

Module Outline

RISK ASSESSMENTS FOR FINANCING PV





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Relevance and Background

Solar PV projects can be designed to add value to all stakeholders. However, there are risks involved which if not addressed could jeopardize the projects. These risks and their effects vary with the applications and business models.

Solar PV projects have a life of 25 years with longer payback periods in some cases. Long durations increase the risks for the projects which could vary for each phase of the project's lifetime. These risks not only affect the project performance during the respective phase but also in the subsequent phases.- Therefore, these risks from each phase of their project and their impacts on the project need to be understood in detail to design appropriate risk mitigation mechanisms. Some risks can be addressed by the investors, while a few would need support from the insurers. Other risks would need to be addressed by the policy makers and regulators.

Theme – Financing

Competency – Business Models and Financing

Code of the Module – To4Co9M26

Learning Outcomes

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

- Risk assessment framework, related to financing.
- Types of risks associated with projects, related to financing
- Risk mitigation strategies

Finally, the participants will study a few examples of such risks and their mitigation.

Method of Delivery

Duration	Resource Code	Resource Delivery
60 min.	M26 L01	Lecture on Risk Assessments for Financing PV

M26 L01: Lecture Presentation

The MS PowerPoint presentation will present the identification of risks and the impact of risks on the project finance. The presentation will then discuss the risk assessment framework and risk mitigation strategies.

With this understanding, risks and their mitigation in the lending framework are introduced followed by a few examples of risks and their mitigations in a solar PV project.



Key Topics to be Covered

1. Project Risk Identification & Impact on Financing
2. Risk Assessment Framework
3. Risk Mitigation Strategies



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1 Introduction

Project finance is usually approved during the project preparation phase and the approved project finance is disbursed during the project implementation and commissioning phases. The risk for the funding agencies increases with the disbursements and reduces with the loan repayment. In other words, the risk depends on the outstanding loan and the risk profile of the project. The risk profile includes the risks associated with the project and the risk mitigation strategy adopted.

The focus of this module is on risks particularly associated with project financing.

2 Project Risk Identification & Impact on Financing

From a project finance perspective, a risk is an event that can negatively impact the debt service capacity. The negative impact can be the inability to complete the project, the inability to service debt from the operations, i.e., lower profit margins, and premature termination of the project. Project risk identification involves identifying the events that have a negative impact and the factors leading to the events. Major types of risks for a Solar PV project are:

1. **Project Implementation** - Risks arising during this phase can be:
 - Delays in supply and execution
 - Delays in acquiring permits and clearances.



- Accidents
 - Poor design, planning and execution.
 - Cost overruns
 - The negative impact of these events can be the inability to complete the project and/or the inability to service debt from the operations.
2. **Operational** - Risks that are faced during commercial operations leading to poor upkeep of the project can be due to:
- Inadequate working capital
 - Inadequate planning/availability of resources
3. **Technology** - These risks arise from equipment failure, which can be due to:
- Poor quality of the equipment
 - Poor design of the project
 - Poor installation and operations
4. **Policy and Regulatory** - Risks related to major changes in the policy and regulatory regime.
- The negative impact of the above events (2, 3 & 4) can be lower profitability and premature termination of the project.
5. **Revenue Realization and Loan Service** - Risks arising from realizing the revenue from the buyers and subsequently servicing the loan

3 Risk Assessment Framework

Risks for a project are influenced by several factors. Each risk is assessed for the likelihood of incidents and the impact of each incident. Basis the impact and frequency, risks are segregated as low, medium and high risks.

		Severity		
		Low	Medium	High
Likelihood	Low	Low	Low	Medium
	Medium	Low	Medium	High
	High	Medium	High	High

4 Risk Mitigation Strategies

The risk profile of projects varies across countries and PV applications, depending on local and global factors. Each identified risk needs to have a mitigation plan to reduce the overall risk of the project. Common risk mitigation strategies are:



- **Avoid** - This strategy includes eliminating or drastically reducing the risk by building redundancies and contingencies into the project or processes. Achieving critical milestones such as pre-disbursement conditions and periodic audits and inspections are few examples.
- **Mitigate** - Mitigation is about reducing the impact of the risk to an acceptable level by reducing the probability and impact of adverse events. Using multiple sources of data for solar irradiance and weather for designing the project is an example of mitigation.
- **Transfer/Share** - The transfer/sharing of risk with a third party is recommended which has a better capacity for handling the said risk. Warranties and insurance are a few examples of risk sharing.
- **Acceptance** - Accepting the risk that is unavoidable with adequate security or backup to whatever extent possible. Debt service reserves and escrow accounts are a few examples.

