

The World Bank  
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PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED IBRD LOAN  
IN THE AMOUNT OF US\$75 MILLION,

A PROPOSED CLEAN TECHNOLOGY FUND (CTF) LOAN  
IN THE AMOUNT OF US\$23 MILLION,

AND A PROPOSED CTF GRANT  
IN THE AMOUNT OF US\$2 MILLION

TO THE

INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY LIMITED

FOR

THE SHARED INFRASTRUCTURE FOR SOLAR PARKS PROJECT

MARCH 13, 2017

Energy and Extractives Global Practice  
South Asia Region  
India Country Management Unit

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**CURRENCY EQUIVALENTS**  
(Exchange Rate Effective March 9, 2017)

Currency Unit = Indian Rupees  
INR 66.8 = US\$1

FISCAL YEAR  
April 1 – March 31

**ABBREVIATIONS AND ACRONYMS**

ADB	Asian Development Bank	FY	Fiscal Year
CA	Chartered Accountant	GAP	Gender Action Plan
CAAA	Controller of Aid, Accounts, and Audit	GDF	Gender Development Framework
CAG	Comptroller and Auditor General of India	GEF	Global Environment Facility
CAGR	Compounded Annual Growth Rate	GHG	Greenhouse Gas
CEA	Central Electricity Authority	GO	Government Order
CERC	Central Electricity Regulatory Commission	GOI	Government of India
CFA	Central Financial Assistance	GRC	Grievance Redress Committee /Cell
CG/CGFA	Corporate Governance and Financial Assessment	GRM	Grievance Redress Mechanism
CPS	Country Partnership Strategy	GRS	Grievance Redress Service
CQS	Consultant's Qualification Selection	GW	Gigawatt
CRAR	Capital to Risk Asset Ratio	Ha	Hectare
CSR	Corporate Social Responsibility	IBRD	International Bank for Reconstruction and Development
CTF	Clean Technology Fund	ICB	International Competitive Bidding
CTU	Central Transmission Utility	ICR	Implementation Completion and Results Report
CUF	Capacity Utilization Factor	IDA	International Development Association
CVC	Central Vigilance Commission	IDU	Internal Documents Unit
DA	Designated Account	IFC	International Finance Corporation
DC	Direct Contracting	IGRM	Integrated Grievance Redress Mechanism
DGS&D	Directorate General of Supplies and Disposal	INR	Indian Rupee
Discom	Distribution Company	IPF	Investment Project Financing
DMRC	Delhi Metro Rail Corporation	IPP	Indigenous Peoples Plan
DOP	Delegation of Powers	IPPF	Indigenous Peoples Plan Framework
DPE	Department of Public Enterprises	IPR	Independent Procurement Review
DPR	Detailed Project Report	IREDA	Indian Renewable Energy Development Agency Limited
EAP	Externally Aided Project	IT	Information Technology
EMP	Environmental Management Plan	IUFR	Interim Unaudited Financial Report
ERR	Economic Rate of Return	JNSM	Jawaharlal Nehru National Solar Mission
ESDE	Environmental and Social Development Expert	JV	Joint Venture
ESIA	Environment and Social Impact Assessment	KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
ESMF	Environment and Social Management Framework	kV	kilovolt
ESO	Environmental and Social Officer	kWh	kilowatt-hour
ESPP	Environmental & Social Policy and Procedures	LCO <sub>2</sub>	Lifetime Carbon Dioxide Equivalent
ESMAP	Energy Sector Management Assistance Program	LCS	Least-Cost Selection
FA	Framework Agreement	LIB	Limited International Bidding
FBS	Fixed Budget Selection	LTA	Long-Term Access
F&C	Fraud and Corruption	M&AOA	Memorandum and Articles of Association
FM	Financial Management	MAC	Marginal Abatement Cost
FIRR	Financial Internal Rate of Return	MDB	Multilateral Development Bank

MNRE	Ministry of New and Renewable Energy	PV	Photovoltaics
M&E	Monitoring and Evaluation	QBS	Quality-Based Selection
MOU	Memorandum of Understanding	QCBS	Quality & Cost Based Selection
MP	Madhya Pradesh	RAP	Resettlement Action Plan
MPNRED	Madhya Pradesh New and Renewable Energy Department	RBI	Reserve Bank of India
MPPMCL	Madhya Pradesh Power Management Company Limited	RE	Revised Estimates
MPPTCL	Madhya Pradesh Power Transmission Company Limited	RGO	Renewable Generation Obligation
MPUVNL	Madhya Pradesh Urja Vikas Nigam Limited	RPF	Resettlement Policy Framework
MPR	Monthly Progress Report	RPO	Renewable Purchase Obligation
MTon	Million Tons	R&R	Resettlement and Rehabilitation
MTR	Mid-Term Review	RTI	Right to Information (Act)
MVA	mega volt ampere	RUMSL	Rewa Ultra Mega Solar Limited
MW	megawatt	SC	Schedule Caste
NAPCC	National Action Plan on Climate Change	SEBI	Securities and Exchange Board of India
NBFC	Non-Banking Financial Company	SECI	Solar Energy Corporation of India (Limited)
NCB	National Competitive Bidding	SHG	Self Help Group
NDC	Nationally Determined Contributions	SIA	Social Impact Assessment
NGO	Nongovernmental Organization	SMF	Social Management Framework
NOC	No Objection Certificate	SNA	State Nodal Agency
NO <sub>2</sub>	Nitrogen di Oxide	SORT	Systematic Operations Risk-Rating Tool
NREL	National Renewable Energy Laboratory	SO <sub>2</sub>	Sulphur di Oxide
NPV	Net Present Value	SSS	Single-Source Selection
NTPC	National Thermal Power Corporation (Limited)	STEP	Systematic Tracking of Exchanges in Procurement
OM	Operations Manual	STU	State Transmission Utility
O&M	Operation and Maintenance	TA	Technical Assistance
OP	Operations Policy	ToR	Terms of Reference
PAD	Project Appraisal Document	UDAY	Ujwal Discom Assurance Yojna
PAO	Pay and Accounts Officer	UNDB	United Nations Development Business
PAP	Project-Affected Persons	USAID	United States Agency for International Development
PDO	Project Development Objective	US\$	United States Dollar
PFS	Project Financial Statements	WB/WBG	World Bank/World Bank Group
P-RAMS	Procurement-Risk Assessment Management System	WRPC	Western Region Power Committee
PSU	Public Sector Utility		

Vice President:	Annette Dixon
Country Director:	Junaid Kamal Ahmad
Practice Manager:	Demetrios Papathanasiou
Senior Global Practice Director:	Riccardo Puliti
Task Team Leader:	Surbhi Goyal
Co-Team Leaders:	Gevorg Sargsyan, Amit Jain

# INDIA

## SHARED INFRASTRUCTURE FOR SOLAR PARKS PROJECT

### TABLE OF CONTENTS

	<b>Page</b>
<b>I. STRATEGIC CONTEXT .....</b>	<b>1</b>
A. Country Context.....	1
B. Sectoral and Institutional Context.....	1
C. Higher Level Objectives to which the Project Contributes .....	5
<b>II. PROJECT DEVELOPMENT OBJECTIVES .....</b>	<b>6</b>
A. Project Development Objective .....	6
B. Project Beneficiaries .....	6
C. PDO Level Results Indicators.....	6
<b>III. PROJECT DESCRIPTION .....</b>	<b>6</b>
A. Project Components .....	7
B. Project Cost and Financing .....	8
C. Lessons Learned and Reflected in the Project Design.....	8
<b>IV. IMPLEMENTATION .....</b>	<b>9</b>
A. Institutional and Implementation Arrangements .....	9
B. Results Monitoring and Evaluation .....	10
C. Sustainability.....	10
<b>V. KEY RISKS AND MITIGATION MEASURES .....</b>	<b>11</b>
A. Overall Risk-Rating Explanation.....	11
<b>VI. APPRAISAL SUMMARY .....</b>	<b>12</b>
A. Economic and Financial Analysis.....	12
B. Technical Issues .....	13
C. Financial Management.....	13
D. Procurement .....	15
E. Social (including Safeguards).....	16
F. Environment (including Safeguards) .....	17
G. Other Safeguard Policies.....	18

H. World Bank Grievance Redress.....	18
<b>Annex 1. Results Framework and Monitoring.....</b>	<b>19</b>
<b>Annex 2. Detailed Project Description .....</b>	<b>22</b>
<b>Annex 3. Implementation Arrangements .....</b>	<b>31</b>
<b>Annex 4. Implementation Support Plan .....</b>	<b>58</b>
<b>Annex 5. Economic and Financial Analysis.....</b>	<b>60</b>
<b>Annex 6. Clean Technology Fund Investment Plan.....</b>	<b>73</b>

**PAD DATA SHEET**

*India*

*Shared Infrastructure for Solar Parks Project*

**PROJECT APPRAISAL DOCUMENT**

*SOUTH ASIA*

*0000009260*

Report No.: PAD1659

<b>Basic Information</b>			
Project ID P154283	EA Category F - Financial Intermediary Assessment	Team Leader(s) Surbhi Goyal,Amit Jain,Gevorg Sargsyan	
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ]		
	Financial Intermediaries [ X ]		
	Series of Projects [ ]		
Project Implementation Start Date 30-Mar-2017	Project Implementation End Date 30-Mar-2022		
Expected Effectiveness Date 01-May-2017	Expected Closing Date 30-Mar-2022		
Joint IFC No			
Practice Manager/Manager Demetrios Papathanasiou	Senior Global Practice Director Riccardo Puliti	Country Director Junaid Kamal Ahmad	Regional Vice President Annette Dixon
Borrower: Indian Renewable Energy Development Agency Limited			
Responsible Agency: Indian Renewable Energy Development Agency Limited			
Contact: Telephone No.:	Mr. K. S. Popli 91-11-24682206	Title: Email:	Chairman and Managing Director cmd@ireda.gov.in
<b>Project Financing Data(in USD Million)</b>			
[ X ] Loan	[ ] IDA Grant	[ ] Guarantee	
[ ] Credit	[ X ] Grant	[ ] Other	
Total Project Cost:	200.00	Total Bank Financing:	75.00
Financing Gap:	0.00		

<b>Financing Source</b>							<b>Amount</b>
Borrower							100.00
International Bank for Reconstruction and Development							75.00
Clean Technology Fund							25.00
Total							200.00
<b>Expected Disbursements (in USD Million)</b>							
Fiscal Year	2017	2018	2019	2020	2021	2022	
Annual	0.00	10.00	15.00	15.00	30.00	30.00	
Cumulative	0.00	10.00	25.00	40.00	70.00	100.00	
<b>Institutional Data</b>							
<b>Practice Area (Lead)</b>							
Energy & Extractives							
<b>Contributing Practice Areas</b>							
<b>Proposed Development Objective(s)</b>							
The proposed development objective is to increase solar generation capacity through the establishment of large-scale solar parks in the country.							
<b>Components</b>							
<b>Component Name</b>			<b>Cost (USD Millions)</b>				
Component 1: Shared Infrastructure for Solar Parks (estimated total project cost: US\$198 million of which IBRD Loan: US\$75 million and CTF Loan: US\$23 million)			98.00				
Component 2 - Technical Assistance (Estimated Cost: US\$2 million of which CTF Grant:US\$2 million)			2.00				
<b>Systematic Operations Risk- Rating Tool (SORT)</b>							
<b>Risk Category</b>					<b>Rating</b>		
1. Political and Governance					Low		
2. Macroeconomic					Low		
3. Sector Strategies and Policies					Substantial		
4. Technical Design of Project or Program					Substantial		
5. Institutional Capacity for Implementation and Sustainability					Substantial		
6. Fiduciary					Substantial		
7. Environment and Social					Moderate		
8. Stakeholders					Moderate		

9. Other			
<b>OVERALL</b>		Substantial	
<b>Compliance</b>			
<b>Policy</b>			
Does the project depart from the CAS in content or in other significant respects?		Yes [ ]	No [ X ]
Does the project require any waivers of Bank policies?		Yes [ ]	No [ X ]
Have these been approved by Bank management?		Yes [ ]	No [ X ]
Is approval for any policy waiver sought from the Board?		Yes [ ]	No [ X ]
Does the project meet the Regional criteria for readiness for implementation?		Yes [ X ]	No [ ]
<b>Safeguard Policies Triggered by the Project</b>		<b>Yes</b>	<b>No</b>
Environmental Assessment OP/BP 4.01		X	
Natural Habitats OP/BP 4.04		X	
Forests OP/BP 4.36		X	
Pest Management OP 4.09			X
Physical Cultural Resources OP/BP 4.11		X	
Indigenous Peoples OP/BP 4.10		X	
Involuntary Resettlement OP/BP 4.12		X	
Safety of Dams OP/BP 4.37			X
Projects on International Waterways OP/BP 7.50			X
Projects in Disputed Areas OP/BP 7.60			X
<b>Legal Covenants</b>			
<b>Name</b>	<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
Operations Manual	X		CONTINUOUS
<b>Description of Covenant</b>			
Indian Renewable Energy Development Agency Limited (IREDA) to prepare, approve and adopt an Operations Manual approved by the Bank.			
<b>Name</b>	<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
Selection of Solar Parks	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to: (i) invite prospective implementing agencies (PIAs) to submit sub-loan applications pursuant to the Operations Manual, for the financing of eligible shared infrastructure in their respective solar parks; (ii) screen such proposal and assess the proposed PIAs in accordance with the eligibility criteria set forth in the Operations Manual; and (iii) prior to sanctioning a sub-loan for a selected solar park, submit the financing proposal and ancillary documentation for the Bank's approval.			



Name	Recurrent	Due Date	Frequency
Sub-loan Agreements	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to enter into written agreement with the PIAs in accordance with terms and conditions acceptable to the Bank, including: (i) the PIAs commitment to the Project objective; (ii) compliance with the Bank's Anti-Corruption Guidelines, Procurement and Consultant's Guidelines; (iii) preparation of annual work plans and budgets; (iv) provision of required counterpart resources; (v) development of a time-bound corporate governance action plan; (vi) maintenance of monitoring and procedures as well as provision of information required by the Bank; (vii) consent to random inspections; (viii) preparation of interim unaudited financial reports and annual audited financial reports; (ix) retention of procurement records and evidence of expenditures; (x) establishment of grievance redressal mechanism; and (xi) standard suspension remedies for ineligible expenditures, debarment of PIAs and/or non-compliance with safeguards requirements.			
Name	Recurrent	Due Date	Frequency
Safeguard documents	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to carry out, and cause the PIAs to carry out, the Project in accordance with the Environmental and Social Management Framework (ESMF), and the Environmental and Social Impact Assessments (ESIA), Environmental Management Plans (EMP), Resettlement Action Plan (RAP) and Indigenous People's Development Plan (IPDPs) prepared or to be prepared as per the ESMF (the Safeguard Documents).			
Name	Recurrent	Due Date	Frequency
Screening of project activities	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to ensure, prior to signing a Sub-Loan Agreement, that: (i) the proposed activities/selected solar park, have/has been screened in accordance with the ESMF; (ii) the respective ESIA, EMPs, RAPs and/or IPDPs, as required, have been prepared and submitted to the Bank for review and no-objection; and (iii) the safeguard documents have been disclosed by IREDA and the PIA in local languages in their websites and at the relevant Project's sites.			
Name	Recurrent	Due Date	Frequency
Permit and clearances	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to ensure or cause the PIA to ensure that prior to commencing any civil works on a solar park: (i) all necessary permits and clearances have been obtained; (ii) all pre-conditions imposed in those permits/clearances have been complied with; and (iii) all resettlement measures set forth in the applicable RAPs have been executed (including full payment of compensation prior to displacement or the provision of relocation assistance).			
Name	Recurrent	Due Date	Frequency
Civil work contracts	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to ensure and cause the PIAs to ensure that each contract for civil works includes the obligation of the relevant contractor to comply with the Safeguard Documents.			

Name	Recurrent	Due Date	Frequency
M&E Safeguard protocol	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to maintain, and cause the PIAs to maintain, monitoring and evaluation protocols and record keeping procedures adequate to enable IREDA and the Bank to supervise and assess the implementation of/compliance with the Safeguard Documents.			
Name	Recurrent	Due Date	Frequency
Ineligible expenditures	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to ensure that: (i) all land acquisitions required for the selected solar parks and/or any other activity under the Project; and (ii) any compensation, resettlement, and rehabilitation payment to Displaced Persons, as per the RAPs, are financed exclusively out of GoI's, IREDA's or the PIAs' own resources.			
Name	Recurrent	Due Date	Frequency
Linked activities	X		CONTINUOUS
<b>Description of Covenant</b>			
IREDA to ensure that solar parks associated with "linked activities" be selected subject to: (i) the respective implementing agency implementing such "linked-activities" having carried out a social and environmental due diligence as per the Bank's Safeguard Policies; (ii) the implementing entity issuing a written commitment to implement the "linked activities" as per the Bank's Safeguard Policies, EMPs, RAPs and/or IPDPs; (iii) the Bank's granting its no-objection to the safeguard document applicable to such "linked activities"; (iv) the public disclosure of such documents; and (v) the execution of the resettlement measures and payment of full compensation or provision of resettlement assistance to any displaced person on account of such "linked activities".			
Name	Recurrent	Due Date	Frequency
Linked activities - guarantor's cooperation	X		CONTINUOUS
<b>Description of Covenant</b>			
GoI to impress upon the states to ensure that all "linked activities" identified pursuant to the Loan Agreement, shall: (i) be screened as per the Bank's safeguard policies; (ii) covered by ESIA's, EMPs, RAPs and/or IPDPs prepared by the respective implementing agency as per the Bank's Safeguard Policies, and approved by the Bank; and (iii) have the respective safeguard documents publicly disclosed; and (iv) have the respective resettlement measures, if any, fully executed, including full payment of compensation and/or provision of relocation assistance to displaced persons.			
<b>Conditions</b>			
Source Of Fund	Name	Type	
IBRD	IBRD Loan / CTF Loan / CTF Grant	Effectiveness	
<b>Description of Condition</b>			
At least one Sub-Loan Agreement has been executed between IREDA and one implementing agency (PIA) and the agreement has become effective in accordance with its terms.			
Source Of Fund	Name	Type	

IBRD	IBRD Loan / CTF Loan	Disbursement		
<b>Description of Condition</b>				
Disbursements for prospective solar parks (other than Rewa and Mandsaur) to be withheld until and unless the IREDA has prepared, approved and adopted the Operations Manual.				
<b>Team Composition</b>				
<b>Bank Staff</b>				
<b>Name</b>	<b>Role</b>	<b>Title</b>	<b>Specialization</b>	<b>Unit</b>
Surbhi Goyal	Team Leader (ADM Responsible)	Senior Energy Specialist	Energy	GEE06
Amit Jain	Team Leader	Energy Specialist	Energy	GEE06
Gevorg Sargsyan	Team Leader	Program Manager	Energy	GEEDR
Swayamsiddha Mohanty	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	Procurement	GGO06
Siddharth Kohli	Financial Management Specialist	Consultant	Finance Management	GGO24
Bipulendu Narayan Singh	Team Member	Energy Economist	Energy	GEE06
Boonsri Prasertwaree Kim	Team Member	Program Assistant	Project Administration	GEE06
Gaurav D. Joshi	Safeguards Specialist	Senior Environmental Specialist	Environment	GEN06
Joonkyung Seong	Team Member	Energy Specialist	Energy	GEESO
Kumudni Choudhary	Team Member	Program Assistant	Project Administration	SACIN
Martin M. Serrano	Counsel	Senior Counsel	Legal	LEGES
Parthapriya Ghosh	Safeguards Specialist	Senior Social Development Specialist	Social	GSU06
Pyush Dogra	Safeguards Specialist	Senior Environmental Specialist	Environment	GEN06
Shanker Lal	Team Member	Senior Procurement Specialist	Procurement	GGO06
Victor Manuel Ordonez Conde	Team Member	Senior Finance Officer	Finance	WFALA
Anuradha Ray	Team Member	Senior Financial Sector Specialist	Financial Markets	GFM06

<b>Extended Team</b>					
<b>Name</b>	<b>Title</b>	<b>Office Phone</b>	<b>Location</b>		
Debabrata Chakraborty	Procurement Consultant	9811755494	Noida		
Dinkar Sohony	Consultant-Technical	9100949761	Hyderabad		
Hari Prakash	Consultant-Environment	9810533235	New Delhi		
Ramola Bhuyan	Consultant-Financial Management	8420155702	Kolkata		
Srinath Anekal	Consultant - Clean Development Mechanism	9740978471	Bangalore		
Vedamurthy Angadi Jayadevappa	Consultant	9480511672			
<b>Locations</b>					
<b>Country</b>	<b>First Administrative Division</b>	<b>Location</b>	<b>Planned</b>	<b>Actual</b>	<b>Comments</b>
India	Odisha	State of Odisha	X		
India	Madhya Pradesh	Madhya Pradesh	X	X	
India	Haryana	State of Haryana	X		
India	Chhattisgarh	State of Chhattisgarh	X		
<b>Consultants (Will be disclosed in the Monthly Operational Summary)</b>					
Consultants Required ?    Consultants will be required					

## **I. STRATEGIC CONTEXT**

### **A. Country Context**

1. Fueling India's economic growth and providing electricity to its increasing population require accelerating the growth of its power system. India is among the world's top ten, fastest-growing nations, having expanded its economy at an average annual rate of 7.6 percent over the past decade.<sup>1</sup> It is projected that such high rates of growth will continue. The country's demand for power is expected to rise to support the growing manufacturing sector and meet its people's rising aspirations. With about 314 gigawatts (GW) of installed capacity (January 2017 figure),<sup>2</sup> India's power system is among the largest in the world. Yet per capita electricity consumption is less than one-third of the global average. An estimated 300 million<sup>3</sup> people are not connected to the national electrical grid. Furthermore, those who are, face frequent power disruptions. Industrial establishments and manufacturers still rely on diesel-based backup power supplies, which are significantly more expensive than grid-based electricity. Lack of a reliable electricity supply is also leading to diverting resources to coping costs that could otherwise be used to support growth.

2. The Government of India (GOI) wants a growing share of the country's electricity to come from renewable energy. The GOI has set an ambitious target of providing uninterrupted power for all by 2019. Currently, India relies largely on coal, both domestic and imported, to meet about 60 percent of its electricity generation requirements.<sup>4</sup> However, carbon emissions and local pollution are of major concern. India is the world's third largest carbon emitter, behind China and the United States, although its per capita emissions are far lower. In addition, according to a recent report of the World Health Organization, 13 of the 20 most polluted cities in the world are in India. Recognizing the urgent need to supplement non-renewable energy sources with cleaner, abundant renewable energy sources, the GOI has announced plans to quadruple India's renewable energy capacity from 50 GW<sup>5</sup> (January 2017 figure) to 175 GW by 2022, which is expected to require more than US\$150 billion in investments. This translates into solar Renewable Purchase Obligations (RPO) of 8 percent by 2022.<sup>6</sup> To achieve these targets, the GOI has doubled the clean energy tax (cess) levied on coal, the proceeds of which will partially finance the above-mentioned investment requirement, using innovative public-private partnership models.

### **B. Sectoral and Institutional Context**

3. Under India's Constitution, both the central and state governments can formulate electricity policies and laws; however, the states are responsible for their implementation. Before enactment of the Electricity Act in 2003, India's power sector was under central government control, meaning that electricity generation, transmission, and distribution to consumers were functions carried out predominantly by state-owned companies and boards. Subsequent to the Electricity Act of 2003, these companies and boards were encouraged to unbundle into generation, transmission, and distribution utilities to improve operational efficiencies. The Electricity Act specifically encouraged sector competition, de-licensed generation, recognized trading as a separate activity, introduced open access in transmission, promoted multiple licenses in the distribution sector, and set up independent regulatory commissions to fix tariffs and promote sector development. Thus, electricity sector reforms have enabled a transition from a vertically integrated monopoly market structure to one of competitive wholesale and retail mechanisms, along with the introduction of marketplaces, including power exchanges.

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<sup>1</sup> See World Bank, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2015&locations=IN&start=2005>

<sup>2</sup> See Central Electricity Authority, Monthly Report on Power Sector, January 2017.

<sup>3</sup> <http://www.worldbank.org/en/country/india/overview>

<sup>4</sup> Ibid.

<sup>5</sup> Excluding 44 GW in large hydropower capacity.

