estimated tonnes of ERCs likely generated for the second issuance	Average price of renewable energy project in Asia, Verified Carbon Standard (VCS) and Gold Standard (GS)
Non-ERC revenues or inflows	• Estimated grid emission factor: 0.9305 tonnes per megawatt hours (MWh) • Estimated annual electricity consumption: 19,091 MWh • Solar PV efficiency rate: 20% • Estimated total electricity generation: 21,237 MWh • Electricity tariff rate: $0.16 per kilowatt hour (KWh) • Estimated annual excess electricity generation: 2,146 MWh	Solar Grouped Project case study benchmark, World Bank – Cost of Doing Business study, International Renewable Energy Agency (IRENA)
Project investment and implementation cost	• Solar PV capacity: 12,121 kW • Installation costs: $590 per kW • Annual O&M costs: $9.6 per kW • Operating and maintenance costs assumed to be 5% of total investment and installation costs	Solar Grouped Project case study benchmark
ERC generation	• $10,000 for the project's registration and first issuance • $15,000 for each verification process across two issuance cycles • $0.14 per tonne generated for issuances	Verra Fee Schedule

Table 3: Net cashflows summary (in USD)

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
ERC Component			
Revenues/Inflows	0	3,264,135	3,264,135
Costs/Outflows	0	-57,409	-57,409

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
Net value	0	3,206,726	3,206,726
Primary/Non-ERC Component			
Revenues/Inflows	0	6,923,150	6,923,150
Costs/Outflows	-5,163,708	-1,807,298	-6,971,006
Net value	-5,163,708	5,115,853	-47,855
Net Present Values			
NPV		$651,345	
NPV (ERC Component)		$1,378,329	
NPV (Non-ERC Component)		-$726,984	

Footnote 1: All prices are expressed in United States Dollars (USD)

Related Content

- **Guidance for Countries in Assessing ERC Projects (Download PDF version)**

Additional Resources

- Climate-Smart PPPs
- Finance Structures for PPP

This section is intended to be a living document and will be reviewed at regular intervals. The Guidelines have not been prepared with any specific transaction in mind and are meant to serve only as general guidance. It is therefore critical that the Guidelines be reviewed and adapted for specific transactions. Unless expressly stated otherwise, the findings, interpretations, and conclusions expressed in the Materials in this Site are those of the various authors of the Materials and are not necessarily those of The World Bank Group, its member institutions, or their respective Boards of Executive Directors or member countries. For feedback on the content of this section of the website or suggestions for links or materials that could be included, please contact the Public-Private Partnership Resource Center at ppp@worldbank.org.