Even a combination of the abovesaid strategies can be used for dealing with project risks.

Risks and their mitigation in lending framework

Project finance is a long-term loan (usually more than 10 years). The outstanding amount and the remaining tenure of the loan influence the risk. The risk is highest at the beginning of the commercial operations. The risk reduces as,

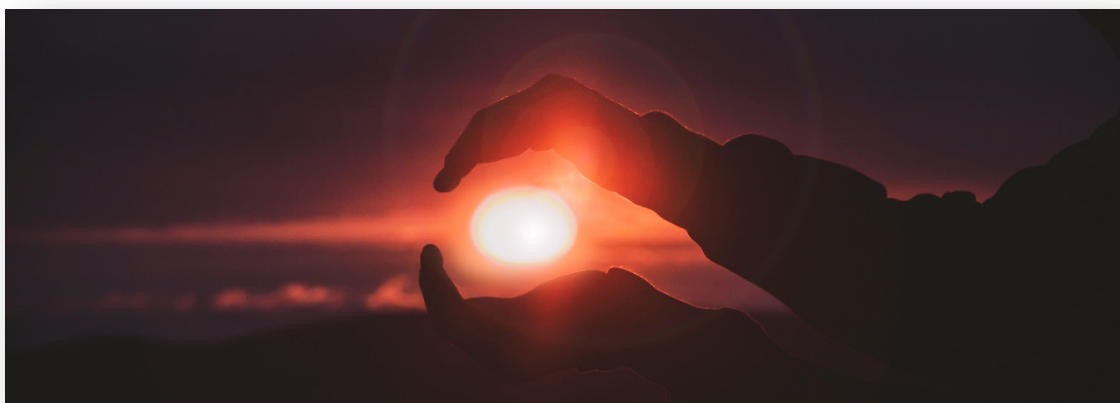
- The project demonstrates good technical and commercial performance.
- The outstanding amount of the loan reduces.

- The remaining tenure of the loan reduces.

The reverse is also true. Poor performance of the plant and higher outstanding amount due to lack of debt servicing increases the risk for the lender.

As highlighted earlier, the project finance is sanctioned during the project preparation phase. Certain critical activities like project design, acquisition of land, permits and clearances, and placement of purchase and service orders, have an impact on the performance of the project throughout its life and therefore the debt servicing. The risks for the lender can be reduced through the due diligence of the project, pre-disbursement conditions and covenants, and hence should be part of the lending framework for the project. A lending framework can include:

- Identification of the critical risks which can disrupt the project before and during the execution phase.
 - Reject the loan proposal if the risks cannot be mitigated.
 - Include implementation of the mitigation as a pre-disbursement risk
- Provisioning contingencies in the project for debt service like,
 - Maintaining a debt service reserve account
 - Operating a bank account with first charge for the lender(s) for revenue payments of the project
- Regular audits by the lenders for ensuring project implementation and performance of the plant.
- Covenants to include mitigations for the other critical risks, including force majeure events.