<sup>6</sup> Details are available at <http://mnre.gov.in/file-manager/UserFiles/Presentation-on-RE-Policy-and-Wind-Energy.pdf>

4. As per estimates of the Central Electricity Authority, India is expected to observe an average peak surplus (measured in megawatts, MW) at 2.6 percent while average energy surplus (measured in million units) at 1.1 percent in the fiscal year (FY) 2017.<sup>7</sup> However, the electricity supply to the end consumers is still unreliable due to poor performance of India's heavily indebted electricity distribution companies or 'discoms'. For the most part, these are publicly-owned companies whose limited resources—resulting from weak governance, low regulatory support (often resulting in tariffs below cost recovery), high aggregate technical and commercial losses, and poor commercial performance—have left them incapable of providing reliable electricity supply. Currently, the accrued losses of the distribution companies total about US\$66 billion (INR4,422 billion). Furthermore, as noted in the Fourth Integrated Rating for State Power Distribution Utilities, conducted by Power Finance Corporation, the performance of the distribution companies vary, with some companies being more advanced (e.g., in Gujarat, Maharashtra, and Uttarakhand) than others (e.g., in Jharkhand and Uttar Pradesh). This rating exercise showed that the cost coverage ratio for 33 out of the 40 utilities rated remained low due to a substantial increase in expenses and tariffs (rates) that were not cost reflective. However, the median cost coverage ratio improved to 0.85, compared to 0.80 from the third rating exercise. Overall, 27 out of the 40 rated power-distribution entities showed improvement in their cost coverage ratios.<sup>8</sup>

5. The distribution sector is a vital link in the power-sector value chain as it provides the interface with the end consumers and serves as the revenue generator for the power sector as a whole. A robust distribution sector is thus of paramount importance for steering the ambitious power development programs of the country. To support the financial sustainability of the electricity sector and provide the distribution companies the financial capacity to meet the GOI's 24x7 Power for All plans, the government announced a parallel debt-restructuring program in 2015. Entitled Ujjwal Discom Assurance Yojna (UDAY), the program aims to restructure the distribution companies' debt, requiring state governments to take responsibility for part of it in return for improved service delivery and commercial performance by the distribution companies.

6. Solar photovoltaics (PV) has emerged as a promising long-term option to meet India's growing energy demand while addressing the adverse environmental impacts of conventional fuels. India is endowed with an enormous solar energy potential, lying in the high solar insolation region. Indeed, most of the country has about 300 days of sunshine per year, with annual mean global solar radiation in a range of 3.5–6.5 kilowatt-hour (kWh) per square meter per day. Solar power can help India meet its growing electricity demand, as well as foster energy security by reducing dependence on imported fossil fuels (e.g., coal and diesel). The confluence of declining cost trends in solar PV power generation—mainly through dramatic declines in solar panel prices—and innovations in energy storage technology that are putting downward pressure on battery prices offer exciting opportunities for India. In rural areas, solar PV can offer significant health benefits by displacing the use of kerosene for lighting. Energy-efficient irrigation pumps powered by solar panels can provide reliable, cost-effective irrigation for agricultural consumers.

7. The GOI has announced a bold target of installing 100 GW of solar power out of a total renewable-energy target of 175 GW by 2022. For solar power, the target represents about a twelve-fold increase in current installed capacity, which is little over 9 GW (January 2017 figures). To meet its ambitious targets, the GOI wishes to significantly increase the pace of solar power deployment. It foresees that at least 60 GW of the targeted installations will come from large-scale, ground-mounted solar power plants. Of these, 40 GW, increased from 20 GW in February 2017,<sup>9</sup> will be installed in solar parks, which are concentrated

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<sup>7</sup> Refer Load Growth Balance report of 2016-17, Central Electricity Authority of India

<sup>8</sup> Details are available at [http://www.pfcindia.com/writereaddata/WhatsNew/4th\\_rating\\_booklet\\_Final\\_20-6-16.pdf](http://www.pfcindia.com/writereaddata/WhatsNew/4th_rating_booklet_Final_20-6-16.pdf)

<sup>9</sup> Details are available at <http://pib.nic.in/newsite/PrintRelease.aspx?relid=158621>

zones of solar power generation projects that provide developers a well-characterized area, with appropriate infrastructure and access to amenities, where project risks can be minimized.

8. The scaled-up development of large solar-power generation projects within such a short time frame presents significant challenges for India. Apart from a major risk of public sector distribution companies being unable to make timely payments for the procurement of power from these newly established solar generation plants, the main barriers are identified as follows: (i) unavailability of large tracts of suitable land; (ii) lengthy land acquisition process; (iii) no single window for obtaining permits and clearances (e.g., land, transmission evacuation, and environment); (iv) limited access to transmission network; (v) relatively low capacity of nascent agencies in the renewable energy sector; (vi) long-term, contractually-binding power purchase agreements (PPA) of distribution companies with conventional power plants; (vii) higher tariff compared to existing PPAs with conventional power plants, which does not reflect solar power's positive externalities (e.g., environmental and health benefits) and thus is not an obvious choice for the distribution companies; and (viii) grid-integration challenges due to the variable nature of renewable energy.

9. To address these challenges, the GOI is taking action on multiple fronts. These initiatives include the following: (i) identifying large tracts of barren land with no alternate use for installing solar-power generation projects; (ii) conducting reverse auctions for Viability Gap Funding to facilitate the discovery of increasingly competitive solar-power prices in India; (iii) bundling solar power with power from the unallocated quota of National Thermal Power Corporation (NTPC) Limited's coal-based stations, resulting in large investor turnout; (iv) proposing amendments to the Electricity Act of 2003 to increase RPO targets from 3 percent to 8 percent by 2022, introducing Renewable Generation Obligation (RGO) targets, and imposing penalties on RPO and RGO non-compliance; (v) proposing amendments to the National Tariff Policy of 2005, along with socializing the cost of interstate transmission of renewable energy, procurement of bundled solar power by the distribution companies from conventional power generators on a cost plus basis, and easy pass-through of RPO compliance cost; and (vi) setting up the India Smart Grid Task Force, an inter-ministerial task force, and the India Smart Grid Forum, a public-private partnership initiative under the leadership of Power Grid Corporation of India Limited (POWERGRID), India's Central Transmission Utility (CTU) to address grid-integration issues. With regard to off-taker risk, the GOI is cognizant of the fledgling state of the Indian distribution companies and thus has been working on structural solutions through such programs as UDAY and 24x7 Power For All. Under the latter program, the World Bank is engaging with the GOI through working with selected states to address this risk by investing in more efficient infrastructure and power sector reforms with an objective of improving commercial performance. While these measures will yield results over a longer term, the GOI has a payment guarantee mechanism (covering off-taker risk) in place—through publicly owned enterprises like NTPC and Solar Energy Corporation of India Limited (SECI)—for targeted projects of Jawaharlal Nehru National Solar Mission (JNNSM) to address the immediate concerns of private-sector investing in the solar energy sector. Such a mechanism has proven to enhance the creditworthiness of the transactions, as observed since 2015, showing that NTPC and SECI backed solar auctions achieved better pricing than state auctions.<sup>10</sup> In 1987, Ministry of New and Renewable Energy (MNRE) had also set up a public limited government company, IREDA, under its administrative control to promote, develop and extend financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. IREDA is a Mini-Ratna<sup>11</sup> enterprise, established as a Non-Banking Financial Company (NBFC).<sup>12</sup>

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<sup>10</sup> See India Solar Map, 2016 edition, <http://www.bridgetoindia.com/our-reports/india-solar-map/>

<sup>11</sup> Mini-ratna status is granted to those central public sector enterprises which have made profits in the last three years continuously and have positive net worth.

<sup>12</sup> <http://www.ireda.gov.in/>

10. In 2014, the GOI, through MNRE, launched the Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects to meet some of the above-mentioned challenges and facilitate the development of large-scale solar-power plants in India.<sup>13</sup> Under this Scheme, 34 large-scale, grid-connected solar parks of varying capacities were sanctioned,<sup>14</sup> together constituting 20 GW to be commissioned by 2022 (Annex 2). The solar parks are being developed through a close partnership between the central government’s MNRE, SECI, and respective state governments. Recently, MNRE has doubled its capacity targets under the Scheme, from 20 GW to 40 GW to be achieved by 2022. This Scheme applies lessons from India’s Charanka and Bhadla solar parks, as well as international experience in similar-scale solar-power development projects (e.g., United States of America and South Africa).

11. The initiative for creating a large-scale solar park under the Scheme rests with the individual states, whose first step is to identify and purchase or lease the land for setting up the parks. The states are entitled to receive Central Financial Assistance (CFA) of up to 30 percent of project costs—about US\$30,000 per MW (INR2 million per MW)—for preparing a Detailed Project Report (DPR) and constructing shared infrastructure or common facilities in these sanctioned solar parks.<sup>15</sup> As per the Scheme, the solar parks can be developed and managed by (i) the state nodal agency (SNA) responsible for promoting renewable energy in the respective state, (ii) a joint venture (JV) company between SNA and SECI, (iii) SECI alone, or (iv) private-sector entrepreneurs.

12. An innovative business model is in place for constructing these parks. The central government provides policy guidance and CFA, while the respective state provides land and shared infrastructure facilities, handles local coordination, and owns and manages the park; the state also selects developers (private or public players) on a competitive basis who install, operate, and maintain the solar PV panels and sell power through long-term PPAs. The Scheme also provides for arrangements to transfer solar energy to the off-takers by fostering a partnership between solar park owners in the respective states and POWERGRID or the respective State Transmission Utility (STU), enabling access to the transmission network. Once the amendments to the Electricity Act of 2003 are enacted, this aspect will gain importance since the RPO will become mandatory for all “obligated entities,” including the distribution companies. Access to the grid (national or state) at the park site also increases the value proposition for potential investors considering placement of their panels inside the park, enabling them to easily access potential off-takers. Thus, this business model offers a “plug-and-play” facility, which enables mobilization of potential investors in solar PV generation by mitigating risks related to pre-commissioning of the project.

13. Considering the above background and investment needs of the sector, the GOI requested the World Bank’s support in achieving its targets of solar-power capacity in India by 2022. Specifically, it requested the Bank to support the sector through IREDA<sup>16</sup> by providing US\$200 million in total funding for the proposed shared infrastructure facilities for the selected solar parks, to be implemented and financed in two phases. The project is one in a series of projects requested by the GOI from the World Bank in the solar power sector.<sup>17</sup> Through these engagements, it is expected that the World Bank-supported projects will create market confidence and catalyze further support from other investor groups to help the GOI achieve its ambitious 2022 target of installing 100 GW of solar power capacity. These projects are expected to

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<sup>13</sup> Details are available at <http://mnre.gov.in/file-manager/grid-solar/Scheme-forpercent20development-of-Solar-Park-&-Ultra-Mega-Solar-Power-Project-2014-2019.pdf>

<sup>14</sup> Details are available at <http://mnre.gov.in/file-manager/UserFiles/List-of-approved-Solar-Parks.pdf>

<sup>15</sup> These include common electrical equipment that allows power generated inside the park to be metered, pooled in substations, and sent out of the park to various customers and common lighting arrangements for the park, as well as needed access roads, water supply for cleaning panels and any other facility deemed necessary for enabling generation and evacuation of solar power from the park.

<sup>16</sup> Referred as the ‘Borrower’ in the legal agreements.

<sup>17</sup> In particular, the World Bank is engaging with the GOI on its two requests to (i) support the establishment of grid-connected rooftop solar PV (US\$648 million) and (ii) demonstrate innovative technologies in the renewable-energy sector (e.g., solar-wind hybrid, energy storage, and floating solar PV) (US\$200 million).



demonstrate important economies of scale in solar generation, push down equipment and transaction costs, and increase efficiency while reducing unit costs of solar power.

14. Other development partners, including the German Development Bank (KfW) and Asian Development Bank (ADB) are also working closely with the GOI to mobilize investments in the solar energy sector. KfW has provided US\$100 million to IREDA for promoting investments in solar sector in the country including financing for grid integration, open access, viability gap funding and rooftop systems. The ADB is preparing a project to provide US\$500 million financing for rooftop solar systems through Punjab National Bank, an Indian financial institution. The ADB is also providing another US\$500 million government-backed loan, along with an additional financing of US\$500 million in non-sovereign lending to POWERGRID, India's national transmission company. These transmission lines will feed the electricity generated from renewables into the national grid. KfW is also providing a total of Euro 1 billion for the construction of "green corridors".

15. To scale up the solar program, the GOI has further sought additional concessional financing support from the Clean Technology Fund (CTF) in order to lower the generation and delivery costs of solar energy through blended co-financing of CTF with Multilateral Development Bank (MDB) resources. CTF has allocated US\$775 million of funding for India's clean energy investments, including support for national solar targets that will contribute to promoting the country's long-term, environmentally sustainable growth.

### **C. Higher Level Objectives to which the Project Contributes**

16. ***Alignment with the GOI's National Priorities.*** The project is aligned with the GOI's National Action Plan for Climate Change (NAPCC), issued in 2008 to enhance India's ecological sustainability and encourage sustainable energy sources. It is also consistent with the JNNSM, launched in 2010 as part of the NAPCC to promote development of 100 GW of solar power by 2022. In addition, the proposed project is consistent with the GOI's goal of providing uninterrupted power for all by 2019. The GOI has reiterated these commitments as part of its Nationally Determined Contributions (NDC) to achieve about 40 percent cumulative, electric-power installed capacity from non-fossil-fuel energy resources by 2030.

17. ***Alignment with the World Bank's India Country Partnership Strategy.*** The proposed project is aligned with the three pillars of India's Country Partnership Strategy (CPS): (i) integration, (ii) transformation, and (iii) inclusion. Under integration, the project will accelerate private-sector investment in solar power in some of India's solar resource-rich states. In Madhya Pradesh, for example, an estimated US\$30 million investment in shared infrastructure from the World Bank is leveraging an investment of US\$1 billion in solar PV assets. Under transformation, the project directly aims to reduce greenhouse gas (GHG) emissions and local environmental pollution associated with alternate coal-based thermal power generation, add clean power generation capacity, and foster innovative solar development through shared large-scale infrastructure. Under inclusion, the project offers the opportunity to increase electricity access by increasing the availability of electricity generation in the system. As access to electricity is expected to open up new and sustainable avenues for livelihood, it also aligns with the World Bank Group (WBG) goals of reducing poverty and promoting shared prosperity. In addition, the project conforms to the CPS emphasis on the GOI's Finance-Plus approach, whereby the value added by the World Bank extends beyond financing, contributing to the transfer of knowledge and international best practices, reform of processes and systems, and strengthening of institutional capacity. Furthermore, the proposed project supports the WBG's corporate commitment to increase renewable-energy lending and address climate change.

## **II. PROJECT DEVELOPMENT OBJECTIVES**

### **A. Project Development Objective**

18. The proposed project development objective (PDO) is “to increase solar generation capacity through the establishment of large-scale solar parks in the country.”

### **B. Project Beneficiaries**

19. The project’s direct beneficiaries are (i) people in the participating states and elsewhere who will benefit from the electricity generated in the solar parks, (ii) distribution companies, which will be able to meet their RPO with electricity generated from the solar parks, and (iii) solar project developers/generators who will be setting up their generation plants within these solar parks.

20. The project is not financing new household connections or last-mile connectivity and is not directly contributing to expanding access in the participating states. However, the project is likely to make a significant indirect contribution to expanding electricity access as a result of the increased availability of electricity in all participant states; that is, the investments supported under the project are expected to lead to increased availability of electricity supply among existing customers, which may enable the utilities to connect and serve new customers. Indirect beneficiaries are people who will benefit through (i) avoided costs of local environmental damage and (ii) additional growth and productivity due to improvements in the state’s power supply situation.

### **C. PDO Level Results Indicators**

21. The following indicators will be used to track progress in achieving the PDO:
- Generation Capacity of Solar Energy Constructed (MW), and
  - Avoided GHG emissions (thousand tons)

## **III. PROJECT DESCRIPTION**

22. The project will finance IREDA, which will support implementation of MNRE’s Solar Park Scheme, hence promoting the large-scale, grid-connected solar-power generation plants in the country. IREDA will receive the funds under the project and will on-lend the funds, at pre-defined terms (refer Section B below), to the selected states agencies, which, in turn, will deploy these funds to procure shared infrastructure goods and services required for development of the respective solar park. IREDA will serve as the nodal project implementing agency (PIA) under the project for supervising the works of the selected state PIAs.<sup>18</sup> As nodal PIA under the project, IREDA will discharge all the functions necessary to carry out due diligence during the implementation and reporting and monitoring of this project.

23. The project is expected to demonstrate important economies of scale in solar generation, push down equipment and transaction costs, and increase efficiency while further reducing unit costs of solar power. It is expected that the ability to offer lower user charges—using a blend of International Bank for Reconstruction and Development (IBRD) and CTF support to construct the parks—for access to the “plug-and-play” benefits of the solar park business model will translate into lower power tariffs quoted by solar generators.

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<sup>18</sup> Referred as ‘Implementing Agency’ in the legal agreements.

## **A. Project Components**

24. The project will have the following two components: Shared Infrastructure for Solar Parks (Component 1), and Technical Assistance (Component 2). These are described below.

***Component 1. Shared Infrastructure for Solar Parks (estimated total project cost of US\$198 million, including US\$75 million in IBRD loan and US\$23 million in CTF loan)***

25. Component 1 will cover financing for shared infrastructure, such as, access roads, water supply and drainage, telecommunications, pooling station inside the solar parks and transmission lines connecting these internal pooling stations to the external substation that may or may not be at the periphery of the park, feeding into the national/state grid. The scope of investments covered will depend on the modality and approach adopted by the respective selected state for developing the solar parks. While some states intend to provide a full range of infrastructure services to the selected private-sector developers, others intend to provide only pooling stations to facilitate internal evacuation. In most solar parks, project developers/generators will be responsible for the interconnection of each plot in the solar park with pooling stations, using suitable voltage for underground or overhead cable.

26. The project will lend to IREDA as a line of credit that will provide sub-loans to the selected state PIAs to invest in various solar parks included in MNRE's Solar Park Scheme. The first two solar parks are located in the Rewa and Mandsaur districts of Madhya Pradesh, with expected installed capacities of 750 MW and 250 MW, respectively. The estimated investment cost for shared infrastructure in these parks is US\$62 million (of which the project is funding US\$31 million). The state has already secured a majority of the land and has already awarded the contracts for shared infrastructure facilities for both the solar parks. In addition, various other solar parks for funding under this project have been tentatively identified. IREDA, in consultation with MNRE, the states and the Bank, will continue to identify additional solar parks during the project implementation period. The project follows a framework approach, allowing new states to join if they meet the project's Readiness Criteria for subprojects (Annex 2), including key milestones and deliverables identified as prerequisites (e.g., techno-economic, site clearance, fiduciary, environmental, and social requirements). This approach will ensure that the proposed future investments are ready for execution and meet the necessary due-diligence requirements of the World Bank.

***Component 2. Technical Assistance (US\$2 million in CTF grant)***

27. Component 2 will provide capacity-building support to IREDA, the SNAs in the states where selected solar parks are located, and the selected state PIAs, which will include the SNA and/or JV companies or state agencies across the participating states. Specifically for the state PIAs, although their role and mandate is growing rapidly to meet the GOI's ambitious renewable-energy targets, they have limited capacity and experience to deliver on these mandates. The support activities will include:

- a) Strengthening institutional capacity of IREDA, the SNAs, as well as the respective state PIAs, in order to build their core competencies in human resource and business planning, project monitoring, procurement and contract management, environmental and social safeguards monitoring and implementation, financial management (FM), and assimilation/integration of information technology in their daily operations.
- b) Developing a pipeline of solar parks through supporting, inter alia, pre-feasibility studies, site identification, social and environmental assessment, techno-commercial studies, and other preparatory activities.
- c) Providing technical assistance to IREDA, the SNAs and the state PIAs for, inter alia, identification of sectoral needs, dissemination of knowledge, and piloting of innovative financial solutions in order to successfully achieve India's solar energy targets by 2022.

## B. Project Cost and Financing

28. The project is designed as an Investment Project Financing (IPF), which will cover the investments required for shared infrastructure in the identified solar parks in the partnering states. Funds will be passed on to IREDA in US dollars. Total World Bank-financing requirements are estimated at US\$100 million, comprising the IBRD loan (US\$75 million), CTF loan (US\$23 million), and CTF grant (US\$2 million). The US\$75 million IBRD loan will have a variable spread, with a final maturity of 19 years, including a grace period of 5 years and level repayments.

29. The shared infrastructure facilities for solar parks will be financed through a combination of IBRD loan, CTF loan, and counterpart funding, including internal accruals, equity, land, and support from MNRE (Table 1).

30. The CTF loan is offered with a service charge of 0.25 percent per year on the disbursed and outstanding loan balance and 40-year maturity, including a 10-year grace period, with principal repayments at 2 percent for years 11–20 and 4 percent for years 21–40. Principal and service-charge payments accrue semi-annually. A management fee equivalent to 0.18 percent per annum on the unwithdrawn CTF loan amount that will accrue after 60 days of signing of the loan and payable after the effectiveness of the loan.

**Table 1. Project Cost and Financing (in US\$ million)**

<i>Project component</i>	<b>Project cost</b>	<i>Financing plan</i>			<i>Counterpart financing</i>
		<i>IBRD loan</i>	<i>CTF loan</i>	<i>CTF grant</i>	
1. Shared infrastructure for solar parks	198	75	23	0	100
2. Technical assistance	2	0	0	2	0
<b>Total project costs</b>	<b>200</b>	<b>75</b>	<b>23</b>	<b>2</b>	<b>100</b>

31. The terms and conditions under which these funds will be on-lend on to the state PIAs, by IREDA, are as a loan for a tenor of up to 20 years, with a 5 year moratorium at an annual interest rate of 8.5 percent. Refer Annex 3 (Figure A3.1) for more details on the funds flow structure.

## C. Lessons Learned and Reflected in the Project Design

32. The project builds on lessons learned from the experience of India in implementing the Charanka and Bhadla solar parks in the states of Gujarat and Rajasthan, respectively. In particular, these experiences have highlighted the need to (i) keep the shared infrastructure costs of solar parks low in order to attract developers to the park, (ii) ensure the solar park's access to the Inter State Transmission System to ensure linkage with the national market, and (iii) closely coordinate development of transmission interconnections to the solar park to ensure that developers' assets are not stranded. The GOI has also built these major lessons into the design of the Solar Park Scheme.

33. The project also incorporates lessons from implementation of World Bank-financed power-sector projects in India. Specifically, when PIAs (whether at center or at state level) with limited institutional capacity are anticipating a significant increase in capital investment over a short span of time, it is important to have the support of a strong project management consultant (PMC) or sub-PIA (e.g., a state-owned enterprise with a strong track record of delivering and achieving results in a given project area) to guide these PIAs.

## **IV. IMPLEMENTATION**

### **A. Institutional and Implementation Arrangements**

34. IREDA will be the borrower of this loan and will provide oversight to the project as a nodal PIA. It will carry out due diligence while selecting the state PIAs and the solar parks, supervision of their respective implementation arrangements, and reporting and monitoring of progress under each of the selected subproject. It will provide supervisory expertise to the selected state PIAs to implement this project. The responsibility of overall project implementation will lie with the Project Head in IREDA (Director (Technical)). The project follows a framework approach, whereby the state PIAs identified as eligible to receive funds will be determined by their ability to meet the project's Readiness Criteria for subprojects. The initial investments are being undertaken in the state of Madhya Pradesh as Rewa Ultra Mega Solar Limited (RUMSL), the state PIA, is eligible to receive funds and meets the project's Readiness Criteria for subprojects. In addition to a pipeline of future solar parks in that state, the project is expected to finance solar parks in the states of Odisha, Haryana, and Chhattisgarh. Other states will also be eligible to join, subject to availability of funding and meeting of the project's Readiness Criteria for subprojects.

35. For new entrants to the project, IREDA will carry out detailed subproject assessments along the lines of RUMSL. IREDA may hire additional resources, such as, consultants to augment their respective capacities on an as-needed basis and in consultation with the Bank, to assist it in conducting such assessments. An Operations Manual (OM) will lay out the detailed procedures to be followed for assessing the new states/solar parks in the project. Basic FM requirements are captured in the FM Framework (Annex 2), while safeguards are covered in ESMF. Once there is compliance to these requirements (FM as well as ESMF) by each state PIA for their selected solar park, a detailed action plan agreed on with the Bank will be drawn up to mitigate the risks, and the Bank will monitor its implementation. Disbursements to the new state PIAs will be subject to satisfactory implementation of the agreed action plan in the respective areas. The project's technical assistance component can be used to strengthen the project execution capacity of IREDA as well as that of the state PIAs based on agreement with the Bank.

36. At the state level, implementation (including FM) will be the responsibility of the state PIA (i.e., SNA or a JV between SECI and State Utility/SNA (a state Public Sector Utility [PSU] or SECI or the STU or any other state agency). In the case of Madhya Pradesh (MP), the subprojects are being executed by RUMSL, a JV of SECI and MP Urja Vikas Nigam Limited (MPUVNL). Other states have formed similar JVs (e.g., in Haryana) or their respective SNAs will continue to manage the solar parks in their states (e.g., in Chhattisgarh and Odisha).

37. Local and foreign contractors engaged under the subprojects will carry out the supply, installation and building works. To ensure that the state PIAs develop the required capacity to operate and maintain the assets under the shared infrastructure created by this project, STUs and SNAs in the respective states may delegate their staff to these newly formed PIAs to implement the subprojects and thus develop an understanding of the technical requirements of the assets created. This will also serve to enhance the technical capacity strengthening of these state PIAs. RUMSL has hired MP Power Transmission Company Limited (MPPTCL), a state-owned enterprise, as its sub-PIA to support the successful implementation of the infrastructure works in the state solar parks.

38. IREDA will also manage the technical assistance component of the project, which will provide capacity-building support to itself and to the participating state PIAs and agencies. The activities to be supported under this component will be mutually agreed between IREDA and the World Bank for IREDA specific activities, and, between IREDA, the respective state PIA and the World Bank for state PIA specific activities.

## **B. Results Monitoring and Evaluation**

39. The respective PIAs, which are essentially state-level companies or government agencies, through IREDA, will provide the World Bank with quarterly physical progress reports and interim financial reports, annually audited financial statements (within nine months of the end of each financial year), and other such information as the Bank may reasonably require. IREDA will provide information on key performance as well as intermediary indicators on an annual basis. Since the nature of these contracts is Design, Supply and Installation, and Consultancy, monitoring and evaluation (M&E) will be linked to project targets on completion of the standard milestones (e.g., delivery of materials, erection, and commissioning).

40. The key outcome indicators are: (i) the generation capacity of solar energy constructed with an end-project target value of 1,750 MW, and (ii) avoided GHG emissions with an end-project target value of 6.3 thousand tons per annum. The intermediary indicators are: (i) investment mobilized in solar projects in the solar parks, and (ii) grievances received that are addressed within two months of the receipt. Annex 1 provides further details on indicators. IREDA in consultation with state PIAs will provide to the Bank annual monitoring reports on the indicators.

41. IREDA along with the respective state PIAs, will carry out a mid-term review and report its findings and conclusions to the Bank two-and-a-half years after effectiveness, and will review these with the Bank. The Bank will field implementation support mission twice per year.

## **C. Sustainability**

42. The principal basis of this project's sustainability is the commitment of the GOI, IREDA, and participating states to achieving the target of 100 GW of installed capacity of solar-energy generation in India by 2022. As part of this ambitious target, the GOI envisages a sub-target of 40 GW (recently doubled from 20 GW) of installed capacity in solar parks. This commitment has been demonstrated through the GOI and its agencies' intensive engagement and involvement during project preparation.

43. There has been a strong response to Rewa Solar Park in Madhya Pradesh, which has recently invited bids from the private sector.<sup>19</sup> Such a response is expected to continue for the "plug-and-play" solar-generation plots being developed inside the park, which will help ensure the park's financial sustainability. As noted above, with regard to off-taker risk, the GOI has launched such programs as Ujwal Discom Assurance Yojna (UDAY) to improve commercial performance of the distribution companies. Furthermore, the GOI has put in place a payment guarantee mechanism for targeted JNNSM projects to address the immediate concerns of private-sector investing in the solar energy sector. Thus, the GOI and respective states are introducing a number of policy and regulatory reforms, implementation mechanisms, and incentives to ensure that the cost of solar power is kept low enough to attract distribution companies and ensure sufficient off-take demand for the power generated from the solar parks. Additionally, fulfilling RPO targets by the distribution companies, once they become mandatory, will foster the demand for the solar energy generated.

44. Further, IREDA has prior associations with the World Bank, and other Multilateral/ Bilateral financing agencies. IREDA implemented a Global Environment Facility (GEF) funded project (P010410) from 1993 to 2002 with the financing of US\$26 million and another World Bank funded project (Second Renewable Energy Project) from 2000 to 2008. As per Implementation Completion and Review (ICR) report, IREDA committed adequate internal staff and resources for project implementation. It complied with all the World Bank loan covenants and discharged its fiduciary duties in a satisfactory manner. Apart

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<sup>19</sup> Business Standard: [http://www.business-standard.com/article/economy-policy/rewa-solar-project-ends-with-ultra-low-tariffs-117021100022\\_1.html](http://www.business-standard.com/article/economy-policy/rewa-solar-project-ends-with-ultra-low-tariffs-117021100022_1.html)

from the World Bank, IREDA has been raising lines of credit from other multilateral and bilateral agencies, such as, KfW, ADB, French Development Bank, Japan International Cooperation Agency, European Investment Bank, etc. demonstrating that IREDA has enough experience of working with such partners. Further, as per the draft business plan, the profits of IREDA has seen a double-digit growth compounded annually over the past decade.

45. Project sustainability will also be ensured by supporting institutional strengthening of IREDA and beneficiary state PIAs (Component 2). During the implementation period, the project team will continue dialogue with all key stakeholders in the sector on implementing measures to further improve performance of the solar parks.

## **V. KEY RISKS AND MITIGATION MEASURES**

### **A. Overall Risk-Rating Explanation**

46. The risk associated with “sector strategies and policies” is rated as “Substantial” owing to the financial situation of the distribution companies, which will be the main off-takers of power generated from the solar parks. Their financial distress could discourage them from signing PPAs with solar-power developers, contributing to limiting the interest of reputable private-sector developers in setting up generation capacity inside solar parks. In 2015, the GOI undertook a debt-restructuring scheme (UDAY) and established a framework to help states put the distribution sector’s finances back on track. The distribution companies will have to comply with RPO, following approval of proposed amendments to the Electricity Act of 2003, as well as enactment of the National Renewable Energy Act.

47. The risk associated with “institutional capacity for implementation and sustainability” and fiduciary risk are rated as “substantial” due to the involvement of newly formed entities (essentially state PIAs) in implementation of the project. Many of these newly formed entities (e.g., JV companies formed between SECI and the respective SNA) have low capacity in terms of project management, fiduciary management (e.g., procurement, contract management, and FM), and manpower availability. In addition, the significant coordination required among central and state agencies, the private sector, state utilities, and the CTU could present significant risks to the timely and successful implementation of the project. To mitigate this risk, the World Bank plans to work with IREDA and the state PIAs (in consultation with IREDA) to build their core competencies in fiduciary, safeguards, and other areas as part of Component 2 of the project.

48. The risk associated with “technical design of the project” is rated substantial owing to the challenges of integrating a variable renewable energy source like solar power into the grid. The main technical risks are (i) grid instability resulting from large-scale solar generation at a single point and (ii) curtailment of energy generated in the solar park due to technical and economic factors. The Bank, through a separate engagement, is partnering with USAID to support the grid integration of increasing levels of renewable energy generation using production cost model (software) at the selected load dispatch centers across the country. This will enable the decision makers to assess the optimal mix of renewable energy generation in the grid. Furthermore, in the identified solar parks, the investments are being made in the standard and widely accepted technologies.

49. The overall risk is rated as “Substantial” given (i) the weak capacity of the state PIAs involved in implementation of the project and (ii) the financial situation of the electricity distribution companies in the country that are the main off-takers of solar power. To address these concerns, the project intends to work with the state PIAs to strengthen them institutionally. The Bank is also in active dialogue with the GOI and IREDA to strengthen the payment guarantee mechanism (covering off-taker risk for a pre-defined period),

which is expected to further reduce the solar-power tariff and thus minimize the financial burden on these distribution companies.

## VI. APPRAISAL SUMMARY

### A. Economic and Financial Analysis

50. **Rationale for Public-Sector Financing.** Public financing under this project will be used to provide services where the public sector has an advantage (e.g., providing common infrastructure and interconnections from the solar park to the state and national grid). This will help remove or reduce the private sector's risk perception about solar power and increase the availability of private investment and financing for solar power. Public support and financing for solar parks infrastructure is also necessary to reduce the financial costs of solar power and thus enable it to be competitive with thermal generation. In this way, the full externalities of solar power through avoided environmental and health damage costs can be captured.

51. **Value Added from World Bank's Support.** Since solar power is a variable energy source, the transition from conventional generation will have to be managed effectively to succeed. The WBG can play a valuable role in this transition by (i) making long-term concessional financing available for development of solar power, (ii) sharing international knowledge and experience on how large-scale solar parks have been implemented across the world, and (iii) providing technical assistance and capacity-building support to key stakeholders.

52. **Development Impact.** The economic viability of the project was assessed through a cost-benefit analysis of the solar park in Madhya Pradesh's Rewa District, which is the most advanced of the solar parks being supported under the project. Since the World Bank-funded shared infrastructure investments under this project cannot have an economic return independent of the solar PV generation and transmission investments, the economic analysis covers the entire package of solar park investments.

53. **Economic Rate of Return.** The economic analysis for the project is based on the assessment of Rewa Solar Park that is economically viable; a similar economic rate of return (ERR) is expected for other solar parks. The baseline ERR of the "with Rewa Solar Park" scenario is 15.3 percent (a net present value [NPV] of US\$156.7 million) against a thermal counterfactual comprising coal generation. The project will help the GOI meet its NDC target of 40 percent renewable-energy capacity by displacing thermal generation in the country's electricity generation mix. Local and global environmental benefits contribute 15 percentage points to the ERR and US\$366 million to the NPV, enabling the project to cross the hurdle rate of 10 percent. The Rewa Solar Park will help reduce 25.7 million tons of GHG emissions over the life of the project. Annex 5 provides more information on the methodology, assumptions, and results.

54. **Sensitivity Analysis and Risk Assessment.** Sensitivity analysis shows that the project ERR is robust to unfavorable outcomes of such variables as PV cost, share of energy curtailed, coal price, and capacity utilization factor. The cost of PV would have to be 39 percent higher and coal prices 48 percent lower than the base case for the ERR to fall below the hurdle rate of 10 percent. Likewise, the share of energy curtailed and the capacity utilization factor would have to reach 20 percent and 15 percent, respectively, for the ERR to fall below the hurdle rate. Risk assessment using Monte Carlo analysis indicates some downside risks to achieving the forecast returns if multiple input variables combine unfavorably, although the mean of expected rate of return is above the hurdle rate (Annex 5).

55. **Activities during Implementation.** More information collected during project implementation on the costs and benefits of the solar parks will be used when the economic analysis is revisited at mid-term



and for the ICR review. These data include (i) capacity value of solar PV plants, (ii) grid-integration costs of electricity generated from solar PV, and (iii) energy curtailed from solar parks.

56. **Financial Analysis.** The Financial Internal Rate of Return (FIRR) of the Rewa Solar Park for RUMSL, the state PIA, is 10 percent. RUMSL will incur shared infrastructure investment costs and administrative costs, which will be covered through annual land, infrastructure, and administrative charges to solar park developers and support from MNRE. In NPV terms, solar park developers will pay US\$67,500 (INR 4.5 million) per MW of capacity over 25 years of the solar park project (Annex 5).<sup>20</sup>

## **B. Technical Issues**

57. The project supports the infrastructure facilities that have already been deployed at a much larger scale within the country using proven technologies and implementation practices. However, a key technical issue for the project is the availability of a sound internal and external evacuation system for solar parks. Based on a Long-Term Access (LTA) application from RUMSL, POWERGRID has carried out detailed grid evacuation and grid impact studies and is already undertaking augmentation/needed additions to the existing network so that the generation can be absorbed without any adverse effect. These studies cover load-flow analysis, reactive power-flow patterns, and measures and corrective actions to be implemented by the partners in the grid. The studies also assess the health of the consolidated system in case of outage of any network element of the grid, including solar park generation. In November 2015, these studies, including the technical design of the proposed evacuation arrangement for the solar park, were reviewed and cleared for Rewa Solar Park by the Standing Committee on Power System Planning, chaired by the Central Electricity Authority. For Mandsaur Solar Park, the state is absorbing all of the power generated. The evacuation line from the solar park to the nearest STU grid is under the scope of this project. PPAs for off-take of power from Rewa Solar Park are in advanced stages of finalization and signing with the Delhi Metro Rail Corporation (DMRC) Limited and Madhya Pradesh Power Management Company Limited (MPPMCL), which purchases electricity on behalf of the three state distribution companies. The PPA for the Mandsaur Solar Park was also signed with the MPPMCL.

## **C. Financial Management**

58. IREDA will be the borrower and nodal PIA, providing budgetary and supervisory oversight to the project; it will also oversee the inclusion of newly eligible state PIAs in the project, including the FM assessment of new states, as per the project's OM. Specifically, IREDA will carry out the functions like due diligence before disbursement of loan, coordinated recovery of loan, and obtaining relevant documents from these selected state PIAs, as required during the implementation and monitoring of this project. IREDA may seek to procure additional resources, such as, consultants to augment their capacities in this respect. Arrangements for the project's FM are adequate for meeting the World Bank's fiduciary requirements, as it requires state PIAs to comply with the FM Framework (Annex 2).<sup>21</sup> Furthermore, a detailed FM Manual, which has been developed for RUMSL, covers all FM aspects (e.g., budgeting, accounting, reporting, internal controls, and audits. Annex 3 provides a detailed FM assessment. An FM manual for the project has also been drafted, which is a part of the project OM.

59. **Summary Assessment of IREDA and Risk.** IREDA, a Public Sector Company fully owned by the GOI was registered in 1987 under the Companies Act 1956. IREDA is an NBFC under the administrative control of MNRE for providing term loans for renewable energy and energy efficiency projects. As required

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<sup>20</sup> The financial plan for RUMSL was developed by the International Finance Corporation (IFC) as part of an advisory assignment.

<sup>21</sup> Based on the assessment of RUMSL (refer Annex 3 for more details), a framework has been developed (refer Annex 2) that will serve as eligibility criteria for inclusion of new state PIAs into the project.

by law, IREDA is registered with the Reserve Bank of India (RBI) to commence/ carry on the business of non-banking financial institution without accepting public deposits.

60. As mentioned above, IREDA has prior associations with the World Bank, and other Multilateral/ Bilateral financing agencies. It complied with all the World Bank loan covenants and discharged its fiduciary duties in a satisfactory manner. In light of the above, the FM risk with respect to IREDA is assessed as 'Moderate'.

61. **Summary Assessment of RUMSL and Risk.** The state PIA is about two years old and thus does not have a track record or experience in Bank-funded projects. It is in the process of setting up appropriate structures, systems, and procedures and hiring of staff. Consultants have been appointed where there are gaps in capacity, such as technical and financial supervision of the subprojects. However, the JV partners are established entities in the central and state public sectors with a track record and are actively supporting RUMSL in project preparation and providing senior staff on deputation. Under these circumstances, the FM assessment concludes that RUMSL would be in a position to accurately account for receipts and expenditures under the project and provide timely reports to the Bank. Implementation support would be required from the Bank. For new entrants, detailed FM assessments along the lines of RUMSL will be carried out. Since basic FM requirements are captured in the FM Framework (Annex 2), once there is compliance in this respect, a detailed action plan agreed on with the Bank will be drawn up to mitigate the risks, and the Bank will monitor its implementation. Disbursements to the new state PIAs will be subject to satisfactory implementation of the FM action plan. Details will be elaborated in the project's OM. Therefore, the FM risk with respect to the state PIAs (which will be similar to RUMSL) is assessed as "Substantial." Based on this, the overall FM risk is assessed as "Substantial".

62. **Funds Flow and Disbursement Methods (Bank).** IBRD and CTF funds from this project will directly flow to IREDA, with a guarantee of the GOI. Under the project, funds will flow to IREDA's dedicated project bank account. The funds from the dedicated account of IREDA will flow into dedicated bank accounts of the respective state PIAs. The Bank will disburse funds on a reimbursement basis (contractors will be paid by state PIA first and later reimbursed by IREDA). A fixed advance up to 20 percent of the project funds (that is, US\$100 million) shall be available to IREDA for drawal as and when required. The advance amount will be adjusted with the balance available funds during the penultimate year of the project period. Advances paid by IREDA to the state PIAs as per sub-loan agreement shall be eligible for reimbursement by the Bank. The eligible expenditure in this case will be the transfer of sub-loans by IREDA to the state PIAs. The state PIAs will submit periodic utilization certificates and yearly audit reports based on which utilization will be confirmed by IREDA. In case of the technical assistance component, the Bank will consider eligible actual expenditures on goods, services, consultancies, and incremental operating costs. The disbursements will be based on quarterly IUFRRs prepared by IREDA in the prescribed format and submitted within 45 days after the end of each quarter.

63. **Project Accounting and reporting:** While IREDA and the state PIAs shall follow their own procedures for accounting and reporting, they shall maintain separate bank account and separate accounting records for the project. Before signing a sub-loan agreement with a state PIA, IREDA will assess existing FM systems, document results of the assessment, and share them with the Bank. The auditors of IREDA will conduct audit of the activities under the project (as part of the project audit), as per terms of reference (ToR) agreed with the Bank. IREDA and the state PIAs will submit to the Bank the external audit report of the project within 9 months from the close of financial year, i.e. by December 31st of each year. IREDA will also appoint internal auditors for the project to conduct an audit of each state PIA.

64. **Retroactive Financing:** Retroactive financing up to an amount of US\$20 million will be available under the project, for financing eligible activities procured under the World Bank's procurement guidelines for the project (refer section on procurement), incurred on or after May 1, 2016 and before the loan signing.

65. **Financial Intermediary Assessment of IREDA:** The project largely envisages a tenor matched loan profile to eligible subprojects. The proposed on-lending rate of 8.5 percent per annum to the subprojects is expected to provide IREDA with a positive but relatively narrow credit spread. Managing credit risks on this operation would therefore be critical and will require strong oversight mechanisms and close co-ordination with the state PIAs. Refer Annex 3 for further details on IREDA's Financial Intermediary assessment.

#### **D. Procurement**

66. Procurement for the proposed project will be carried out in accordance with the World Bank's procurement and consultant guidelines and provisions stipulated in the IBRD Loan Agreement. The procurement guidelines ("Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and International Development Association (IDA) Credits and Grants by World Bank Borrowers") and consultant guidelines ("Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers") are both dated January 2011, with revision dates of July 2014. The project will also be subject to the Bank's "Anti-Corruption Guidelines" (dated October 15, 2006 and revised January 2011).

67. **Procurement Approach and Strategy.** IREDA will be the borrower of this loan and will provide oversight to the project as a nodal PIA. IREDA will carry out the assessment of procurement readiness of the new states along with the small procurement under Component 2, for which it may also hire, on need basis, an advisor to ensure compliance of such activities with the Bank's policies and procedures. The project follows a Framework approach, whereby the state PIAs identified as eligible to receive funds will be determined by their ability to meet the project's Readiness Criteria for subprojects, briefly mentioned in Annex 2 and to be laid out in detail in the project's OM. The initial investments are being undertaken in the state of Madhya Pradesh as RUMSL meets the project's Readiness Criteria for subprojects and is eligible to receive funds. In Madhya Pradesh, MPPTCL (the STU) is supporting RUMSL in conducting procurement for its two solar parks, following the Bank's procurement guidelines. RUMSL has submitted the procurement plan for 18 months, which is acceptable to the Bank (Annex 3). Currently, the major procurement packages under RUMSL are supply and installation of substations, transmission lines, and transformers.

68. **Procurement Capacity.** A procurement risk and capacity assessment has been done for IREDA, which has prior experience of implementing the World Bank funded projects. As mentioned above, for the procurement under the Component 2, IREDA will carry out the procurement. IREDA may strengthen its capacity in procurement, as per need basis, through hiring of an advisor, who would provide procurement support for preparation of procurement plan and selection of consultants under the Component 2. A procurement capacity assessment has also been conducted for MPPTCL whose staff has procurement knowledge and has received basic training in the World Bank procurement procedures. The procurement of packages for Rewa and Mandsaur solar parks have been awarded. Although RUMSL, the state PIA, is supported by MPPTCL, with procurement capacity for implementing conventional contracts following its own procurement rules and procedures, neither RUMSL nor MPPTCL has prior experience in World Bank-funded procurement. Furthermore, as a newly formed JV, RUMSL does not have a permanent staff in place and has yet to develop procurement systems for disclosure, complaints handling, and contract management. A detailed procurement capacity assessment is available in P-RAMS (Procurement-Risk Assessment Management System) for IREDA and RUMSL. A similar procurement capacity and risk assessment will be done, following the guidance to be provided in the project's OM, for new state PIAs as and when they are included in this project.

69. **Procurement Risk Assessment.** The procurement risk assessment questionnaire was circulated to IREDA and RUMSL during project preparation. Based on the assessments, the overall procurement risk is rated as “Substantial.” Annex 3 provides a detailed description of the risks and mitigation measures.

#### **E. Social (including Safeguards)**

70. **Issues and Impacts.** While communities are expected to benefit from the project as a result of the generation of additional livelihood sources and Corporate Social Responsibility (CSR) investments, project implementation may also lead to adverse social impacts. During the construction phase of shared infrastructure, these might include loss of land or structures, loss of access to areas for livelihood support, noise pollution and other disruptors at sensitive locations (e.g., schools and health centers), and public-safety issues. The social impacts are not confined to the solar parks area; they also include the area covered by the transmission line that will evacuate power as an associate facility. Some, but not all, of these transmission lines may be integral to the project. Thus far, two solar parks, Rewa and Mandsaur, have been identified under the project.

71. For Rewa Solar Park, a detailed Social Impact Assessment (SIA) was carried out to assess the magnitude of social impacts, and mitigation plans were prepared in accordance with the agreed on Resettlement Policy Framework (RPF). Private land needs to be acquired apart from government land to be transferred. The 164.231 hectares (ha) of private land owned by a total of 309 titleholders will be acquired. The land, however, has, for the past three years, been left barren and unused, owing to a decline in rainfall. The majority of farmers are now engaged in non-agriculture labor. Based on SIA results, a Social Management Plan has been prepared and disclosed locally and in the World Bank’s Internal Documents Unit (IDU). For Mandsaur Solar Park, the project is financing a transmission line of about 50 km to evacuate power. Since the park developer has already started work; the World Bank carried out due diligence for both the park and transmission line. Based on its report, an action plan was agreed on with RUMSL, in accordance with which appropriate safeguards documents are being prepared and will be implemented.

72. **Mitigation and Management Measures.** IREDA has prepared an ESMF for the project, which is to be followed by subprojects to be later identified. Preparation of the ESMF is based on social profiling of a candidate sites, specifically Rewa Solar Park. The ESMF is to be applied to all subprojects under this project and includes the following: (i) an RPF; (ii) an Indigenous Peoples Plan Framework (IPPF); (iii) a Gender Development Framework (GDF); (iv) an Integrated Grievance Redress Mechanism (GRM); (v) specific procedures on public consultation and disclosure; (vi) monitoring arrangements covering subproject selection, appraisal, and implementation; (vii) schedule, procedures, and terms of reference for periodic environmental and social audits; and (viii) a plan to augment the institutional capacity of implementing agencies to manage project-related environmental and social issues (Annex 3). The ESMF has been disclosed in the country, as well as in the World Bank’s IDU. The OM for the project will provide guidance on application of the ESMF, as well as review of the site-specific safeguards reports/studies to be done by the state PIAs in consultation with IREDA. IREDA will hire a safeguards advisor to address social safeguard issues.

73. The environmental and social impacts will not only be confined to the solar parks area, but will also be applicable to the associated infrastructure, such as evacuation/transmission lines (that will evacuate the power to the grid), among others. The proposed project will finance those transmission lines that are integral to the project.

74. **Gender.** As part of the ESMF, a GDF has been designed to help analyze gender issues during the preparation stages of the subproject. To be financed at a later date using the funds available in the Component 2 under the project, the GDF will be used to design interventions to address women’s needs. In

the Rewa subproject, specific consultations were carried out with women's groups and gender actions were developed.