Examples of Identification of Project Risk and Mitigation

Risk	Risk Factors	Effect	Mitigation
Delay in acquiring permits and licenses	Developers may underestimate the time and efforts for the acquisition of permits and licenses	<ul style="list-style-type: none"> • Delay in project execution • Increase in project costs (like added interest expense, inflation in the project component costs) due to delays 	Avoid – Disburse funding only after the acquisition of critical permits and licenses
Impact of international markets on supply of equipment	A large part of the equipment (in terms of share in project cost) like inverters and solar PV modules are imported and subject to fluctuations due to international markets and currency exchange rates	<ul style="list-style-type: none"> • Increase in project cost • Delays in projects due to delays in delivery of equipment 	Mitigate – Provide currency hedging facility preferably as part of the loan
Theft and damage of property	Due to the nature of construction, there is scope for theft and damage to property due to accidents like fire	<ul style="list-style-type: none"> • Delay in execution • Increase in the project cost 	Share/Transfer – Include purchase of insurance and security measures like CCTVs and deployment of security personnel as a pre-condition for loan sanction and ensure the pre-condition is followed
Inadequate design due to lack of quality human resources	Inadequate personnel to design a feasible project as per the requirements of power purchase agreements (PPAs)	<ul style="list-style-type: none"> • Inadequate performance of the project leading to penalties • Lower energy yield leading to lower revenues 	Avoid – Assess the design of the project through third-party engineering consultants
Change in law	PPAs, usually, are long-term in nature (15-20 years), though laws can change over this period, which can affect the PPAs	<ul style="list-style-type: none"> • Termination of PPA • Reduction in returns on the projects 	Avoid, Share/Transfer, Accept - Lenders may take up projects whose PPAs include a clause of compensation for change in law

Risk	Risk Factors	Effect	Mitigation
			Lenders can procure partial risk guarantee instruments to service the debt
Property damage due to factors beyond human control	Solar PV plants can get damaged due to acts of God like cyclones, fire, floods, and other risks like riots	<ul style="list-style-type: none"> • Loss in property • Additional expenses for repairs • Loss in revenue 	<p>Share/Transfer –</p> <p>Lenders should insist and ensure developers procure insurance against the property damage.</p> <p>Lenders can carry out risk assessments on a regular basis through third-party assessors to understand the risks</p>
Reduction in generation	Poor upkeep, lower radiation can lead to reduction in generation	<ul style="list-style-type: none"> • Reduction in revenue and project returns 	<p>Avoid, Mitigate and Accept –</p> <p>Lenders should carry out inspections and audits on a regular basis to correct any faults in operations of the project and foresee the reduction in radiation.</p> <p>Ensure proper reserves like debt service reserve are maintained</p>
Delay in payments from power buyers to the project	Utilities can delay the payments to developers against the purchase of electricity	<ul style="list-style-type: none"> • Delay in debt service • Delay in payment of O&M costs to the vendors 	<p>Mitigate, accept –</p> <p>Lenders can insist for an escrow account where all payments from utilities are deposited. Lenders can first use the proceeds for debt service and then allow the rest to be used by the developer.</p> <p>Lenders can ask developers to maintain a debt service coverage account where debt service payments for the next 3-6 months can be maintained by the developers</p>
Termination of PPA	<ul style="list-style-type: none"> • Default by the developers can lead to termination of PPA by utilities. 	<ul style="list-style-type: none"> • Project failure leading to default in debt service and lower return on equity 	<p>Mitigate, Transfer/Share, Accept –</p> <p>Lenders independently or along with the developers can</p>

Risk	Risk Factors	Effect	Mitigation
	<ul style="list-style-type: none"> Utilities may also terminate the PPA despite developers not defaulting. Other reasons can be political risk 		<p>procure a partial risk guarantee instrument.</p> <p>Lenders can get a share in the compensation paid by the utilities for terminating the PPA</p>



Reading Material

Risk Management for Mini-Grids - A New Approach to Guide Mini-Grid Deployment by Alliance for Rural Electrification (<https://d-nb.info/1097756378/34>)

Photovoltaic Solar Plant PPP Risk Allocation Matrix by The World Bank (<https://content.gihub.org/live/media/1602/photovoltaic-solar-plant-matrix.pdf>).

The document identifies the risks of a solar PV plant and lists mitigation measures.

Solar Bankability - Mitigating Technical Risks in PV Investment through Quality Infrastructure Funded by the Horizon 2020 Framework Programme of the European Union (https://www.irena.org/-/media/Files/IRENA/Agency/Events/2017/Sep/Quality-infrastructure/1000_SolarBankability_Presentation_Caroline-Tjengdrawira.pdf?la=en&hash=926C4887C81ECD29D3D1B1AF21D9BAF5C180D6B5)