#### **F. Environment (including Safeguards)**

75. **Issues and Impacts.** The provision of infrastructure for installing solar PV project will have some impacts on the natural environment. These will vary with site conditions and surroundings, as well as by the extent of the proposed activities. The key change will be land use, which will change from the current use to one where machinery and equipment will be installed. This change may require the removal of local vegetation, including trees, and create barriers in the movement across any existing land parcels. While the current candidate site does not include any conservation or otherwise forested areas, such issues may arise with future sites. In some locations, a change in drainage patterns due to the leveling/dressing of the land may have potentially adverse downstream impacts. During the short construction and installation phase, the safety of workers, residents, and land users may be a temporary concern. Other temporary impacts could include the generation of dust, use of water for construction, and excess traffic movement along site connection roads. During the project's operational phase, a key concern will also be worker safety in the handling of batteries and transformer oils containing chemicals. In line with ESMF stipulations, an ESIA has been done for the Rewa Solar Project site. It is found that the site is mostly barren with few environmentally-sensitive features.

76. **Mitigation and Management Measures.** The ESMF prepared for the project includes guidance on handling these issues and focuses on minimizing negative impacts as the first priority. It then prioritizes such measures as appropriate channelization of drainage within the area and its diversion from the site so that natural flow is maintained to the extent possible. Responsibility for implementing EMP will be jointly shared between the respective state PIA, generators, and IREDA, depending on when the impact occurs, and which stakeholder can effectively implement the measure required. Compensation for trees would be undertaken as determined by the respective forest and/or horticulture departments, depending on the legal status of the land involved. It also requires developers to ensure that permissions are in place for use of local resources (e.g., water for construction). Finally, adequate traffic movement and safety plans would be prepared in line with the ESMF to ensure that the movement of machinery and equipment does not inconvenience other users of the roads.

77. During the project construction period, appropriate facilities are required for workers both at labor camps and work sites (to provide for their safe stay and hygiene and sanitation, including waste management). The works sites will be properly demarcated and access-controlled to prevent unauthorized entry and any safety risk that may arise from such movement in the site. In addition, the ESMF includes ToR for detailed assessments, as well as formats for monitoring and reporting on environmental aspects. For the Rewa Solar Park, the ESIA has included an EMP, which lays out steps to be undertaken at the site by the various stakeholders (including RUMSL and plant owners and operators), customized from the above-mentioned common approach to site conditions. Relevant portions of the EMP have been integrated into the contract documentation for the implementation of the solar park and ancillary infrastructure. For the Mandsaur Solar Park site, where development is already under way, a due diligence exercise has been undertaken and agreements will be reached to manage identified or anticipated adverse impacts. An ESIA, in line with ToR included in the ESMF, will be undertaken for the common infrastructure that is proposed to be financed under the loan.

78. During development of the ESMF, consultations were undertaken in nearby, currently known candidate sites. In addition to the social issues described above, these consultations covered such issues as drainage and local flora. The ESMF also includes guidance on undertaking consultations for sites that may be later identified. For the Rewa site, additional consultations were undertaken for the ESIA, whose findings

have informed the EMP. Consultations were carried out during the due diligence exercise for Mandsaur site as well.

**G. Other Safeguard Policies**

79. No other safeguard policies are triggered.

**H. World Bank Grievance Redress**

80. Communities and individuals who believe they are adversely affected by a World Bank-supported project may submit complaints to existing project-level grievance redress mechanisms or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project-affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel, which determines whether harm occurred or could occur as a result of Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention and Bank management has been given an opportunity to respond. Information on how to submit complaints to the World Bank's corporate GRS is available at <http://www.worldbank.org/GRS>, while information on how to submit complaints to the World Bank's Inspection Panel is available at [www.inspectionpanel.org](http://www.inspectionpanel.org).

## Annex 1. Results Framework and Monitoring

**Country: India**

**Project Name: Shared Infrastructure for Solar Parks Project (P154283)**

### Results Framework

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#### Project Development Objectives

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PDO Statement

The proposed development objective is "to increase solar generation capacity through the establishment of large-scale solar parks in the country".

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**These results are at** | Project Level

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#### Project Development Objective Indicators

Indicator Name	Baseline	Cumulative Target Values					
		YR1	YR2	YR3	YR4	YR5	End Target
Generation Capacity of Renewable Energy (other than hydropower) constructed (Megawatt) - (Core)	0.00	0.00	250.00	1000.00	1600.00	1750.00	1750.00
Generation Capacity of Renewable Energy constructed-Solar (Megawatt - Sub-Type: Breakdown) - (Core)	0.00	0.00	250.00	1000.00	1600.00	1750.00	1750.00
GHG Emissions Reduction (Tons of CO2 equivalent per year) (Tones/year)	0.00	0.00	342.00	1712.00	3903.00	6300.00	6300.00

### Intermediate Results Indicators

Indicator Name	Baseline	Cumulative Target Values					
		YR1	YR2	YR3	YR4	YR5	End Target
Investment mobilized in solar projects in solar parks under the project (US\$ Million) (Amount(USD))	0.00	0.00	216.00	837.00	1314.00	1428.00	1428.00
Grievances received that are addressed within two months of receipt (Percentage)	0.00	100.00	100.00	100.00	100.00	100.00	100.00

### Indicator Description

#### Project Development Objective Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Generation Capacity of Renewable Energy (other than hydropower) constructed	This measures the capacity of renewable energy (other than hydropower) constructed under the project, specifically solar. The baseline value for this indicator will be zero.	Annual	Progress Report	IREDA and the state PIAs
Generation Capacity of Renewable Energy constructed-Solar	This measures the capacity of solar energy constructed under the project, specifically solar. The baseline value for this indicator will be zero.	Annual	Progress Report	IREDA and the state PIAs
GHG Emissions Reduction (Thousand tons of CO2 equivalent per year)	This indicator measures GHG emissions reduced against a thermal counterfactual	Annual	Progress Report	IREDA and the state PIAs



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**Intermediate Results Indicators**

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Investment mobilized in solar projects in solar parks under the project (US\$ Million)	This indicator measures the investment mobilized in solar projects in solar parks under the project.	Annual	Progress Report	IREDA and the state PIAs
Grievances received that are addressed within two months of receipt	This indicator measures the grievances/ complaints received and percentage addressed within a period of two months from date of receipt	Annual	Progress Report	IREDA and the state PIAs

## Annex 2. Detailed Project Description

1. This project is one in a series of engagements requested by the GOI from the World Bank for US\$1 billion of funding in the solar power sector. Through these engagements, it is expected that the Bank-supported projects will create market confidence, demonstrate important economies of scale in large-scale solar generation, push down equipment and transaction costs, and increase efficiency while reducing unit costs of solar power, catalyzing further support from other investor groups to help the GOI in achieving its ambitious target of installing 100 GW of solar power capacity by 2022.

2. The project will support MNRE’s announced Solar Park Scheme for installing large-scale, grid-connected solar parks by 2022, with a targeted, collective installed capacity of 40 GW, recently increased from 20 GW. IREDA through the state PIAs will utilize project funding to develop the enabling common infrastructure (such as, power pooling substations, as well as intra-park transmission infrastructure, access roads); this, in turn, will facilitate solar power investment by private or public-sector developers. Thus, this business model offers a “plug-and-play” facility that enables mobilization of potential investors in solar PV panels by mitigating risks related to pre-commissioning of the project. The project-supported, shared infrastructure facilities for the solar parks will be owned and managed by JV company comprising the SECI and the SNA for renewable energy or the SNA alone or SECI alone<sup>22</sup> or the STU or any other government agency.

3. The JV company will offer plots of 50 MW (minimum in size) within a solar park to solar power developers/generators (the one putting up the generation assets within the solar parks) in return for user fees that is designed to gradually recover the upfront investment cost in the shared infrastructure. The benefit of low-cost, long-term funding for the shared infrastructure will be passed on to the end consumer by reducing the initial investment requirement by the developer as well as by de-risking its investments in such solar park. As a result, developers will be able to competitively bid for long-term PPAs with the distribution companies within and outside the state; they will also have the option of generating solar power for captive/bulk customers (that are not distribution companies). POWERGRID (the CTU), or the STU will build the necessary evacuation infrastructure. Some parks will sell all of their power outside the state, while others will seek to consume most of it within the state. The project design allows for all of the required flexibility.

4. Each of the participating states, along with MNRE, the central ministry for promoting India’s renewable energy sector, has drawn up a long list of candidate solar parks. To date, MNRE has sanctioned more than 30 solar parks with a cumulative capacity of about 20 GW (Table A2.1).

**Table A2.1 Long List of Approved Solar Parks by MNRE**

<i>S. no.</i>	<i>State</i>	<i>Capacity (MW)</i>	<i>Name of solar power parks developer</i>	<i>Location of identified land</i>
1.	Andhra Pradesh	1,500	Andhra Pradesh Solar Power Corporation Pvt. Ltd.	NP Kunta of Anantpuramu and Galiveedu, Kadapa Districts
2.	Andhra Pradesh	1,000		Kurnool District
3.	Andhra Pradesh	1,000		Galiveedu Madal, Kadapa District

<sup>22</sup> However, MNRE’s scheme does not preclude the validity of fully private-sector developed and managed solar parks as alternative business model.

<i>S. no.</i>	<i>State</i>	<i>Capacity (MW)</i>	<i>Name of solar power parks developer</i>	<i>Location of identified land</i>
4.	Andhra Pradesh	500		Talaricheruvu village, Tadipathri Mandal, Anathapuramu District
5.	Assam	69	JV Company of Assam Power Distribution Company Ltd and Assam Power Generation Corporation Ltd	Amguri, Sibsagar District
6.	Chhattisgarh	500	Chhattisgarh Renewable Energy Development Agency	Rajnandgaon, Janjgir Champa Districts
7.	Gujarat	700	Gujarat Power Corporation Limited	Radhanesda, Vav, Banaskantha District
8.	Haryana	500	Saur Urja Nigam Haryana Ltd. (SUN Haryana)	Bugan, Hisar District; Baralu and Singhani, Bhiwani District; and Daukhera, Mahendergarh District
9.	Himachal Pradesh	1,000	Himachal Pradesh State Electricity Board Ltd.	Spiti Valley, Lahaul & Spiti District
10.	Karnataka	2,000	Karnataka Solar Power Development Corporation Pvt. Ltd.	Pavagada Taluk, Tumkur District
11.	Kerala	200	Renewable Power Corporation of Kerala Limited	Paivalike, Meenja, Kinanoor, Kraindalam, and Ambalathara villages, Kasargode District
12.	Madhya Pradesh	750	RUMSL	Gurh and Rewa
13.	Madhya Pradesh	500	RUMSL	Neemuch and Mandsaur
14.	Madhya Pradesh	500	RUMSL	Agar and Shajapur
15.	Madhya Pradesh	500	RUMSL	Chhattarpur
16.	Madhya Pradesh	500	RUMSL	Rajgarh-Morena
17.	Maharashtra	500	M/s Pragat Akshay Urja Ltd	Sakri, Dhule District
18.	Maharashtra	500	Maharashtra State Electricity Generating Company Ltd.	Dondaicha, Dhule District
19.	Maharashtra	500	M/s K. P. Power Pvt. Ltd.	Taluka Patoda, Beed District
20.	Meghalaya	20	Meghalaya Power Generation Corporation Ltd.	West Jaintia Hills & East Jaintia Hills Districts
21.	Nagaland	60	Directorate of New and Renewable Energy, Nagaland	Dimapur, Kohima and New Peren Districts
22.	Odisha	1,000	Green Energy Development Corporation of Odisha Limited	Balasore, Keonjhar, Deogarh, Boudh, Kalahandi and Angul
23.	Rajasthan	680	Rajasthan Solar Park Development Company Ltd.	Bhadla Phase II, Bhadla

<i>S. no.</i>	<i>State</i>	<i>Capacity (MW)</i>	<i>Name of solar power parks developer</i>	<i>Location of identified land</i>
24.	Rajasthan	1,000	Surya Urja Company of Rajasthan Ltd.	Bhadla Phase III, Bhadla
25.	Rajasthan	750	M/s Essel Surya Urja Company of Rajasthan Limited	Ugraas, Nagnechinagar, and Dandhu villages, Phalodi tehsil, Jodhpur District (450 MW); Lavan and Purohitar villages, Pokaran tehsil, Jaisalmer District (300 MW)
26.	Rajasthan	500	M/s Adani Renewable Energy Park Rajasthan Limited	Bhadla Phase IV, Bhadla, Jodhpur Rajasthan
27.	Rajasthan <sup>a</sup>	421	M/s Adani Renewable Energy Park Rajasthan Limited	Fatehgarh & Pokaran, Jaisalmer, Rajasthan
28.	Telangana	500	Telangana New and Renewable Energy Development Corporation Ltd.	Gattu, Mehboob, Nagar District
29.	Uttar Pradesh	600	Lucknow Solar Power Development Corporation Ltd.	Jalaun, Allahabad, Mirzapur and Kanpur Dehat Districts
30.	Uttarakhand	50	State Industrial Development Corporation Uttarakhand Limited	Sitarganj, Industrial Area (phase I); Sitarganj, Industrial Area (phase II); and Kashipur, Industrial Area
31.	West Bengal	500	West Bengal State Electricity Distribution Company Ltd.	East Mednipur, West Mednipur, Bankura
32.	Tamil Nadu	500	To be finalized	Initially proposed in Ramanathapuram District; site under revision.
<b>Total</b>		<b>20,000 (approximately)</b>		

Source: MNRE (<http://mnre.gov.in/file-manager/UserFiles/List-of-approved-Solar-Parks.pdf>).

<sup>a</sup>. 421 MW out of 1,500 MW through GOI support.

5. The GOI has requested the World Bank's support to IREDA for setting up solar parks in interested states, with Madhya Pradesh serving as a frontrunner with its two solar parks in Rewa (750 MW) and Mandsaur (250 MW) districts, respectively. Beyond the future solar parks in Madhya Pradesh, other states where potential solar parks could be supported under this project are Chhattisgarh, Haryana, and Odisha. The project follows a framework approach, whereby other states can join if they meet the project's Readiness Criteria for subprojects described below. Table A2.2 provides the tentative list of solar parks in the selected states provided by the state PIAs, in consultation with MNRE, to be explored for financing under the project, given that they meet the project's Readiness Criteria for subprojects. Once the sites are confirmed, ESIA and other due diligence will be conducted for these potential solar parks.

**Table A2.2 Tentative List of Solar Parks Allocated to the World Bank Project**

<i>S No.</i>	<i>State</i>	<i>Location (capacity)</i>	<i>Remarks</i>
1		Rewa (750 MW)	

<i>S No.</i>	<i>State</i>	<i>Location (capacity)</i>	<i>Remarks</i>
	Madhya Pradesh	Mandsour (250 MW)	Already being funded under the project (US\$31 million of the World Bank funding)
		Neemuch (250 MW)	Indicated by the state PIA (approximate requirement of US\$73 million of the World Bank funding)
		Agar-Shajapur (500 MW)	
		Rajgarh-Morena (500 MW)	
		Chhattarpur (500 MW)	
<b>2</b>	Chhattisgarh	Rajnandgaon, Janjgir, Champa Districts (500 MW)	Indicated by the state PIA (funding not known)
<b>3</b>	Haryana	Hisar, Bhiwani, Mahendergarh Districts (500 MW)	Indicated by the state PIA (funding not known)
<b>4</b>	Odisha	Balasure (650 MW)	Indicated by the state PIA (approximate requirement of US\$30 million of the World Bank funding)

6. Given that the RUMSL has already awarded the contracts for the two solar parks in MP to be funded under the project and other states still in process of identifying suitable land areas for establishing their solar parks, a pipeline of projects will be established. Based on the list of proposed subprojects, the allocation of project costs and funding across states in Phase I is tentatively established. IBRD and CTF funding (lending portion) will be allocated to the selected subprojects on a pro-rata basis (Table A2.3).

**Table A2.3 Tentative Funding Allocation to States (in US\$ million)**

<i>States (solar park)</i>	<i>IBRD/ CTF funding</i>	<i>Counterpart funding</i>	<i>Total funding</i>
<i>Project Component 1<sup>a</sup></i>			
Madhya Pradesh (Mandsaur)	16	16	32
Madhya Pradesh (Rewa) <sup>b</sup>	22	24	46
Other solar parks (to be selected)	60	60	120
<i>Project Component 2</i>			
Technical assistance	2	0	2
<b>Total</b>	<b>100</b>	<b>100</b>	<b>200</b>

a. For Rewa and Mandsaur solar parks, this includes MPPTCL services of about US\$7 million

b. Total counterpart funding is expected to be higher than 50 percent of the total project cost.

7. ***Project's Readiness Criteria for Subprojects and Eligibility for Inclusion of New Solar Parks.*** Recognizing that flexibility under this project is needed to ensure maximum development impact, a specific provision of Readiness Criteria for subprojects was added to include new solar parks in various states (beyond the long list of potential/candidate solar parks). The new entrant states need to meet the project's Readiness Criteria for subprojects, which include a combination of techno-economic, fiduciary, environmental, and social requirements to be a part of the project. Table A2.4 gives a list (not limited to) of such criteria from safeguards perspective. These criteria will be further expanded and elaborated in the project's OM.

**Table A2.4 Project’s Readiness Criteria for Subprojects**

<i>Departments/agencies</i>	<i>Description/output</i>
<b>Energy and other relevant department/Project proponent</b>	Policy document under which the solar/renewable energy park will be developed
	Land lease/usage agreement for 25 years or more
	ESIA completed and mitigation measures in place
	Grievance redress mechanism developed and made functional
<b>Revenue department</b>	Land status with non-agriculture conversion
	Availability of groundwater/groundwater assessment
<b>Third-party reports</b>	Geo-technical study reports; social and environmental monitoring and evaluation reports; social audits
<b>Approval of Industrial Commissioner</b>	Detailed information of land plots
<b>Ministry of Environment and Forests (MoEF)/State forest department</b>	No Objection Certificate (NOC) from forest department for land usage
	NOC that plant/facility should not be within a 10 km radius of national parks, wildlife sanctuaries, and eco-sensitive zones
<b>NOC from irrigation department, if applicable</b>	No irrigation canal or pipeline should cross through land
<b>NOC from concerned agency, if applicable</b>	In case any oil, gas, or water pipelines cross nearby site land
<b>Local Gram Panchayat, as applicable</b>	NOC for land usage for development of solar/ renewable energy park
<b>Local Nagar Parishad, as applicable</b>	NOC for land usage for development of solar/ renewable energy park
<b>Town planning, as applicable</b>	Permission/NOC
<b>State transmission utility/company</b>	Grid feasibility study report
	In principle, grid connectivity to substation
	Grid connectivity agreement
	ESIA of transmission route completed and mitigation measures in place
<b>POWERGRID</b>	Long-term, open-access agreement
	Confirmation that POWERGRID is following its Environment and Social Policy and Procedures, as accepted under Use of Country Systems by the World Bank, for associated evacuation/transmission facilities
<b>Central groundwater authority</b>	Permission for borewell and extracting groundwater for required water usage
<b>State pollution control board</b>	Consent to establish under Air and Water Act
	Hazardous waste/water pollutants discharge
<b>JV company</b>	Capacity to comply with fiduciary (FM elaborated in Box A2.1), social and environmental safeguards, and other World Bank policies that will be elaborated further in the project’s OM.

8. Similarly, based on RUMSL’s assessment (Annex 3), an FM Framework has been developed, which will serve as eligibility criteria for any new state PIA to become a project participant (Box A2.1).

<b>Box A2.1 Framework Approach on FM Parameters</b>	
I.	<b>Legal status:</b> The state PIA should be an incorporated entity registered under a regulatory statute as demonstrated by their registered Memorandum of Association/ Incorporation documents or the government agencies. (In case of companies it would include appointment of independent directors, women directors, audit committee, accounting, audit, and disclosures. FM Framework should be demonstrably complied with and/or an action plan should be drawn for meeting the applicable requirements).

- II. **Organizational capacity:** The state PIA should have a well-defined organizational structure covering all aspects of its operations, including technical, administrative, human resource, financial, and internal audit, with defined roles and responsibilities and filling of key positions. The structure should be in line with the projected work volume, in accordance with project implementation plans and forecasts.
- III. **Financial powers:** The state PIA should have the required autonomy and financial powers to implement the project, including the ability to sign contracts and be accountable for project performance. Delegation of operational, administrative, and financial powers should be documented and up to date.
- IV. **Operating systems:** Appropriate systems, procedures, and controls should be in place and properly documented in order to minimize deviations from good practices and facilitate identification of exceptions and ineligible expenditure through reviews and audits. A creditable database and software should be available with the state PIA to account for funds received and expenditures incurred, among other items, as well as to generate periodic reports for effective management decisions. The state PIA should have the flexibility of opening a separate, dedicated bank account for the project.
- V. **Internal audit:** The state PIA should ensure independence of the internal audit function through a third-party audit, review of audit reports by the audit committee, and timely action on exceptions. The internal audit should cover the project audit according to standard terms of reference specified in the project's OM.
- VI. **Annual statutory audit:** The state PIA should have statutory auditors appointed in accordance with the law (e.g., in the case of companies, auditors are appointed by the Comptroller and Auditor General of India [CAG]). The annual statutory audit should be extended to the Bank-funded project, according to the Bank-approved terms of reference, by auditors appointed in accordance with the Bank's requirements. Audit reports should be submitted within the time frame required by law and in accordance with the legal agreements with the Bank.

9. **Project Components.** The project will have the following two components: shared infrastructure for solar parks (Component 1) and technical assistance (Component 2). These are described below.

**Component 1. Shared Infrastructure for Solar Parks (estimated total project cost of US\$198 million, including US\$75 million of IBRD lending and US\$23 million of CTF lending)**

10. This component will cover financing for such shared infrastructure as access roads, water supply and drainage, telecommunications, and pooling stations (with 220/66/33 kV or switchyard and respective transformers as may be suitable) inside the solar parks and transmission lines connecting these internal pooling stations to the external 400/220 kV substation that may or may not be at the periphery of the park, feeding into the national/state grid. The scope of investments covered under this project will depend on modality and approach adopted by the state for developing the solar parks. While some states intend to provide a full range of infrastructure services to the selected private-sector developers, others intend to only provide pooling stations to facilitate internal evacuation. In most cases, solar project developers/generators will be responsible for the interconnection of each plot in the solar park with pooling stations, using suitable voltage for underground or overhead cable.

11. The project will finance a portion of the capital cost of next five-year period of MNRE's Solar Park Scheme to achieve 100 GW solar energy targets by 2022. The project will lend to IREDA as a line of credit that will further provide sub-loans to the selected state PIAs to invest in the identified solar parks in the respective states. The project follows a framework approach, allowing other states to join if they meet the project's Readiness Criteria for subprojects, as set forth above (Table A2.4) and to be further elaborated in

the project's OM. This will ensure that the proposed future investments are ready for execution and meet the necessary due-diligence requirements of the World Bank. The project's Readiness Criteria for subprojects have been tested in terms of relevance and applicability with the identification of two solar parks in Madhya Pradesh, where the project has its first set of investments. These solar parks are located in Rewa District (750 MW) and Mandsaur District (250 MW). Land has already been identified for these parks, and the contracts have been awarded. In addition, various other solar parks that meet the project's Readiness Criteria for subprojects have been identified (Table A2.4). Still other solar parks that may be identified in the future will be eligible for financing under the project, provided they meet the project's Readiness Criteria for subprojects. It is envisioned that, by the time this loan is fully committed, a follow-up loan will be considered in order to continue funding the development of solar parks in the country.

12. **750 MW Rewa Solar Park.** This solar park in Madhya Pradesh, owned and managed by RUMSL, consists of three 250 MW solar plants. Each plant will require an evacuation system to take the generated power to the nearest grid point. Results of studies conducted in this area to assess the impact of the injection of the solar power in the grid were favorable. These results have been shared among members of the Western Region Power Committee (WRPC), as well as the CTU, in order to move the solar park project forward. The barren, fairly level land selected for the project is quite suitable. The site is well connected by road, with adequate availability of construction materials. As per the arrangement, RUMSL is the solar park developer that owns the shared infrastructure assets and issues the bidding documents for selecting solar project developers/generators. MPPTCL, the STU, is hired by RUMSL as a sub-PIA to carry out the planning, design, bid advisory, implementation and operations and maintenance (O&M) of the shared infrastructure assets inside the solar park. RUMSL/MPPTCL are undertaking the entire work for shared infrastructure for internal evacuation in the solar park in two packages: one transformer package and a substation package with three lots consisting of building three 33/220 kV substations and connected 220 kV lines to transfer power from the solar plant to the 400/220 kV substation being constructed by POWERGRID. The strategy is found to be reasonable and in line with practices followed by various utilities in the power sector. RUMSL has already awarded the contracts for such shared infrastructure facilities. Following are the details of the packages:

- a) Transformer Package
  - i. Package for supply of 9 x 100 mega volt ampere (MVA), 33/220 kV transformers for all three substations.
- b) Substation package (with three lots)
  - i. Package for Solar Plant 1
    - Supply, erection, and commissioning of 1 x 33/220 kV substation for 3 x 100 MVA transformers (supply of transformers excluded from the scope).
    - Supply, erection, and commissioning of 220 kV line from 33/220 kV substation to POWERGRID station.
  - ii. Package for Solar Plant 2
    - Supply, erection, and commissioning of 1 x 33/220 kv substation for 3 x 100 MVA transformers (supply of transformers excluded from the scope).
    - Supply, erection, and commissioning of 220 kV line from 33/220 kv substation to POWERGRID station.
  - iii. Package for Solar Plant 3
    - Supply, erection, and commissioning of 1 x 33/220 kV substation for 3 x 100 MVA transformers (supply of transformers excluded from the scope).
    - Supply, erection, and commissioning of 220 kV line from 33/220 kv substation to POWERGRID station.

13. **250 MW Mandsaur Solar Park.** This solar park, owned and managed by RUMSL, is located at Suwasara in Madhya Pradesh's Mandsaur District. The power generated will be absorbed in the 220 MVA



grid for use in the state. The plant is being built by NTPC Limited, while RUMSL will construct the shared internal evacuation system. RUMSL has engaged MPPTCL as the sub-PIA for the purpose. RUMSL/MPPTCL has decided to execute the work in two packages: one for the transformer and one for the substation comprising of building a 33/220 kV substation and connected 220 kV line for this purpose. RUMSL has already awarded the contracts for such shared infrastructure facilities. Following are the details of the packages:

- a) Transformer Package: For supply of 3 x 100 MVA, 33/220kV transformers in Mandsaur Solar Park..
- b) Substation package for Solar Plant at Mandsaur
  - i. Supply, erection, and commissioning of 1 x 33/220 kV substation for 3 x 100 MVA transformers (supply of transformers excluded from the scope).
  - ii. Supply, erection, and commissioning of 220 kV line from 33/220 kV substation to the 220 kV substation of the state utility.

### ***Component 2. Technical Assistance (US\$2 million of CTF grant)***

81. Component 2 will provide capacity-building support to IREDA, the SNAs in the states where selected solar parks are located, and the selected state PIAs, which will include the SNA and/or JV companies or state agencies across the participating states. Specifically for the state PIAs, although their role and mandate is growing rapidly to meet the GOI's ambitious renewable-energy targets, they have limited capacity and experience to deliver on these mandates. The support activities will include:

- a) Strengthening institutional capacity of IREDA, the SNAs, as well as the respective state PIAs, in order to build their core competencies in human resource and business planning, project monitoring, procurement and contract management, environmental and social safeguards monitoring and implementation, FM, and assimilation/integration of information technology in their daily operations.
- b) Developing a pipeline of solar parks through supporting, inter alia, pre-feasibility studies, site identification, social and environmental assessment, techno-commercial studies, and other preparatory activities.
- c) Providing technical assistance to IREDA, the SNAs and the state PIAs for, inter alia, identification of sectoral needs, dissemination of knowledge, and piloting of innovative financial solutions in order to successfully achieve India's solar energy targets by 2022.

14. IREDA will be handling the management of this component. The activities to be implemented by IREDA will be mutually agreed between IREDA and the World Bank. The activities to be implemented by the state PIA will be mutually agreed between IREDA, the respective state PIA, and the World Bank. Technical assistance will also support the consultants/advisors that IREDA may need to take onboard for successful implementation of the project. This will be decided on the need basis. The services by which such consultants will support IREDA may span across FM, social, environment, procurement (of Component 2 activities) and technical due diligence of the subprojects and of the new entrant state PIAs. The project's OM will provide further details on selection and management of such activities under the technical assistance.

15. ***Counterpart Funding.*** The state PIA, entrusted with implementing the project, will develop the land and provide the necessary infrastructure (e.g., road connectivity and transmission infrastructure). Significant investments will also be made in the O&M of the solar park, employing staff, marketing, and other activities. The state PIA will prepare in advance an estimate of the total project cost, consisting of the entire cost of development, including the cost of land acquisition. Based on this as well as running costs

(such as, O&M costs that will be financed by the state PIA) estimate, the state PIA will formulate a recovery model to ensure the solar park's sustainability. The state PIA may raise the funds/make contribution as follows:

- a) Selling or leasing out the plots to prospective project developers/generators. The lease period will be in accordance with the state land policy or as agreed between the state PIA and the concerned state agencies/stakeholders in respective states. The allotment price per square meter (inclusive of all applicable taxes and duties), payable by the plot applicant, must be specified in a transparent manner. The state PIA will review the allotment price annually, and may also specify an annual increment to this allotment price. The maximum stretch of plot to be allotted will be decided in accordance with the benchmarks finalized by the respective state PIA. A one-time registration fee (per project or megawatt) may be collected by inviting applications from the prospective buyers when the subproject is finalized and the land is identified and marked. An advance may be collected from the prospective buyers with each progressive milestone of land acquisition (say, a certain percent when 50 percent of the land is acquired and so on). Such fee will be ploughed back as counterpart funding for investments in the shared infrastructure facilities.
- b) The state PIA will charge an annual user fee that will cover the repayment of the loan, annual O&M charges and other administrative expenses of the state PIA.
- c) The state PIA may provide matching contribution through land parcels for solar park sites.
- d) MNRE grant available under the Solar Park Scheme is to be released as follows:<sup>23, 24, 25</sup>
  - i. MNRE will release to the SECI CFA in the amount of US\$37,500 (INR 2.5 million) per solar park for preparation of the DPR, conducting surveys, and related activities.
  - ii. In addition, upon achieving the milestones as presented in the Scheme, it will release to the SECI CFA of up to US\$30,000 (INR 2.0 million ) per megawatt or 30 percent of the project cost, including the grid-connectivity cost (whichever is lower).

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<sup>23</sup> The grant will be managed and released by SECI, on behalf of MNRE, for which SECI will be given a fund-handling fee of 1 percent of the grant released.

<sup>24</sup> Details are available at <http://mnre.gov.in/file-manager/UserFiles/Solar-Park-Guidelines.pdf>

<sup>25</sup> CFA is available to any PIA that is following either of the implementation model defined in MNRE's Solar Park Scheme

## Annex 3. Implementation Arrangements

### A. Project Institutions

1. The project will support the implementation of MNRE's Solar Park Scheme, which promotes large-scale, grid-connected solar power generation plants in India. IREDA will be the borrower and will serve as the nodal PIA. IREDA will on-lend the funds, at pre-defined terms (refer Section B above), to the selected state PIAs, which, in turn, will deploy these funds to procure shared infrastructure goods and services required for development of the respective solar park. Once the shared infrastructure assets are created and commissioned, the state PIA will operate and maintain these assets in accordance with industry norms. Although the solar parks under the Scheme could be developed and managed by an SNA, JV between an SNA and SECI, SECI, or private entrepreneurs, the project will support only those solar parks that are developed and managed by either an SNA or SECI or JV between an SNA and SECI or the STU or any other state agency. In Madhya Pradesh state, RUMSL (a JV company of SECI and MPUVNL) has been established as a designated state PIA to own and manage the sanctioned solar parks. Other states similarly have formed JVs (e.g., Haryana) or are having their respective SNAs continue to manage their state solar parks (e.g., Chhattisgarh and Odisha).

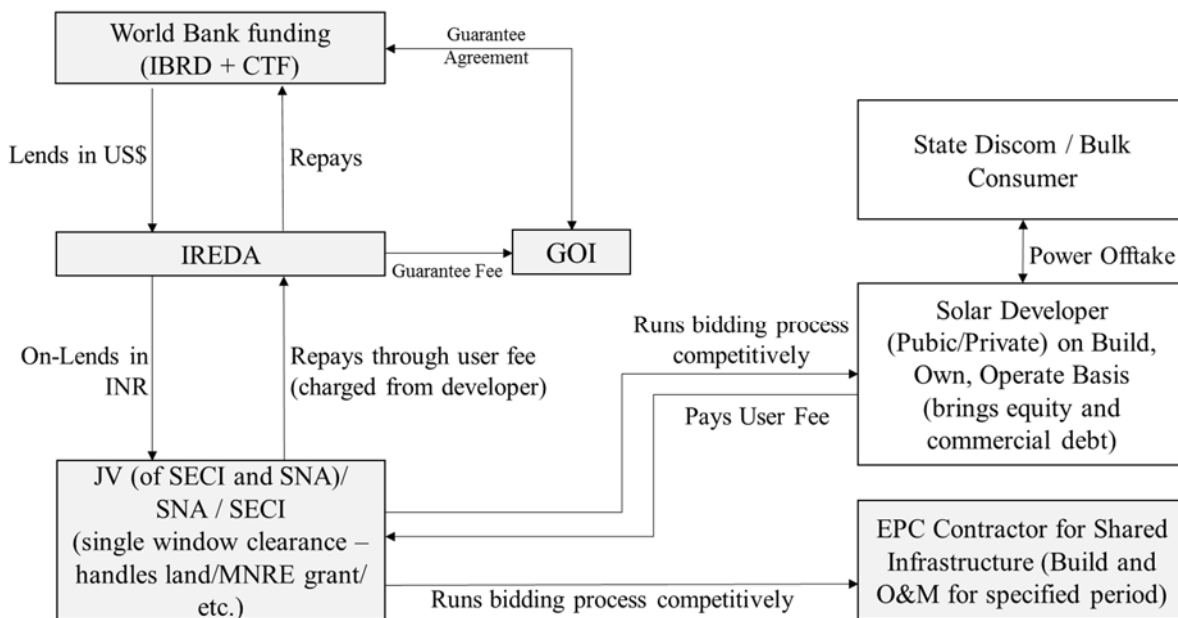
2. IREDA will assess the new state PIAs and will conduct the necessary due diligence required to ensure that the project's Readiness Criteria for subprojects is being met before signing the sub-loan agreement with the state PIA. For new entrants to the project, detailed project assessments along the lines of RUMSL will be carried out by IREDA. The roles and responsibilities of IREDA will include: (i) mobilizing stakeholders for the development of a pipeline of solar-park projects; (ii) assisting the state PIAs with the carrying out of feasibility studies, site identification and techno-commercial studies; (iii) screen and ensure the state PIAs' and the selected solar park's compliance with technical, financial, social and environmental eligibility requirements and operational standards set forth in the project's OM and the ESMF; (iv) preparing bidding documents and subsequent changes/variations thereof required under Component 2 of the project; (v) evaluating the contractors'/consultants' technical and financial proposals and handling contractual matters and procurement disputes under Component 2 of the project; (vi) coordinating the disbursements to the state PIAs under the sub-loan agreements; (vii) ensuring the state PIA's compliance with their respective safeguards documents; and (viii) compiling/preparing the IUFs and quarterly project reports. For conducting assessment for new subprojects, IREDA may hire consultants (across FM, safeguards, procurement, technical aspects), on need basis and in consultation with the Bank. These consultants will be hired as per the terms of reference agreed with the Bank and as stipulated in the project's OM.

3. The project's OM will also detail out the procedures to be followed for assessing the new states/solar parks in the project. Basic FM requirements are captured in the FM Framework (Annex 2), while safeguards are covered in ESMF and once there is compliance in this respect, a detailed action plan will be drawn up to mitigate the risks and agreed with the Bank. The implementation of the action plan will be monitored by the Bank. Disbursements to the new state PIAs will be subject to satisfactory implementation of the action plan. Technical assistance component of the project can be used to strengthen project execution capacity of IREDA as well as of the beneficiary state PIAs upon agreement with the World Bank.

4. All of the subprojects under this project will be implemented by the state PIAs. Local and foreign contractors engaged through international competitive bidding will carry out the supply and installation works. To ensure that the state PIAs develop the capacity required to operate and maintain the assets created through this project, STUs and SNAs in the respective states may delegate their staff to the state PIAs to work alongside the state PIA officials in implementing the subproject and thus develop an understanding of the technical requirements of the assets created (Figure A3.1). The project funds will be borrowed by

IREDA as a line of credit that will be on-lend to the state PIAs to be invested in financing shared infrastructure facilities within these solar parks. As can be observed from the below figure, the risk of repayment of the Bank loan rests with IREDA however that will be passed on to the state PIAs through sub-loan agreements between IREDA and the respective state PIA. Further, as the project funds are available in US\$ to IREDA, which will on-lend the funds to state PIAs in INR, the foreign exchange risk is being absorbed by IREDA for which it has a well-established foreign exchange management system.

**Figure A3.1 Overview of Project Structure**



## B. Financial Management

5. **Overall.** At the central level, IREDA will be the borrower and the nodal PIA for the project, responsible for overseeing the work executed and monitored by the respective state PIAs. IREDA will on-lend the funds at pre-defined terms (refer Section B above) as well as exercise supervisory oversight of project implementation by the selected state PIAs. It will also oversee the inclusion of newly eligible state PIAs in the project including FM assessment of new states, as per the project’s OM. IREDA will be responsible in carrying out the functions like due diligence before disbursement of loan, coordinated recovery of loan, and obtaining relevant documents from these selected state PIAs, as required during the implementation and monitoring and reporting of this project. IREDA may seek to procure additional resources, such as, consultants to augment their capacities in this respect as per the ToR agreed with the Bank and attached in the OM. Arrangements for the project’s FM are adequate for meeting the World Bank’s fiduciary requirements, as it requires state PIAs to comply with the FM framework (Annex 2). The project’s OM will detail out the requirements that IREDA will need to follow to successfully implement the project. The selected state PIAs, presently RUMSL, will be responsible for all aspects of field-level implementation, including procurement and compliance with agreed on arrangements for FM. An FM manual has already been prepared to assist RUMSL in this respect.<sup>26</sup> The objective of the Bank’s fiduciary assessment is to ensure that the Bank funds are utilized for the purposes intended and with reasonable

<sup>26</sup> The Project FM Manual is a live document subject to changes after mutual agreement between the PIA and the World Bank.

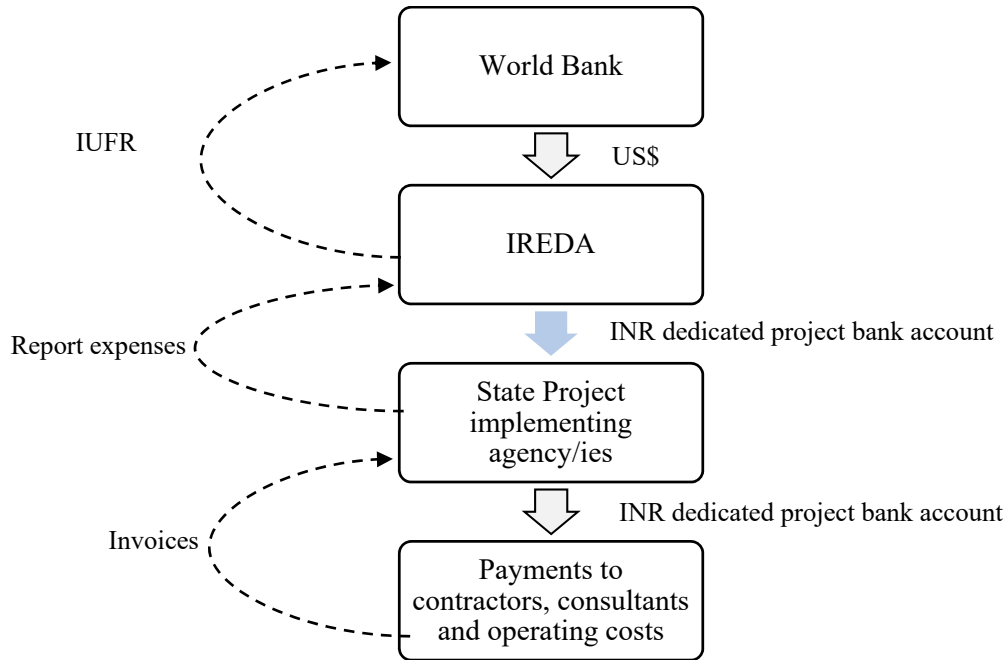
economy and efficiency. To this end governance, procurement and FM systems of the beneficiary state PIA (at present RUMSL) have been assessed to provide reasonable assurance regarding appropriate use of the Bank funds in compliance with the fiduciary requirements.

6. **Sources and Application of Funds.** The overall project size is US\$200 million, consisting of US\$100 million as Bank funding (IBRD loan, US\$75 million; CTF loan, US\$23 million; and CTF grant, US\$2 million) and US\$100 million as counterpart funding. The counterpart share is expected to be met out of the GOI subsidy under the Solar Park Scheme, as well as the user fee charged by the state PIA from the solar power plant developer and land contribution. CTF funding (lending portion) will be allocated on pro-rata basis, with IBRD funding to the selected solar parks under the project.

7. **Planning and Budgeting.** IREDA and the state PIAs will prepare overall project implementation plans for the duration of the project which will be updated from time to time based on actual progress of implementation. The plan will indicate the proposed activities, outputs, time frame and the estimated expenditure along with fund sources. Based on the project implementation plan as revised, annual budgets will be prepared by the state PIAs and shared with IREDA prior to the beginning of each financial year. The annual budget will indicate the activities, estimated expenditure and fund requirements. Based on the budget, IREDA will assist/ advise the state PIAs on sourcing required funds and also include such requirements in their own budget.

8. **Funds Flow, Disbursement Methods, and Eligible Expenditure.** Based on the agreed disbursement method/s e.g., advance/ reimbursement, the World Bank funds will flow to IREDA in accordance with the Loan Agreement and on lent to the state PIAs. A fixed advance to the tune of the 20 percent of the total loan amount of US\$100 million, i.e., US\$20 million shall be available to the project for drawl as and when required. The advance amount will be adjusted with the balance available funds during the penultimate year of the project period. IREDA will maintain a dedicated bank account for receipt and disbursement of World Bank funds under the project. On lending of World Bank funds to the state PIAs by IREDA will be in accordance with the relevant sub-loan agreement. Every quarter, the state PIAs will prepare IUFs in the prescribed format showing project related inflows and outflows during the period and other pertinent information and share them with IREDA. IREDA will review and consolidate the IUFs and forward the individual and consolidated IUFs along with the Withdrawal Application to the Bank for the disbursement of loan funds. The project IUFs will be submitted within 45 days from the end of each quarter. The state PIAs (currently, RUMSL) will receive all World Bank funds on lent under the sub-loan agreement in their dedicated bank account to be opened by the state PIAs for the project (Figure A3.2). The Bank would disburse following reimbursement method. Amounts advanced to the state PIAs by IREDA as per sub loan agreement with the state PIAs shall be eligible for reimbursement by the Bank. These amounts would be treated as advances by both IREDA and the Bank. The eligible expenditure would be the actual expenditure on goods, works and services etc. incurred by the state PIA. The state PIAs would submit periodic utilization certificates and yearly audit reports based on which such expenditure will be confirmed. Eligible expenditures under the technical assistance component will comprise consulting and non-consulting services, goods, works, workshops and training, and other operating costs

**Figure A3.2 Funds Flow Structure**



9. **Project Accounting and reporting:** While IREDA and the state PIAs shall follow extant procedures for accounting and reporting, they would maintain separate bank account and separate accounting records for the project. IREDA would record the sub-loans to PIAs as advances in its books of account. Such amounts should be eligible for disbursement from the Bank. For claiming disbursements IREDA would submit IUFRR along with the checklist to be agreed with the Bank. The actual expenditures under the project would comprise consulting and non-consulting services, goods, works, workshops and training, and other operating costs, which would be accounted for by the state PIAs in their books of account. These amounts need to be captured by IREDA in the form of a management information system. IREDA will facilitate screening of proposals and facilitate liaison with the state PIAs. IREDA may hire a technical cum financial expert, on need basis, following the Bank’s procurement norms to augment the capacities required in successfully executing the project.

10. Before signing a sub-loan agreement with a state PIA, IREDA would assess the existing FM systems, document it and share with the Bank. Any measures to address gaps, if any, would be suggested by IREDA in consultation with the Bank and it would be ensured that the suggestions are implemented by the state PIAs.

11. **Financial Reporting through IUFRR.** The project’s reporting framework will include IUFRRs, which are the quarterly financial monitoring reports, prepared by the respective state PIAs. The IUFRRs will be prepared in a format that gives up-to-date details on subproject inflows and outflows. IUFRRs are due to the Bank within 45 days from the close of the quarter. Once prepared, the state PIAs will submit the quarterly IUFRRs to IREDA for its review. IREDA will then consolidate and review (in cases with more than one state PIA and/or subproject) the state PIAs IUFRR’s. IREDA will then forward the consolidated IUFRR, where appropriate, along with individual IUFRRs, to the Bank. All expenditures reported in the IUFRRs will be subject to confirmation/certification by the annual project audit reports. Any difference between the expenditure reported in the IUFRRs and the annual audit reports will be analyzed; any of those expenditures confirmed by the Bank as being ineligible for funding (refundable to the Bank) will be adjusted in subsequent disbursements. The formats for the IUFRRs will be agreed on in due course.

12. **External Audit.** Each state PIA and IREDA will prepare annual project financial statements (PFS) and have them audited by an independent chartered accountant (CA) firm appointed as per terms of reference (specified in the project FM Manual for each state PIA) agreed with the Bank. All audit reports will be due to the Bank within nine months from the end of each financial year (i.e., December 31), starting with the year in which the first disbursement is made by the Bank. The following audit reports in Table A3.1 will be monitored by the Bank.

**Table A3.1 FM–Audit Reports**

<i>Entity</i>	<i>Type of statements</i>	<i>Auditor</i>	<i>Due Date</i>
IREDA	Project Financial Statements and Entity reports	CA	December 31
State PIAs	Project Financial Statements and Entity reports	CA	December 31

13. **The World Bank’s Access to Information Policy.** The Bank will require IREDA and the state PIAs to disclose their annual project financial statements on the website. Following the Bank’s formal receipt of these statements from IREDA (the borrower in this project), the Bank will make them available to the public, generally by disclosing them on its external website.

14. **Internal Audit.** IREDA would appoint internal auditors for the project who would conduct audit of each state PIA also. The appointment shall be made in accordance with the terms of reference specified in the project FM Manual. The executive summary of such reports will be shared with the Bank on a periodic basis.

**Fiduciary Assessment: IREDA**

15. **Legal Status:** IREDA a Public Sector Company fully owned by the GOI. It was registered in 1987 under the Companies Act 1956. IREDA is an NBFC under the administrative control of MNRE, GOI for providing term loans for renewable energy and energy efficiency projects. As required by law, IREDA is registered with the RBI to commence/ carry on the business of non-banking financial institution without accepting public deposits.

16. **Prior projects with the Bank:** IREDA has prior associations with the World Bank, and other Multilateral/ Bilateral financing agencies. IREDA implemented a GEF funded project (P010410) from 1993 to 2002 with the financing of US\$26 million. Among the project’s objectives were to promote the commercialization of renewable energy resources by strengthening IREDA’s ability to promote and finance investments in renewable energy, and to create financing mechanisms for renewable energy. The project also included institutional and capacity strengthening and marketing measures. The project helped raise awareness of renewable energy among private financial institutions, which then began to offer finance to renewable energy projects. Following on, IREDA implemented the Second Renewable Energy Project (P049770 - Board approval date June 27, 2000; closing date March 31, 2008). The project’s objectives were to: (i) increase power supply through investments in small hydro schemes; (ii) mobilize private sector investment in renewable energy; and (iii) promote energy efficiency and demand-side management investments. The project cost at appraisal was US\$298 million and at completion was US\$257 million. The ICR report rated the implementing agency IREDA’s performance as Satisfactory and all the objectives ‘Substantially Achieved’. The ICR report also stated that IREDA committed adequate internal staff and resources for project implementation. It complied with all the World Bank loan covenants and discharged its fiduciary duties in a satisfactory manner. The quality of supervision support by IREDA’s technical officers was high, and they put in intensive efforts in following up with the individual promoters. It is also noted that IREDA’s policies and lending norms could not adequately keep pace with changing market conditions, and several sanctioned projects were ultimately taken up by local financial institutions which

could offer more competitive financing. The major shortcoming in IREDA's performance was the slow pace of reimbursement processing and the slow pace of procurement in following WB guidelines for activities funded by GEF's technical assistance, although this showed some improvement by project completion.

17. The Annual Report of IREDA for FY2015-16 states that it has signed fresh long-term lines of credit with Asian Development Bank (ADB) and KfW for US\$200 million and Euro100 million, respectively and that a Cooperation Agreement was also signed with IFC for co-financing projects with it. Thus, IREDA has significant experience of working with Multilateral Financing Agencies including the World Bank and therefore familiar with its fiduciary and other requirements.

18. **Performance:** IREDA is a profit making entity that was classified as 'Mini Ratna – Category 1' in 2015. This status provides greater financial autonomy and delegation of powers in its operations in line with the Department of Public Enterprises (DPE) Guidelines. According to the Annual Report for FY2015-16, IREDA sanctioned highest ever loans of US\$1.17 billion (INR78.06 billion), registering an increase of 71.62 percent over the previous year's loan sanctions and earned a record profit before tax of US\$0.06 billion (INR4.17 billion) registering a growth of 10.32 percent over the previous year. During this period, the net worth of IREDA increased to US\$0.34 billion (INR22.96 billion) from US\$0.32 billion (INR 21.78 billion). Bonds issued by IREDA are listed in the stock market by virtue of which IREDA is subject to Securities and Exchange Board of India's (SEBI) Listing Guidelines including Corporate Governance requirement prescribed in the DPE Guidelines. IREDA, in association with the SECI as PMC, is setting up a 50 MW solar power project in Kerala's 200 MW Solar Park located at Kasaragod district.

19. **Governance:** As on March 31, 2016 IREDA's Board comprised five Directors which include three full-time functional directors and two part-time Government nominee directors. According to the report of the independent practicing Company Secretary, who carried out a review of Corporate Governance practices of IREDA, the Board of Directors of IREDA as well as the Committees of the Board were not duly constituted with proper balance of Executive Directors, Non-Executive Directors and Independent Directors. This is due to the reason that IREDA did not have any Independent Director and Woman Director on its Board and therefore not in accordance with the provisions of the Companies Act 2013. In respect of other requirements of Corporate Governance such as enterprise risk management, holding of meetings, information presented to the Board, Code of conduct etc. the Company was compliant.

20. **Legal compliance:** Secretarial audit carried out by an independent Company Secretary reported that other than the imbalance in the constitution of the Board, there are adequate systems and processes in IREDA commensurate with its size and its operations to monitor and ensure compliance with the applicable laws, rules, regulations and guidelines. The laws and rules cover the Companies Act 2013, SEBI requirements for listing of debt securities, listing agreement, RBI guidelines, secretarial guidelines, guidelines on corporate governance, etc.

21. **Statutory audit:** Statutory audit of IREDA is carried out by an independent firm of Chartered Accountants, appointed by the CAG of India. The audit report for FY2015-16 contains an unqualified opinion. IREDA is also subject to Supplementary Audit by the CAG. The CAG report has pointed out certain misclassifications to which IREDA has filed its response. The statutory auditors also carried out audit of Internal Financial Controls under Section 143(3)(i) of the Companies Act 2013. The audit opinion listing a few exceptions states that IREDA has, in all material respects, an adequate internal financial controls system over financial reporting which were operating effectively as at March 31, 2016, based on the Guidance Note on Audit of Internal Financial Controls over Financial Reporting issued by the Institute of Chartered Accountants of India. The exceptions included: (i) Application of interest/reversal of interest in borrowers' accounts having manual interventions; (ii) Delegation of authority of various levels to be



reviewed and is pending for a number of years; (iii) Information technology system for maintenance of records to be updated; and (iv) Absence of audit trail in case of collection of incomes in some misc. heads of accounts.

22. **Internal audit:** IREDA's internal control systems include internal audit by independent firm of Chartered Accountants. The internal audit reports are discussed with the Management and reviewed by the Audit Committee of the Board. The audit covers among others, review of the adequacy and efficacy of the Company's internal controls including its systems and procedures and compliance with regulations and procedures.

23. **Fraud & Corruption:** IREDA is in compliance with the requirements of the RTI Act, 2005 to provide information to the public. It has a RTI website, designated Public Information Officer (PIO) and Appellate Authority for effective implementation of the RTI Act. There is a Vigilance Department which has been entrusted with the role of ensuring that all the instructions / guideline issued by the Central Vigilance Commission (CVC) are being complied with in IREDA.

24. **Assessment:** IREDA has a long experience in the sector. It is financial stable and its operation covers the entire country. It is subject to regulatory oversight by MNRE, RBI, SEBI and is governed by the provisions of the Companies Act, 2013. It has strong internal systems, procedures and controls covering financial management, corporate governance, and compliance with required laws and regulations which have been independently assessed and reported to be adequate by independent professionals appointed under various laws. In addition, IREDA has implemented the World Bank projects and is therefore familiar with the Bank's requirements. Thus, IREDA as an implementation partner in the project will considerably mitigate the risks associated with project implementation by providing fiduciary assurance that project funds are utilized by the state PIAs for the purposes intended with due consideration of economy and efficiency.

#### **Fiduciary Assessment: RUMSL**

25. **Legal Status.** RUMSL is the state PIA for two solar parks located in Madhya Pradesh: one in Rewa District and the other in Mandsaur District. Under the Companies Act 2013, RUMSL was incorporated on July 10, 2015 as a public limited company. RUMSL is a JV between SECI, a central PSU, and MPUVNL, a state PSU, each holding 50 percent of the share capital. The authorized capital of RUMSL is US\$1.5 million (INR100 million). The JV partners have each released US\$0.15 million (INR10 million) against their respective share capital. In addition, the state PIA has been receiving subsidies periodically routed through SECI. According to RUMSL's audited accounts for FY2015-16, US\$0.56 million (INR37.5 million) has been received from SECI up to March 31, 2016.

26. **Board of Directors.** According to the Memorandum and Articles of Association (M&AOA) of RUMSL, the total strength of the Board of Directors, including part-time and full-time Directors, should be not less than four and not more than seven. In accordance with the M&AOA, the Board of Directors comprises a part-time Chairman and Managing Director (nominated by MPUVNL) and three part-time Directors (one nominated by Madhya Pradesh New and Renewable Energy Department (MPNRED) and two nominated by SECI). Currently, RUMSL has no plans to appoint full-time Directors to its board. However, it plans to expand the Board by appointing two part-time Directors nominated by Delhi Metro Rail Corporation (DMRC) Limited, a central PSU, and MPPMCL, a state PSU and holding company of the three MP distribution companies. No action has been taken to date.

27. **RUMSL Structure and Staffing.** RUMSL proposes to strengthen its organizational capacity by inducting two senior-level officials: a financial advisor and a technical advisor. These appointments have

not yet occurred. MPUVNL, through government order (GO), has already delegated four officials to RUMSL. Two will function in finance and accounting; one will be responsible for legal and administrative aspects of company formation, capital issue, and liaison with external authorities; and one will be in charge of general support duties. Overall, RUMSL seeks to be a lean organization, compatible with its requirements; however, the JV will require internal governance and fiduciary capacity for effective management of the project. RUMSL has appointed MPPTCL to support its successful implementation of project activities.

28. **Accounting.** RUMSL maintains its own accounts using accounting software (Tally), and its accounting is up to date. The same system will be used for maintaining project-related accounts. The JV has its own bank account with Punjab National Bank, TT Nagar, and Bhopal. A separate bank account will be opened for Bank funds. Training and familiarization with commercial accounting principles, account classification, and project accounting will be useful.

29. **Audit.** RUMSL has carried out an annual statutory audit of its first year of operations well within the prescribed period (September 30 each year).. The audit report is clean. As required by law, RUMSL is subject to an annual entity audit by auditors appointed by the CAG. The annual audit of the project financial statement, required under the Bank-funded project, can be carried out by the same company auditors or an independent CA firm appointed in consultation with the Bank under the terms of reference specified in the project FM Manual. RUMSL has not yet set up an Audit Committee, and the relevant legal aspects are being reviewed. The project will be subject to internal audit as specified in the project FM Manual.

30. **Project FM Manual.** The project FM Manual for RUMSL has been prepared to assist RUMSL staff in carrying out FM activities. A similar FM Manual will be drafted for each state PIA. The FM Manual covers the following:

- a) Preparation of subproject plans and revisions;
- b) Preparation of annual project budget, sharing with MNRE, budget revisions, and budget monitoring reports;
- c) Project funds flow and disbursements;
- d) Project accounting;
- e) Controls, systems, and procedures covering payments to contractors and others, supporting documents, and retention of records and documents;
- f) Preparation of IUFs; and
- g) Internal and external audits in compliance with Bank requirements.

31. Table A3.2 summarizes the time frame for submitting reports under the legal covenant of the Bank.

**Table A3.2 FM–Related Legal Covenants**

<i>Name of report</i>	<i>Time frame for submission</i>	<i>Responsible entity</i>
IUFR	Within 45 days of quarter end	RUMSL
Internal audit report	As prescribed in the project FM Manual	RUMSL
Annual project financial statements audit report	Within 9 months of year end	RUMSL
Annual entity audit report of RUMSL	Within 9 months of year end	RUMSL

32. Table A3.3 summarizes actions to be taken by RUMSL (JV) and the indicative time frame.

**Table A3.3 Action Matrix**

<i>S. no.</i>	<i>Action to be taken and shared with the Bank</i>	<i>Time frame (due date)</i>	<i>Responsible entity</i>
1.	Appointment of internal auditors	As prescribed in project FM Manual	IREDA

33. **Corporate Governance and Financial Accountability Assessment (CGFA).** The objective of CGFA is to understand the fiduciary capacity of a given organization. The assessment covers the legal framework of corporate governance (CG) in India applicable to the central PSU (whether or not listed in the stock exchange), as well as good governance and FM practices for enhancing fiduciary capacity. CGFA covers following main aspects:

- a) Board of Directors: board composition;
- b) Audit Committee: Committee composition and minimum timelines for convening;
- c) Risk management: risk assessment, along with disclosure norms, emphasizing fraud prevention and identification; and
- d) Other areas: independence in policy and decision making.

34. India’s CG code is not yet mandatory for state PSUs (except those prescribed under the Companies Act); however, RUMSL is jointly held by a central PSU and state PSU. Thus, the applicability of CG code is being looked into. In CGFA assessments, the Bank discusses and agrees on CGFA actions with the state PIAs, based on the above framework. Thereafter, an agreed CG Action Plan is prepared. As these state PIAs/companies are in their initial phase, the detailed CG framework will be discussed a year following the start of implementation and will be monitored during the project period.

35. **Framework Approach on Eligibility Criteria.** Based on RUMSL’s assessment, as detailed above, a FM framework has been developed, which will serve as eligibility criteria for any new state PIA to become a project participant (Box A2.1).

36. **Retroactive Financing:** Retroactive financing up to an amount of US\$20 million will be available under the project, for financing expenditures incurred after May 1, 2016 and before the Loan signing to procure eligible activities procured under agreed guidelines.

**C. Financial Intermediary Assessment of IREDA**

37. IREDA as the borrower and nodal PIA will be responsible for coordinating and managing the project. Due diligence of IREDA as well as of the state PIAs has been conducted.<sup>27</sup> For the new state PIAs, IREDA will assess these new entrants against Readiness Criteria (Annex 2) and will confirm compliance to the same through ongoing monitoring.

38. IREDA is a public limited, Mini-Ratna Category I status government company, notified as a ‘Public Financial Institution’ under the Companies Act 1956. It was established in 1987 and is registered with the RBI as an NBFC. As IREDA plays a key role in the development of renewable energy, including commercialization of technologies, conservation and energy efficiency in India, it benefits from the strong support from the GOI, which is its 100 percent owner. The strategic importance is reflected in, among

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<sup>27</sup> Per design, IREDA will receive funds under the project and will on-lend the funds, at pre-defined terms (refer Section B), to the selected states agencies, which, in turn, will deploy these funds to procure shared infrastructure goods and services required for development of the respective solar park.

others, IREDA being the nodal agency for routing the GOIs various subsidies and grants to the renewable energy sector, access to low cost tax free bonds, and availability of the GOI guarantee for over 50 percent of its borrowings<sup>28</sup> as on March 31, 2016. Most recently, IREDA was mandated to issue on behalf of MNRE, US\$0.6 billion (INR40 billion) of bonds to be fully serviced by the GOI. The institution has had a series of multilateral and bilateral engagements with about twelve credit lines / loans currently under implementation<sup>29</sup> and two new loan agreements signed in FY2016, one each with ADB and KfW. The World Bank has had successful engagements with IREDA in terms of two projects to support renewable energy in the past (with project outcome rated ‘Satisfactory’ per both the ICRs while Borrower’s performance rated ‘Highly Satisfactory’ for the Renewable Resources Development Project and ‘Moderately Satisfactory’ for the Second Renewable Energy Project). It is expected that the proposed project will build on past implementation arrangements with regard to fiduciary and safeguards and apply a robust framework to the new modalities under the current project.

39. The Companies Act 2013 provides for a twelve-member Board for IREDA being a government company and all Directors are appointed by the President acting through MNRE. The current composition of the Board is five, three of which are functional Directors including the Chairman and Managing Director, and two are Government Nominee Directors. In the absence of Independent and Women Directors, the current composition of the Board is not in conformity with the provisions of the Companies Act 2013 and Guidelines on Corporate Governance for Central Public Sector Enterprises, 2010.

40. The Board of IREDA draws upon the powers conferred on it through the Companies Act 2013, Listing Agreements with Stock Exchanges,<sup>30</sup> and M&AOA to provide leadership and strategic guidance, exercise due control and remain accountable to its stakeholders. The Board operates either as a full Board or through its committees constituted with delegated authority for operational flexibility. It has six Board Committees which meet at different frequencies. Of these, key from an operations perspective are the Audit Committee, Committee of Directors, and Investment Committee. In line with good practices for public enterprise corporate governance, IREDA’s financial autonomy and delegation of powers stands enhanced upon elevation to ‘Mini Ratna’ status effective June 2015. The composition and delegation of powers of Board Committees has been modified since to give effect to this enhanced autonomy.

41. The Board approves all policies including loan, investment and non-performing asset management. Periodic reviews on important aspects of the business like strategic and annual business plans, annual resource mobilization plan, review of operations, asset liability management, fixing of concentration limits, review of exposures under foreign currency and treasury operations, review of quarterly and annual financials and review of non-performing assets are placed before the Board at set frequencies. IREDA has adopted detailed guidelines on grievance redressal mechanisms, fair practices code for lenders, and Know Your Customer. IREDA also comes under the purview of the Right to Information Act (RTI) 2005 and complies with its requirements.

42. IREDA has documented loan, investment, and risk management policies which are amended from time to time as required. Its organizational structure has checks and balances to originate and manage loan and investment portfolios including through separate and independent units for loan origination and risk management. IREDA adopts a Committee system for exercise of delegated powers by executives in respect of sanction of credit lines and deployment of wholesale and bulk funds. Over 50 percent of IREDA’s borrowings are from external sources like multilateral and bilateral institutions, the foreign currency risk exposure on which is managed actively by the institution.

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<sup>28</sup> Multilateral and bilateral sources

<sup>29</sup> One each with IBRD and IDA, balance with KfW, JICA, French Development Bank, European Investment Bank as on March 31, 2016.

<sup>30</sup> For securities, debt and equity.

43. The company has internal control procedure(s) commensurate with the nature of business and the size of current operations. The internal control system is supported by an internal audit process for reviewing the adequacy and efficiency of the company's internal controls. The audit function also proactively recommends improvement in operational processes and service quality to mitigate risks. Internal audit reports are discussed with the management and are reviewed by the Audit Committee of the Board which also reviews the adequacy and effectiveness of the internal controls in the company.

44. **Quality of Financial Intermediary.** IREDA has sound credit fundamentals being a AA 'plus' (AA+)<sup>31</sup> rated entity, with a risk governance framework commensurate with its current size and scale of business. IREDA's mandate entails channeling subsidies and grants to the renewable energy sector as well as underwriting loans for energy efficiency, conservation and renewable energy development. As on March 2016, 45 percent of its loan book of US\$1.5 billion (INR103.8 billion) was for wind and solar power projects, followed by 16 percent for small hydro and 13 percent for cogeneration. Further, 11 percent of IREDA's loan book is deployed in refinancing operations. The institution follows commercial principles in its lending operations and has the autonomy to do so. It is adequately capitalized with capital adequacy and leverage ratios well within the regulatory and prudential limits. It will nonetheless need to augment capital going forward, commensurate with its growth plans, to maintain or improve its financial risk profile. IREDA's financial results for the last three years is in Table A3.4.

**Table A3.4 IREDA's Financial Results**

<i>Head</i>	<i>Units</i>	<i>2013-14</i>	<i>2014-15</i>	<i>2015-16</i>
Total Revenue	US\$ Million	134	168	176
Interest income	US\$ Million	127	146	167
Total Expenses	US\$ Million	83	111	113
Finance cost	US\$ Million	73	97	100
Provision for Bad Debts	US\$ Million	3	5	6
Profit After Tax	US\$ Million	36	41	45
Total Assets	US\$ Million	1,361	1,541	1,978
Loan Assets	US\$ Million	1,239	1,320	1,529
Average Assets	US\$ Million	1,086	1,279	1,425
Net worth	US\$ Million	290	327	344
Total Borrowings	US\$ Million	1,014	1,115	1,500
External borrowings	US\$ Million	590	714	833
Average Borrowings	US\$ Million	889	1,065	1,308
% external	%	58%	64%	56%
Average Yield on loan	%	11.69%	11.45%	11.70%
Average cost of borrowings	%	8.23%	9.10%	8.16%
Profit After Tax Net worth	%	12.44%	12.48%	12.98%
CRAR*	%	23.14%	23.79%	19.99%
Gross Non-Performing Assets	%	4.18%	5.34%	5.71%
Net Non-Performing Assets	%	2.46%	3.84%	4.09%

\*CRAR: capital to risk adjusted assets ratio

<sup>31</sup> <http://www.icra.in/Files/Reports/Rationale/Indian%20Renewable-R-23092016.pdf>

45. **Risk Management.** IREDA has a well-documented, Integrated Risk Management Policy which is periodically reviewed by its management and the Board of Directors. To manage the market risk which manifests liquidity risk, interest rate risk and currency risk, an Asset Liability Management Committee is in place to take/review major decisions affecting the business and working results, asset liability management mismatches, budgeting, resource mobilization, business strategy and resource risks, etc. Based on the nature of operation, risks are identified by the Asset Liability Management Committee and due measures are taken to mitigate them.

46. IREDA has a foreign exchange risk management system and a Forex Management Committee to proactively manage and monitor all the foreign exchange risk and derivative-related transactions. Based on the risk appetite and tolerance limit of the Company, the Board appropriately modifies the foreign exchange and derivative risk management limit. As reported in IREDA's annual accounts for FY2016, 'all foreign currency borrowings from various multilateral / bilateral agencies (hedged) viz. ADB, IBRD, Nordic Investment Bank, KfW, French Development Bank, Japan International Cooperation Agency, and European Investment Bank have been converted into INR loan by way of plain vanilla swap transaction /currency, interest rate swap / principal only swap etc. entered into with various banks with whom IREDA has signed International Swaps and Derivatives Association Master Agreement. These swap/derivative transactions have been entered into with the participating bank for a different maturity period for each transaction which is shorter from the maturity period of the loan. The hedging of the foreign currency loan is carried out at various intervals and in multiple tranches of drawal against the lines of credit. The effective landed cost of different lines of credit are a function of the direct interest costs, hedging/derivative costs, commitment fee, government guarantee fee and other financial charges.

47. The institution is exposed to interest rate risk in a dynamic financial market which shows considerable movement. Also, on a weighted average basis, IREDA's tenor profile of INR assets at closer to 4 years is somewhat shorter than the tenor of liabilities at more than 7 years, which makes it sensitive to risks of earning mismatches in a falling rate scenario, though access to concessional funding may limit the risks to some extent. IREDA has put in place a Committee to monitor interest rates and set competitive lending rates in response to market conditions. It relies on its internal credit rating system in addition to using external credit ratings to price credit risk and determining lending rates on term loans. IREDA uses a reference interest rate matrix as in Table A3.5.

**Table A3.5 IREDA's Reference Interest Rate Matrix<sup>32</sup>**

<i>Sector/Borrower</i>	<i>Grade I</i>	<i>Grade II</i>	<i>Grade III</i>	<i>Grade IV</i>
Schedule A, 'AAA' rated PSU borrowers	9.9%			
State sector borrowers	9.9%	10.2%	10.5%	10.75%
LoC for Refinance	Borrowing* cost + lending spread (100 -200 bps)			
Roof top Solar	10.05%	10.3%	10.6%	10.9%
Wind and Grid connected Solar PV	10.2%	10.95%	11.1%	11.4%
Cogeneration, Hydro and CSP	10.5%	11.2%	11.45%	11.7%
Energy efficiency, conservation, Solar Thermal / Solar PV Off grid, Biomass etc	10.6%	11.25%	11.65%	11.9%
Manufacturing	Existing 11.7%		Greenfield 11.9%	

\*Variable and reset periodically by IREDA

48. It has a separate Recovery & Monitoring Group with representation from Legal, Technical and Finance, which follows up on recovery from stressed and non-performing assets. This Group has taken a series of measures to manage credit risk, market risk and operational risk to protect and add value to the

<sup>32</sup> Grades categorized by IREDA are as per internal risk classification of the project and/or promoter along with the state's risk.

organization and its stakeholders. The institution also recognizes various risks inherent in the nature of business such as the threat of non-recovery or becoming a non-performing asset and has a robust policy in place to counter these risks to the extent possible.

49. Delegation of powers to the Committee of Director and Investment Committee of Directors are as follows for:

- a) The Committee of Directors: Sanction of financial assistance between US\$1.5 million to US\$10.5 million (INR100 million to INR700 million) for individual projects/loans including enhancements; up to an annual limit of US\$210 million (INR14 billion).
- b) Investment Committee of Directors: For Investments between US\$375 million to US\$1,500 million (INR25 billion to INR100 billion) at any time, through deployment of wholesale (bulk) funding from credit lines, tax free bonds, allocation from the GOI or bulk prepayments by the borrowers.

50. The composition of the above two committees are similar; they are chaired by the Chairman and Managing Director and comprise Director (Finance), Director (Technical) and one Government Nominee Director.

51. Application of Commercial Principles, Managing Business Risk and Conflict of Interest: In the conduct of its role for development of renewable energy and energy efficiency markets, IREDA uses the: (i) direct lending channel, including at concessional terms where needed, to cater to the under-served segments or where credit market failures exist, and (ii) wholesale financing channel to crowd-in institutions in established credit markets by providing access to cost effective refinance. IREDA's financing operations apply commercial principles while addressing credit market failures in the renewable energy sector which provides the basis for deploying a variety of instruments including long tenor concessional finance, as needed. In As per FY2016 figures, IREDA is moderately healthy given that average yields on loan is at 11.7 percent while profitability ratio (profit after tax/net worth) is at about 13 percent. These ratios capture the dual feature of IREDA's operations when compared to a pure commercial financing operation.

52. It follows clear policies on lending and setting rates based on commercial principles for 'direct project' versus 'refinancing' operations. Markup over cost of funds reflect, among others, the difference in credit risk on 'direct lending' to a range of borrowers / renewable energy projects vis-a-vis lending to banks / financing institutions through a 'refinancing' operation. Distortions, if any, are expected to be addressed through a reasonably distributed lending portfolio across sub segments and project entities though the very nature of 'sectoral' project financing operation limits the extent of portfolio diversification possible. IREDA's financing operations also supports the development of new channels of credit delivery and deployment of cost competitive financial products including through credit enhanced structures, critical for fostering development of the sector.

53. The project largely envisages a tenor matched loan profile to the eligible subprojects. The US\$75 million IBRD loan (variable spread, level repayments) has a final maturity of 19 years, including a grace period of 5 years. These funds are proposed to be passed on to the states by IREDA as a loan for up to a tenor of 20 years, with a 5 year moratorium. The CTF loan component of US\$23million has a longer tenor of 40 years.

54. The cost structure of the US\$100 million line benefits from, among others, concessional funding on the US\$23 million CTF loan and US\$2 million CTF grant. The proposed on-lending rate of 8.5 percent per annum to subprojects is expected to provide IREDA with a positive but relatively narrow credit spread given reasonable assumptions on swap/hedging costs. Managing credit risks on this operation would therefore be critical and will require strong oversight mechanisms and close co-ordination with the selected

state PIAs including through needed support to augment the latter's institutional capacity even as its track record of delivering and achieving results in the project area gets established.

55. Besides following a framework approach where the state PIAs identified as eligible to receive funds will be determined by their ability to meet the project's Readiness Criteria for subprojects, a strong risk mitigating factor is that project implementation accountability vests with the Director (Technical) of IREDA.

56. **Design for Sustainability:** This assesses the risk of a possible disruption in lending operations should the Bank line through IREDA not be available in future. The risk is mitigated on several counts: (i) the Bank line constitutes a relative small share, at about 6.6 percent,<sup>33</sup> of total borrowings of IREDA currently, (ii) IREDA's liabilities originate from a range of external and domestic sources in varying tenor-cost combinations ensuring non-disruptive lending operations; the share of INR funding lines has been on the rise and IREDA's business plan includes issuance of masala / offshore INR bonds signifying diversification of IREDA's funding profile and access to capital markets, (iii) the rate of lending by IREDA is not subsidized to distort credit markets rather to address market failures in renewable energy financing which the project helps address through a combination of blended financing, tenor benefits and additionality to foster sustainable market development, and, (iv) the blended borrowing cost for IREDA under this project is largely in line with its average borrowing costs.

#### **D. Procurement**

57. **Overall.** Project procurement will be carried out in accordance with the World Bank's procurement and consultant guidelines, as well as provisions stipulated in the IBRD Loan Agreement. These guidelines documents (dated January 2011, revised July 2014) are entitled "Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" and "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers." In addition, the project will be subject to the Bank's "Anti-Corruption Guidelines" (dated October 15, 2006, revised January 2011).

58. **Approach and Strategy.** IREDA will be the borrower of this loan and will provide oversight to the project as a nodal PIA. IREDA will carry out the assessment of procurement readiness of the new states along with the small procurement under Component 2, for which IREDA may also hire, on need basis, an advisor to ensure compliance of such activities with the Bank's policies and procedures. Apart from such procurement under this Component 2, no substantive procurement will be conducted by IREDA. The project follows a framework approach, whereby the state PIAs identified as eligible to receive funds will be determined by their ability to meet the project's Readiness Criteria for subprojects, briefly mentioned in Annex 2 and to be detailed out in the project's OM. The initial investments are being undertaken in the state of Madhya Pradesh as RUMSL meets the project's Readiness Criteria for subprojects and is eligible to receive funds. In Madhya Pradesh, the State's transmission utility - MPPTCL - is supporting RUMSL in conducting procurement for its two solar parks, following the Bank's procurement guidelines. RUMSL has submitted the procurement plan for 18 months which is acceptable to Bank (Table A3.6). Currently, the major procurement packages under RUMSL are supply and installation of substation, transmission lines, and transformer packages.

59. **Procurement Capacity.** A procurement risk and capacity assessment has been done for IREDA. IREDA has prior experience of implementing the World Bank funded projects. As mentioned above, IREDA will carry out the procurement under component 2. IREDA may strengthen its capacity in procurement, as per need basis, through hiring of an advisor, who would provide procurement support for

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<sup>33</sup> 5 percent of total borrowings with US\$75million of IBRD; 6.6 percent after including CTF



preparation of procurement plan and selection of consultants under the Component 2. A procurement capacity assessment has been done for MPPTCL. The staff of MPPTCL has procurement knowledge and has received basic training on World Bank procurement procedures. The procurement plan for the Madhya Pradesh solar parks is available, and procurement of the transformer and substation packages for Rewa and Mandsaur have been awarded. Although the implementing agency has procurement capacity for implementing conventional contracts following its own procurement rules and procedures; it has no prior experience in implementing Bank-funded procurement. In addition, as a newly-formed JV, RUMSL does not yet have permanent staff in place. Furthermore, RUMSL has yet to develop procurement systems for disclosure, complaints handling, and contract management, which may contribute to delays in the procurement process and contract management or non-compliance with agreed-on procedures. A Detailed Procurement Capacity Assessment for RUMSL is available in the P-RAMS. A similar procurement capacity and risk assessment will be done, following the guidance to be provided in the project's OM, for other state PIAs as and when they are included in this project.

60. ***Procurement Planning.*** The procurement methods or consultant-selection methods, need for pre-qualification, estimated costs, prior review requirements, and time frame are reflected in the Procurement Plan for first initial 18 months, which has been agreed between the Borrower and the Bank project team. The Procurement Plan, as agreed, will be uploaded in Systematic Tracking of Exchanges in Procurement (STEP). Table A3.6 provides the procurement plan.

**Table A3.6 Procurement Plan of Project Implementing State/Agency (RUMSL)**

**Procurement Plan period: from October 2016 to April 2018**

Rewa Solar Park:

1	2	3	4.00		5.00	6	7	8	9	10	11		12		13	14	15	16.00	17	18	19	20	21	22
			INR	Estimated Cost							Estimate Cost in US\$ million (1 USD=66.798 INR) dated 10.07.16	Procurement Method	Preparation of Bid Document (Date)	Domestic Preference Yes/No										
1	1	Procurement of Proposed Power Evacuation Scheme for 750 MW Rewa Ultra Mega Solar Power (RUMS) Project at Gudh Rewa Madhya Pradesh on Total Turnkey Basis.  <b>Lot I</b> :- Badwar, Construction of 33/220 kV Pooling Substation No. 1 along with Associated 220 kV DCDS Transmission line (Route length 1 Km.) (Supply of Power Transformer is in the scope of Employer).  <b>Lot II</b> :- Barsaita, Construction of 33/220 kV Pooling Substation No. 2 along with Associated 220 kV DCDS Transmission line (Route length 10 Kms.) (Supply of Power Transformer is in the scope of Employer).  <b>Lot III</b> :- Ran Nagar, Construction of 33/220 kV Pooling Substation No. 3 along with Associated 220 kV DCDS Transmission line (Route length 10 Kms.) (Supply of Power Transformer is in the scope of Employer).	343,188,000.00	5,139,098.95	NCB	10.05.2016	NO	Prior Review by the Bank	PLANNED			10.05.2016	8.07.2016		23.09.2016	INR 2,80,17,430.25 (for Lot-I)				JV of M/S Vihan Enterprises and RS Ltd.	16 months from Signing agreement			
2	2	Procurement of 220/33kV Power Transformers	475,200,000.00	7,115,924.28	NCB	16.05.2016	NO	Post	PLANNED		16.05.2016	08.07.2016				INR 343,507,506.00				IMP Power Ltd, Mumbai	8 Months from Signing Agreement			

Mandsaur Solar Park:

SL No.		Description of Goods	Estimated Cost		Procurement Method	Preparation of Bid Document		Domestic Preference	Prior Review by the Bank (Prior/Post)	Planned Versus Actual	Bids			No Objection to BER Date	Contract Award Date	Value in INR	Contract Signed		Contract No.	Name of Supplier/ Nationality and Address	Contract Completion Date	Expenditure incurred to Date	Remarks
1	2		3	4		5	6				7	8	9				10	11					
Package No.			INR	Estimate Cost in US\$ million (1 USD=66.7798 INR) dated 10.07.16		(Date)	Yes/No			(Date)	Invitation (Date)	Opened On (Date)				Date							
1	1	Procurement of Proposed Power Evacuation Scheme for 250 MW Mandsaur Solar Project on Total Turnkey Basis. <b>Lot 1</b> :- Construction of 33/220 kV Pooling Substation No. 1 along with Associated 220 kV DCDS Transmission line (Route length 55 Km.) (Supply of Power Transformer is in the scope of Employer).	925,139,000.00	13,853,575.48	NCB	31.05.2016	NO	PRIOR Review by the Bank	PLANNED		31.05.2016	08.07.2016		19.09.2016	595,973,362.45	19.09.2016	RUMS/2016-17/372/17/86	Bajaj Electricals Ltd, 801, P1 Floor Kustam Jee Aspiree Bhan Shankar, Yagnik Marg, Ston East, Mumbai					
2	2	Procurement of 220/33kV Power Transformers	165,943,000.00	2,484,928.08	NCB	3.06.2016	NO	Post review by the Bank	PLANNED		3.06.2016	13.07.2016		23.09.2016	109,050,000.00	23.09.2016	RUMS/2016-17/347/18/90	IMP Power Ltd, Mumbai	5 months				

61. **E-Procurement System.** For the solar parks in Madhya Pradesh’s Rewa and Mandasaur districts, procurements were done manually. However, if any state PIA plans to make its procurements using e-procurement, the Bank will allow it after assessing the e-procurement portal in accordance with the requirements of the multilateral development banks. The use of e-procurement is likely to increase the efficiency and transparency of procurement.

62. **Systematic Tracking of Exchanges in Procurement.** The project will use STEP, a Bank planning and tracking system, which can provide data on procurement activities and thus establish benchmarks. Details on the procurement plan’s procurement activities for the entire project period have been prepared and approved by the Bank and will be transferred to the STEP system.

63. **Procurement Training.** Key procurement staff of RUMSL have been provided basic training in procurement. Procurement staff of any new implementing agency may be sent for trainings at Administrative Staff College of India, Hyderabad/National Institute of Financial Management, Faridabad. The project can also utilize the Massive Open Online Course offered free of charge by the Bank ([www.procurementlearning.org](http://www.procurementlearning.org)), as well as the paid Professional Diploma in Public Procurement course delivered through the Charter of Public Procurement Studies.

64. **Risk Assessment.** This project represents RUMSL’s first ever engagement with the Bank, meaning that the implementing agency has no prior experience in Bank-funded procurement. The risk ratings decided on are based on the probability of various events occurring and their likely impact. Given these risk factors and mitigation measures, the overall procurement risk at this initial stage is rated as “Substantial” (Table A3.7). The World Bank will periodically review and update the risk rating of procurement.

**Table A3.7 Assessed Procurement Risks and Mitigation Measures**

<i>Risk factor</i>	<i>Initial risk</i>	<i>Mitigation measure</i>	<i>Completion date</i>	<i>Residual risk</i>
Limited capacity in Bank procurement procedures and new procurement approaches, which may lead to delays in procurement and contract management processes	Substantial	<ul style="list-style-type: none"> <li>- Use of skilled procurement staff for handling procurement activities</li> <li>- Prior Bank review of packages</li> <li>- Monitoring through procurement plan and quarterly reports</li> <li>- Attending trainings and workshops</li> </ul>	Continuous from year 1	Moderate
Normal fiduciary risks of transparency, fairness, and capacity associated with procurement of goods and works at the state PIA level	Substantial	<ul style="list-style-type: none"> <li>- Use of e-procurement and contract management tools</li> <li>- Attending trainings and workshops</li> </ul>	Continuous from year 1	Moderate
Non-compliance with agreed procurement arrangements	Substantial	<ul style="list-style-type: none"> <li>- Training and hand-holding provided by the Bank</li> <li>- Prior and post reviews by the Bank</li> <li>- Internal and external audits</li> </ul>	Continuous from year 1	Substantial

<i>Risk factor</i>	<i>Initial risk</i>	<i>Mitigation measure</i>	<i>Completion date</i>	<i>Residual risk</i>
External interference in the procurement process	Substantial	- Disclosure of procurement-related information - Appropriate handling of complaints	Continuous from year 1	Moderate
<b>Overall risk</b>	<b>Substantial</b>			<b>Moderate</b>

65. **Procurement Methods.** Table A3.8 describes the various procurement methods that will be used for activities financed under the proposed loan. These methods, along with agreed thresholds, will be reproduced in the procurement plan. The thresholds shown apply to the initial 18-month implementation period and are based on the procurement appraisal of the project; these thresholds will be modified as required. Domestic preference will (or will not) be applicable for International Competitive Bidding (ICB) procurement of goods, in accordance with the Procurement Guidelines.

**Table A3.8 Procurement Methods<sup>34</sup>**

<i>Category</i>	<i>Procurement method</i>	<i>Threshold (US\$ equivalent)</i>
Works <sup>35</sup>	International Competitive Bidding	> 40,000,000
	National Competitive Bidding (NCB)	Up to 40,000,000 (with NCB conditions)
	Shopping	Up to 100,000
	Direct Contracting (DC)	As per paragraph 3.7 of Guidelines
	Public-Private Partnership (PPP) for works	As per paragraph 3.14 of Guidelines
	Force account	As per paragraph 3.9 of Guidelines
	Framework Agreement	As per paragraph 3.6 of Guidelines
Goods and non-consultant services (NCS) <sup>36</sup>	International Competitive Bidding	> 3,000,000
	Limited International Bidding (LIB)	Wherever agreed by Bank
	National Competitive Bidding	Up to 3,000,000 (with NCB conditions)
	Shopping	Up to 100,000
	Direct Contracting	As per paragraph 3.7 of Guidelines
	Public-Private Partnership services	As per paragraph 3.14 of Guidelines
	Force account (only for NCS)	As per paragraph 3.9 of Guidelines
	Framework Agreement (FA) <sup>37</sup>	As per paragraph 3.6 of Guidelines

<sup>34</sup> This project finances only the shared infrastructure facilities and not the solar PV generation assets within the identified solar park.

<sup>35</sup> Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers” and “Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers.”

<sup>36</sup> Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers” and “Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers.”

<sup>37</sup> Directorate General of Supplies and Disposal) (DGS&D) rate contracts may be used as the framework agreement (FA) provided that several provisions are met. First, they must be reflected in the procurement plan agreed to by the Bank for particular goods. Second, before issuing the purchasing order, the implementing agency must carry out a

<i>Category</i>	<i>Procurement method</i>	<i>Threshold (US\$ equivalent)</i>
	Procurement from United Nations (UN) agencies	As per paragraph 3.10 of Guidelines
Consultant services <sup>38</sup>	Consultants' Qualifications Selection (CQS)/Least-Cost Selection (LCS)	Up to 300,000
	Single-Source Selection (SSS)	As per paragraphs 3.9–3.11 of Guidelines
	Individuals	As per Section V of Guidelines
	Particular types of consultants	As per paragraphs 3.15–3.21 of Guidelines
	Quality and Cost Based Selection (QCBS)/ Quality Based Selection (QBS)/Fixed Budget Selection (FBS)	For all other cases
	International shortlist Shortlist comprising national consultants only	> 800,000 Up to 800,000

66. **World Bank Review of Procurement.** The World Bank will conduct a prior review of the following contracts:<sup>39</sup>

- a) Works (including turnkey, supply and installation of plant and equipment, and PPP): All contracts more than US\$10 million equivalent.
- b) Goods, information technology, and non-consulting services: All contracts more than US\$2 million equivalent.
- c) Consultancy services: More than US\$1 million equivalent for firms and more than US\$300,000 equivalent for individuals.

67. The first contract issued by the state PIA will be subject to prior review, irrespective of the value. In addition, the justifications for all contracts to be issued on the basis of LIB, single-source or direct contracting (except for contracts of less than US\$100,000 in value) will be subject to prior review. The above thresholds are for the initial 18-month implementation period; based on the procurement performance of the project, these thresholds may be subsequently modified. Even for post-review cases, the inputs of the Bank on Technical Specifications/ToRs will be obtained by the project. If bids are called concurrently for several contracts in a package and the state PIA invites cross discounts, the aggregate value of the total package will form the basis for determining the procurement method, as well as the prior-review threshold requirements. All amendments to prior review contracts above 15 percent in contract value or time will be subject to prior review. The prior review thresholds will also be indicated in the procurement plan; the procurement plan will be updated annually (or at any other time, if required) and will reflect any change in prior review thresholds. The World Bank will carry out an annual ex-post procurement review of the

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price analysis on the specific good that is intended to be purchased; if, after this due diligence, the implementing agency concludes that the DGS&D rate contracts are more advantageous (and the Bank agrees), DGS&D rate contracts may be used as FA. Finally, to meet the Bank's requirements for the right to audit and fraud and corruption (F&C), these clauses may be included in the purchase orders (in case the purchasers are directly placing the purchase orders to DGS&D rate contract holders); however, if the indent (order) is placed through DGS&D, the purchaser has the option of signing a separate undertaking with the DGS&D rate contract holder, wherein the Bank's right to audit and F&C clauses could be mentioned.

<sup>38</sup> "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers."

<sup>39</sup> Thresholds are based on a risk rating of "substantial" and may be modified during the project implementation based on procurement risk assessment.

procurement falling below the prior review thresholds provided above. To avoid any doubts, the Bank may conduct, at any time, Independent Procurement Reviews (IPRs) of all contracts financed under the loan.

68. **National Competitive Bidding Condition.** National competition for the procurement of goods and works according to the established thresholds will be conducted in accordance with paragraphs 3.3 and 3.4 of Section III of the Procurement Guidelines with the following provisions:

- a) Only the model bidding documents for NCB agreed on with the GOI Task Force (and as periodically amended) will be used for bidding.
- b) Bid invitations will be advertised in at least one widely circulated, national daily newspaper—or on a widely used website or electronic portal with free national and international access, along with an abridged version of the said advertisement published in a widely circulated national daily inter-alia, providing downloadable details on the bid invitation—at least 30 days prior to the deadline for bid submissions.
- c) No special preference will be accorded to any bidder either for price or other terms and conditions when competing with foreign bidders, state-owned enterprises, small-scale enterprises, or enterprises from any given state.
- d) Except for prior concurrence of the Bank, there can be no negotiation of price with the bidders, even with the lowest evaluated one.
- e) Extension of bid validity will not be allowed with reference to contracts subject to Bank prior review without the prior concurrence of the Bank (i) for the first extension request if longer than four weeks and (ii) for all subsequent extension requests, irrespective of the period (the Bank will consider such concurrence only in cases of force majeure and circumstances beyond the control of the purchaser/employer).
- f) Re-bidding shall not be carried out with reference to contracts subject to Bank prior review without the prior concurrence of the Bank. The system of rejecting bids outside a pre-determined margin or “bracket” of prices will not be used in the project.
- g) Rate contracts entered into by the DGS&D will not be accepted as a substitute for NCB procedures unless agreed with the Bank on case-by-case basis; however, such contracts will be accepted for any procurement under the Shopping procedures.
- h) Two or three envelope system will not be used (except when using e-procurement system assessed and agreed by the Bank).

69. **Record Keeping.** All records pertaining to award of tenders, including bid notification, register pertaining to sale and receipt of bids, bid opening minutes, bid evaluation reports, and all correspondence pertaining to bid evaluation, communication sent to/with the Bank in the process, bid securities, and approval of invitation/evaluation of bids by its PMC or sub-PIA will be retained by the state PIA up to two years after the project closing date subject to no ongoing litigation on any of the contracts.

70. **Disclosure of Procurement Information.** The following documents will be disclosed on the project website: (i) procurement plans and updates; (ii) bid invitations for goods and works for all ICB, NCB, and shopping contracts; (iii) requests for expression of interest for selection/hiring of consultant services; (iv) contract awards of goods and works procured following ICB/NCB procedures; (v) list of contracts/purchase orders placed following shopping procedure on a quarterly basis; (vi) short list of consultants; (vii) contract awards for all consultancy services; (viii) lists of contracts following DC, CQS, or SSS on a quarterly basis; (ix) monthly financial and physical progress reports for all contracts; and (x) actions taken to report on complaints received on a quarterly basis.

71. The following details will be published online in the United Nations Development Business (UNDB) through STEP: (i) invitations to bid on procurement of goods and works using ICB procedures;

(ii) requests for expression of interest in consulting services with estimated cost of more than US\$300,000; (iii) contract award details on all procurement of goods and works using ICB procedure; (iv) contract award details of all consultancy services with estimated cost of more than US\$300,000; and (v) list of contracts/purchase orders placed following DC, CQS, or SSS procedures on a quarterly basis.

72. In addition, the implementing agencies will create a separate web page for the Bank-funded project, as well as a separate procurement field in the project web page. It will also publish on the websites any information required under the provisions of “suo-moto” disclosure, as specified in the RTI Act 2005.

73. **Implementation Support.** The World Bank will normally carry out implementation support missions, including review and support on procurement, on a semi-annual basis. Mission frequency may be increased or decreased, based on the procurement performance of the project.

74. **Use of Government Institutions and Enterprises.** Government-owned enterprises or institutions in India may be hired for activities of a unique and exceptional nature if their participation is considered critical to the achievement of project objectives. In such cases, the conditions provided in clause 1.13 of the Consultant Guidelines will be satisfied, and each case will be subject to prior review by the World Bank.

## **E. Environment and Social Safeguards**

75. **Impacts and Mitigation Measures.** While communities are expected to benefit from the project as a result of the generation of additional livelihood sources and CSR investments, project implementation may also lead to adverse social impacts. During the construction phase of investments, these might include loss of land or structures, loss of access to areas for livelihood support, noise pollution and other disruptors at sensitive locations (e.g., schools and health centers), and public-safety issues. The social impacts are not confined to the solar parks area; they also include the area covered by the transmission line that will evacuate power as an associated facility. Some, but not all, of these transmission lines may be integral to the project. Thus far, two solar parks, Rewa and Mandasaur, have been identified under the project.

76. For Rewa Solar Park, a detailed ESIA was carried out to assess the magnitude of social impacts, and mitigation plans were prepared in accordance with the agreed on RPF. In Rewa, the private land identified for the proposed subproject comprises 164.231 ha owned by a total of 309 titleholders. However, for the past three years, these land parcels have been left barren and unused owing to a decline in rainfall. The majority of farmers are now engaged in non-agriculture labor. During the monsoon season, livestock owners, who represent 31 percent of the project-affected population, graze their animals on government land that falls both within and outside the subproject area. A portion of government land transferred to subproject has been used by livestock owners for seasonal grazing. But only 22.5 percent of the 5,467.26 ha of government land (overlapping with all five subproject villages) has been transferred to the subproject, while alternate grazing land is available within 500 m of the proposed subproject area. Since the barren and rocky government land delineated for the subproject has not been used by local communities for any activities (e.g., income source or shelter), there would be no impact on non-titleholders. The ESIA, which also includes a Social Management Plan, has been disclosed locally and in the World Bank’s IDU. The 400 kV transmission line to evacuate power from Rewa Solar Park to the nearest substation, located at a distance of approximately 60 km, is being laid by POWERGRID. Since this line is not being funded by the World Bank, it will be considered an associated facility. As POWERGRID’s Environmental and Social Policy and Procedures (ESPP) is accepted under “use of country system” by the Bank under the ongoing Fifth Power System Development Project, the Bank will review POWERGRID’s adherence to the ESPP while implementing this line. The ESIA has found few environmentally sensitive receptors that would be affected due to the subproject’s activities. No ecologically sensitive areas are located in the site financed by the project. However, some concerns about local drainage and safety of workers and residents during the subproject implementation phase have been identified for which mitigation measures have been included



in the EMP. Relevant portions of the EMP have been included as part of the contract for installation, commissioning, and operation of the solar park facilities.

77. For Mandsaur Solar Park, the project is financing a transmission line of about 50 km to evacuate power. The park developer has already started work; thus, the World Bank has only just concluded due diligence for both the park and transmission line. Based on its report, an action plan will be agreed on with RUMSL, in accordance with which appropriate safeguards documents will be prepared and implemented. The total land under the subproject, measuring about 553 ha, falls under the jurisdiction of two revenue villages: Runija (134.19 ha out of a total village land area of 2,290 ha) and Gujarkhedi (419.44 ha of uninhabited village out of a total village land area of 626 ha). Of the total land under the subproject, an area of about 545 ha is under government ownership and possession has been transferred to the implementing agency. About 8 ha of land in Runija (2 ha) and Gujarkhedi (6 ha) has been allotted to 9 scheduled caste (SC) families (3 in Runija and 6 in Gujarkhedi). There are no dwellings within 500 m of the subproject boundaries. RUMSL had already initiated the process of compensation and R&R assistance, in accordance with ESMF provisions. The land for which the compensation and R&R assistance process has been initiated is not being used by the PAPs for agricultural use and is lying vacant. Based on census data and consultations with the local people, no tribal populations are residing in these villages. However, the SC population in Runija accounts for nearly 25 percent of the village's total population. Four cultural properties have been identified within 10 km of the subproject site, including two Jain pilgrim (tirtha) sites located outside the village boundary and one Dwarkadheesh temple in Runija village outside the subproject boundary. It is expected that during both its construction and operational phases, the subproject will have positive social impacts on the local population through enhanced employment opportunities.

78. ***Environment and Social Management Framework.*** IREDA has prepared an ESMF for the project, which is to be followed by other subprojects that may be identified at a later date. Its preparation has been based on social profiling of a candidate site, specifically Rewa Solar Park. The ESMF acknowledges the above-mentioned issues and integrates project measures for addressing them during the implementation process. The ESMF prepared for safeguards management requires analyzing various alternatives for each subproject while carrying out respective SIAs, which will be reviewed and cleared by the Bank prior to approving the subprojects for implementation and for the RAP, as applicable. The ESMF has been disclosed in the country, as well as in the World Bank's IDU. The OM for the project will provide guidance on application of ESMF as well as review of the site-specific safeguards reports/studies to be done by IREDA. IREDA will hire a safeguards advisor to assist it in carrying out such roles as per the project's requirement on need basis.

79. The ESMF lays out the policies, procedures, and institutional responsibilities for assessing and managing the potential environmental and social risks and impacts that may arise at any phase of the project cycle for various subprojects. It is intended that the agencies responsible for executing the investment subprojects will apply the ESMF to all subprojects implemented under this project. The ESMF includes the following components: (i) Resettlement Policy Framework; (ii) Indigenous Peoples Plan Framework; (iii) Gender Development Framework; (iv) Integrated Grievance Redress Mechanism; (v) specific procedures on public consultation and disclosure; (vi) monitoring arrangements covering selection, appraisal, and implementation of subprojects; (vii) schedule, procedures, and terms of reference for periodic environmental and social audits; and (viii) a plan to augment the institutional capacity of the implementing agencies to manage project-related environmental and social issues. It also provides guidance on undertaking Environmental Assessments for sites identified subsequently. A generic EMP has also been drawn up and included to facilitate the development of site-specific EMP for later identified sites.

80. The environmental and social impacts will not only be confined to the solar parks area, but will also be applicable to the associated infrastructure such as evacuation/transmission lines (that will evacuate the power to the grid) and others. Some of these transmission lines will be integral to the project and will

be financed under the proposed project but not all. The ESMF will guide the ESIA for all lines that will be financed under the project.

81. **Resettlement and Land Acquisition.** According to the social profiling, the project may require the acquisition of both private and public land, which will result in involuntary displacement and loss of livelihoods. Thus, Operations Policy (OP) 4.12 on involuntary resettlement has been triggered; however, the scale of involuntary resettlement at the individual subproject sites is likely to be small, given the nature of land to be taken. But since the project will support a large number of investments overall, the Social Management Framework (SMF) includes a RPF, which specifies the procedures, eligibility, and mitigation measures to be followed in the event that resettlement or land acquisition is required for any subproject.

82. **Indigenous Peoples Planning Framework.** Baseline studies show the presence of indigenous communities in both of the proposed candidate park areas. Thus, OP 4.10 on indigenous peoples has been triggered. As part of the SMF, an IPPF has been prepared with the objective of including tribal communities in the project so that interventions can have their highest possible impact on improving their quality of life. The IPPF provides guidance on preparing the indigenous peoples plan (IPP). No indigenous community was found in Rewa and Mandsaur subprojects hence no IPP has been prepared.

83. **Gender.** Most of the women’s status indicators—including those pertaining to health, literacy, and workforce participation—show that gender equity and empowerment remain serious issues in the proposed candidate sites. As part of the ESMF, a GDF has been designed, which will help analyze gender issues during the preparation stages of the subproject (to be financed under the project at a later date as part of the Component 2 of the project) and design interventions to address women’s needs. Gender analysis will be part of the SIA. Gender assessment was carried out in Rewa subproject. The assessment results shows that though women play an important role in the society, they have a very low status in the society coupled with little control over household resources; considerable health hazard; and poverty. During consultation the female investigators interacted with the women residing in the affected area on the issues of their living, health care civic amenities and employment. One of the major concerns that women expressed is their deprivation from the employment opportunities in agriculture due to the project; access to safe drinking water facilities and power; and access to common property resources. The development experience shows that it is equally necessary to consult women and offer them choices in enabling them to make informed choices and decide for their own development. Gender actions include (i) development of health care centres (ii) employment opportunities for women, (iii) holding regular medical health camps to address women health issues, (iv) vocational centres to impart skills like stitching, knitting, handicraft making, pickle making etc. The project will ensure that these schemes are dovetailed in the project for the benefit of women PAPs such as (i) *Beti Bachao* to arrest declining sex ratio; (ii) *Ladli Laxmi Yojna* to lay strong foundation of girls' future through improvement in their educational and economic status and to bring about a positive change in social mind set towards birth of a girl; and (iii) *Mukhyamantri Kanyadan Yojna* to provide financial help to poor, needy, destitute families for marrying off their daughters/widows/divorcees. Participation of women has been envisaged specifically in the following areas as shown in Table A3.9 below:

**Table A3.9 Areas for Women Participation**

<i>Key Indicators</i>	<i>Steps taken by the project</i>
Representation and presence of women from different socio-economic groups in all meetings	All meetings that took place, has representation of women. The meetings/consultations are organized at a time when women find it convenient to attend, so that maximum participation can be ensured.

<i>Key Indicators</i>	<i>Steps taken by the project</i>
Venue for meetings is based on discussions with the women so they can feel free and uninhibited in their discussions.	The meeting venue was generally selected by the participants. The meetings took place within the close vicinity of the residential areas in the villages.
Women facilitators or work through women's groups or networks— formal or informal.	Women Investigators were engaged for survey and focus group discussion
Women's involvement in preparation and review of social documents.	The RAP has been disclosed in a mixed group as well as separately for men and women members. The women specific activities to be carried out were finalized in consultation with women members.
Ensure women's involvement and participation in implementation	<p>In order to preempt situations where women are mere tokens in decision-making processes, women are being encouraged to participate in prioritization of activities and monitoring of its implementation.</p> <p>For monitoring and evaluation, there will be scope for women's participation. Monitoring of project inputs concerning benefit to women should invite their participation that will make the process more transparent to them. Women will be encouraged to evaluate the project outputs from their point of view and their useful suggestions should be noted for taking necessary actions for further modifications in the project creating better and congenial situation for increasing participation from women.</p>
Inclusion of women in the socio-economic survey	Gender-segregated data for each household has been collected and analysed with regard to ownership and use of resources; decision making regarding finance and resource use; women's formal and informal income-earning activities; extent of women's dependence on water bodies in the villages; and Women's skills.
Income-restoration programs to address gender issues	During social impact assessment survey, existing levels of women's skills and their occupation were assessed. Women's participation will be initiated through Self-Help Group (SHG) formation for interested women participants. Special orientation meetings will be arranged with the women members to help form self- help groups. Training will be provided to the SHG groups along with the exposure visits. The nongovernmental organization (NGO) during implementation will also explore the opportunities for augmenting existing income

84. ***Social Accountability and Grievance Redress Mechanism.*** A social accountability and GRM will be established for each subproject. The key approaches for ensuring social accountability will be a participatory process guiding social audit, citizen score card, and report card to acquire feedback on subproject performance and record citizens' recommendations for improvement. The social accountability mandate will be further strengthened through a strong GRM. Communities and individuals who believe they are adversely affected by the project may submit complaints to existing subproject level GRM or the Bank's GRS. An IGRM will be established at the state level, with officials and systems in place. Grievances

or feedback of any kind may be submitted through various media (e.g., a dedicated toll-free phone line, direct calls to concerned officials, online via a dedicated portal, or in written form) and will be addressed in a time-bound manner. The project will also comply with the RTI Act of 2005 and, as mandated under Section 4 of the Act, will ensure proactive disclosure and sharing of information with key stakeholders, including communities and beneficiaries. As part of the IGRM, a GRC will be set up at the district level where subprojects have been planned. The mandate of the GRC will be to redress grievances of PAPs in all respects, especially with regard to R&R assistance.

85. ***Stakeholder Engagement.*** The project will have tailor-made interventions for engaging with local communities and key stakeholders to ensure their inclusion and participation in the planning and implementation stages. The local-level consultations were carried out in the Rewa Solar Park site, focusing on specific issues related to the potential subprojects and their associated environmental and social issues. More than 150 participants from candidate subproject sites participated in these consultations and provided inputs for preparation of the ESMF. The ESMF has been disclosed on IREDA's website, and a summary of the ESIA has been disclosed on the websites of the state governments (JV companies). The ESMF has also been disclosed in the World Bank's IDU.

86. The ESMF and its specific instruments provide guidelines and procedures for further consultations during project implementation, particularly in defining and designing subprojects and specific works. The ESMF procedures consider the level of social risk of each subproject in allocating time and resources to be dedicated for stakeholder consultation. Since consultation is an ongoing process, the ESMF's disclosure on the websites of new JVs will continue during project implementation. The RAPs and IPPs for individual subprojects will also be disclosed in accordance with the principles and procedures described in the ESMF.

87. ***Institutional Arrangements.*** Overall, IREDA will implement and monitor the safeguards process in accordance with the ESMF. Responsibility for implementing EMP will be jointly shared between the respective state PIA, generators, and IREDA, depending on when the impact occurs, and which stakeholder can effectively implement the measure required. The OM for the project will provide guidance on application of ESMF as well as review of the site-specific safeguards reports/studies, which is to be done by IREDA. IREDA will hire a safeguards advisor (supported by component 2 of the project) to strengthen their capacity in carrying out such roles as per the project's requirement. IREDA will ensure adherence to the Readiness Criteria while the state PIAs will have an actual role in conducting the necessary assessments and implementation of safeguards action plan together with the developers.

88. For on-the-site implementation, since the ultimate responsibility of implementation of ESMF lies with the generator. The generators will need to appoint an Environmental and Social Development Expert (ESDE). The generator's Chief Executive Officer will have an overall responsibility for implementing subproject-specific RAPs and IPPs as well as the relevant portions of the EMP. The recruited ESDE, who will report to the Chief Executive Officer, will ensure EMP, RAP and IPP implementation, coordination and liaison with government organizations and the World Bank with respect to social and environmental issues. The ESDE will be assisted by the generator's Environmental and Social Officer (ESO), who will be mainly responsible for implementing CSR activities. If required, a NGO will be contracted to assist the ESDE in implementing the RAP and IPP.

89. The ESDE will also be responsible for monitoring progress on environmental and social safeguards (during construction and execution) and submitting regular reports to IREDA, who in turn is responsible for monitoring and confirming the same to the World Bank on EMP compliance (monthly during construction and quarterly during operations). The ESDE will work with the Environmental and Social Team (including Environment and Social Consultants, who will be hired on the need basis to augment the capacity) of IREDA to confirm that all EMP measures are implemented and provide monthly updates regarding the same. In turn, IREDA's team will collate this information on quarterly basis and confirm the

extent of compliance with ESMF provisions. This report will form a part of the regular reporting on the project to be shared with the Bank in a timely manner every quarter. The ESDE can also connect with this team of IREDA, in case there is a need for higher level coordination, to resolve any issue such as timely receipt of forest clearance, etc. The ESDE will also participate in the training programs organized by IREDA from time to time. The ESDE will also assist the Environment and Social team of IREDA in preparing the documentation to catalogue good and bad practices in solar park projects.

90. ***Monitoring and Evaluation.*** Overall responsibility of monitoring and ensuring conformity with the ESMF requirements will lie with IREDA as well as the respective state PIAs accountable for the same. Ultimately within each subproject, for each lot, it will be the responsibility of the respective generator (the one putting up the generation assets within the solar parks). Monitoring will cover all planning and implementation stages. It will be carried out through environmental and social safeguards compliance reports, which will form a part of the Monthly Progress Reports (MPR) for all subprojects, and regular visits by the generator's environmental and social specialists. The generator, in turn, will review these evaluation reports and identify and duly incorporate issues (i.e., technical, managerial, policy, and regulatory) related to compliance of the RAP reports. Thus, project monitoring will be the responsibility of the generator, who will submit the MPRs. These reports will compare the project's progress to targets established at the project outset. The generator will debate policy and regulatory issues internally and determine the need for appropriate interventions. These interventions could include appropriate revisions of the ESMF document and R&R Policy in consultation with the Bank or suitable analytical studies to influence state policy or programs, if warranted.

91. During project implementation, two external evaluations of the RAP implementation prepared for the subprojects will be conducted—one at the project mid-term and the other at the close of implementation, in accordance with the terms of reference agreed with the Bank. During implementation, the state PIA will organize meetings to which all of the generators will be invited to attend to provide information on the progress of project work.

## Annex 4. Implementation Support Plan

1. **Strategy and Approach for Implementation Support.** The development of the project strategy for implementation support is based on the nature of project activities and their commensurate risk profile in accordance with the SORT. The Implementation Support Plan, described below, will be a live document to be regularly reviewed and revised as and when required during implementation.
2. **Technical Support.** The Bank will provide the required technical support through sector specialists. The implementation support will include at least two missions per year, along with continuous exchange of correspondence and regular communication.
3. **Financial Management.** Implementation support will review the project's FM system, including, but not limited to, accounting, reporting, and internal controls. Support will be provided through regular interactions, half-yearly implementation support missions, and thematic implementation support missions, if required.
4. **Procurement.** Implementation support will include (i) review of procurement documents and provision of timely no-objection; (ii) detailed guidance to project staff on the Bank's Procurement Guidelines; (iii) monitoring of procurement progress against the detailed Procurement Plan; (iv) review of contract management activities; and (v) identification of capacity-building and training needs of project staff and officials of partner state PIAs on procurement processing and provision of training, if required. The support will be provided through regular interactions, half-yearly implementation support missions, and thematic implementation support missions, if required.
5. **Environmental and Social Safeguards.** The safeguards specialists on the Bank's project team will supervise various activities to ensure full compliance with the Bank's operational policies and procedures and the agreed Readiness Criteria for subprojects on environmental and social safeguards. Implementation support will be provided through regular interactions, half-yearly implementation support missions, and thematic review missions, if required.
6. **Implementation Support Plan.** The team will consist of a mix of headquarters and country-office specialists in the areas of technical, procurement, FM, and safeguards. These specialists will facilitate the timely, efficient, and effective implementation support for the client. Project implementation and supervision will be conducted through the following:
  - a) Project workshops, to be conducted as and when new state PIAs are added to the project, whereby all the key project functionaries will be brought together to ensure their clear understanding of the project scope, design, process, and responsibilities;
  - b) At least two regular implementation support missions per year over the project duration;
  - c) Intermediate technical missions by specialists, as needed, on identification of new solar parks;
  - d) Quarterly implementation (physical and financial) progress reports prepared by the responsible PIA;
  - e) A Mid-Term Review (MTR) about half way through implementation/loan tenure to review the project's progress and assess the need for any mid-course corrections; and
  - f) An ICR report at the end of the project to assess achievement of the PDO and lessons learned.
7. Given that the team will need to work with new entrants for additional solar parks to be supported under the project, Table A4.1 summarizes the implementation support plan.

**Table A4.1 Implementation Support Plan**

<i>Time period</i>	<i>Focus</i>	<i>Skills needed</i>	<i>Resource estimate</i>
<i>First 12 months</i>	<ul style="list-style-type: none"> <li>- Project design and technical implementation support</li> <li>- FM and procurement</li> <li>- Safeguards implementation support</li> <li>- Capacity building</li> </ul>	<ul style="list-style-type: none"> <li>- Technical</li> <li>- FM</li> <li>- Procurement</li> <li>- Safeguards</li> </ul>	Seven-eight staff, three-four trips per state PIA per staff annually
<i>12-48 months</i>	<ul style="list-style-type: none"> <li>- Implementation support</li> <li>- FM, procurement and safeguards</li> </ul>	<ul style="list-style-type: none"> <li>- Technical</li> <li>- FM</li> <li>- Procurement</li> <li>- Safeguards</li> </ul>	Seven-eight staff, one-two trips per state PIA per staff annually

## **Annex 5. Economic and Financial Analysis**

1. This annex discusses the rationale for public financing of the project, the valued added of the Bank support and presents the analysis of the project's development impact in terms of expected benefits and costs.<sup>40</sup> The analysis for the project is based on the assessment of Rewa solar park and the main finding is that it is economically (and also financially) viable<sup>41</sup> over the life of the project. It will help avoid 25.7 million tons of GHG emissions.

2. Since the shared infrastructure investments funded by the project cannot have an economic return independent of the solar PV generation and transmission investments, the economic analysis covers the entire package of solar park investments.

### **A. Rationale for Public-Sector Provision/Financing**

3. Solar energy is essential for meeting India's growing electricity demand in an environmentally sustainable way. An estimated 300 million people in India are not connected to the national electrical grid; those who face frequent power disruptions. To meet the power demand, industrial establishments and manufacturers have been relying on diesel-based backup power supplies, which are significantly more expensive than grid-based electricity. At present, coal fuels two-thirds of the country's electricity generation. To avoid the global and local environmental damage costs associated with thermal generation, the GOI has announced a bold target of installing 100 GW of solar power capacity by 2022, a twelve-fold increase in current installed capacity, which is little over 9 GW (January 2017 figures). The GOI's solar energy push underpins its Power for All program, which aims to supply 24x7 electricity to residential, commercial, and industrial consumers by 2019. The 2022 target is a key part of the GOI's efforts to meet the country's growing electricity demand in an environmentally sustainable way.

4. Meeting the GOI's solar power targets will require a significant scale-up in both private and public-sector investments. Under the project, there is a strong justification for using public financing on the following grounds:

- a) Public financing under this project will be used to provide services where the public sector has an advantage (e.g., land acquisition, obtaining necessary permits, and providing common infrastructure and interconnections from the solar park to the state and national grid). This will help remove or reduce the private sector's risk perception about solar power and increase the availability of private investment and financing for solar power.
- b) Public support and financing for solar parks infrastructure are also necessary to reduce the financial costs of solar power and enable it to be competitive with thermal generation so that the full externalities of solar power through avoided environmental and health damage costs can be captured.

### **B. Value Added from the World Bank's Support**

5. Since solar power is a variable energy source, this transition must be managed effectively in order to succeed. The WBG can play a valuable role in this transition by (i) making long-term concessional financing available for development of solar power, (ii) sharing international knowledge and experience on

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<sup>40</sup> This economic analysis is consistent with the following guidelines: i) Operational Policy and Bank Procedure 10.00, Investment Project Financing, ii) Power Sector Policy and Investment Projects: Guidelines for Economic Analysis, iii) Social Value of Carbon in Project Appraisal 2014 and (iv) Discounting Costs and Benefits in Economic Analysis of World Bank Projects 2016.

<sup>41</sup> Rewa Solar Park has been used to evaluate the economic viability of solar parks in India since many of its elements are common to parks that will be subsequently financed by the project. A preliminary analysis of the next park in the pipeline, Mandsaur Solar Park, indicates that it will have an ERR of 14.7 percent and reduce GHG emissions by 6.2 million tons.



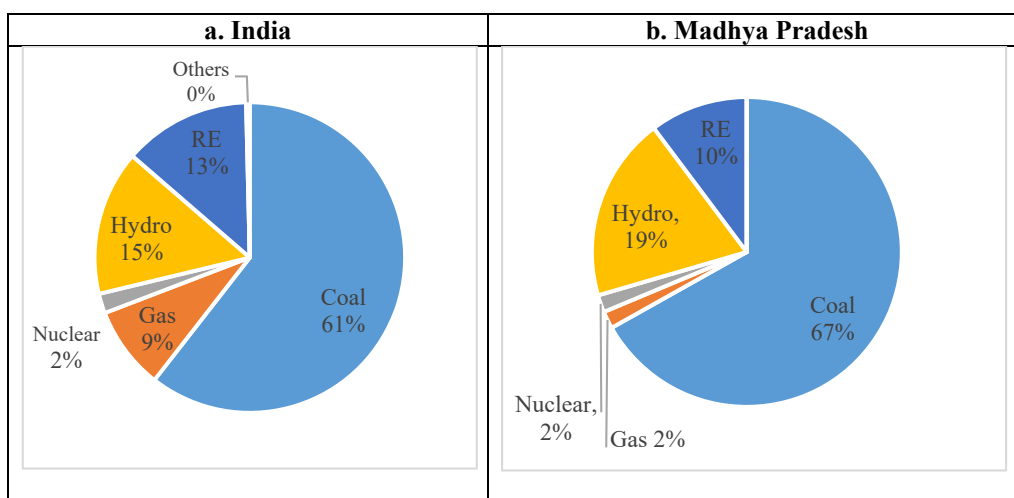
how large-scale solar parks have been implemented across the world, and (iii) providing technical assistance and capacity-building support to key stakeholders.

### C. Analysis of the Project’s Development Impact

#### Context

6. **National and the State’s Generation Mix.** The installed generation capacity at both the national level and in Madhya Pradesh is dominated by coal (Figure A5.1). Impact assessments of new generation sources—in this case, the solar generation—are jointly carried out by the STU; CTU (i.e., POWERGRID); and the Central Electricity Agency (CEA). These assessments help determine the required investments in transmission evacuation arrangements and future generation planning, as well as any measures and investments that may be needed to manage generation from the solar park.

**Figure A5.1 Source-wise Electricity Generation Capacity (GW), 2015**



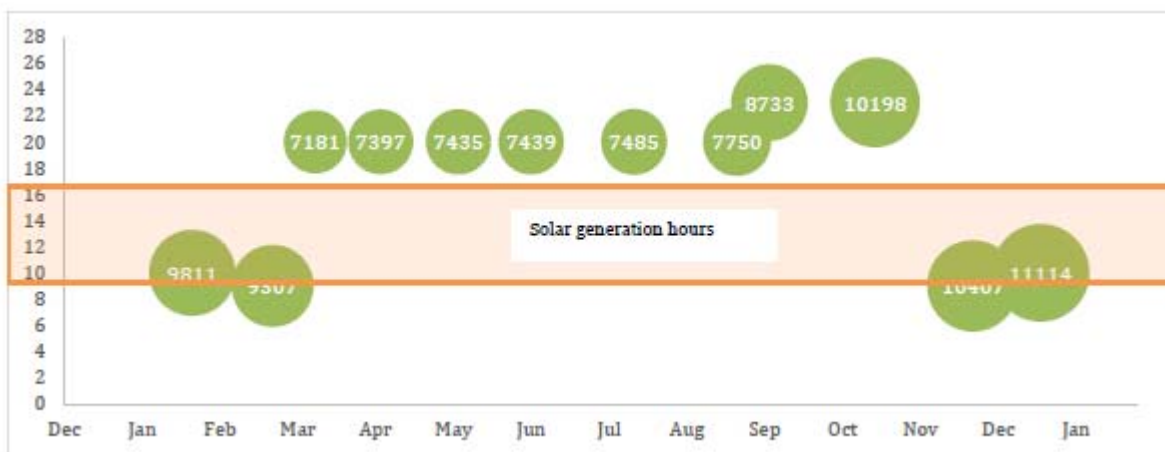
7. **Rewa Solar Park and Offtake Arrangements:** RUMSL has filed an LTA application with POWERGRID for the Rewa Solar Park. The LTA indicates that at least 300 MW of capacity from the subproject will be utilized outside the state, with the remaining power utilized within the state. The Delhi Metro Railway Corporation and MPPMCL (it is a single source of buying power by the three distribution companies in the state) have signed separate PPAs with RUMSL for offtake of energy generated from the subproject.

8. **Counterfactual to the Rewa Solar Park.** This economic analysis uses generation from supercritical coal plants as the counterfactual to the generation from Rewa solar park for two major reasons.<sup>42</sup> First, coal is the marginal unit of thermal generation to meet the baseload in Madhya Pradesh and in India. For the most part, electricity generated from Rewa solar park can be expected to meet the base load due to ‘must

<sup>42</sup> Currently, several studies are under way, including a multi-year grid integration study led by National Energy Renewable Laboratory (NREL), with support from the USAID and the World Bank’s Energy Sector Management Assistance Program (ESMAP), to assess the system-wide impacts of solar power generation in India. These studies are expected to arrive at more accurate estimates of various parameters needed for economic analysis of solar power, including (i) the mix of the counterfactual to solar power, (ii) grid-integration costs, and (iii) capacity benefits of PV. This economic analysis will be updated to reflect the findings of this study during project implementation.

run’ status of the solar power plants. Second, both the central and state governments have a stated policy goal of replacing thermal generation with renewable energy, particularly solar.

**Figure A5.2 Peak Load and Solar Generation Hours in Madhya Pradesh**



### Cost Benefit Analysis of Rewa Solar Park

9. The economic viability of the subproject was assessed using a cost-benefit analysis. Net benefits for Rewa Solar Park were calculated by comparing total system costs and benefits for the “with Rewa solar park” and “without Rewa Solar Park” scenarios. A range of scenarios and sensitivities that meaningfully reflect the uncertainties of key input variables were evaluated. The analysis included a consideration of the relevant environmental and social externalities. Monte Carlo simulation, which assumes input assumptions are defined as probability distributions rather than as single “best estimates,” was used to analyze the possibility of more than one input assumption combining unfavorably.

### **Subproject Costs**

10. **Capital Costs.** The total financial cost of the subproject, excluding price contingencies and interest during construction, is US\$662 million (TableA5.1). This amount includes US\$46 million of shared infrastructure costs, US\$44 million of transmission costs, and US\$572 million of solar PV generation capital cost. The 2016 benchmark capital cost of US\$0.75 million per MW for solar PV, provided by the Central Electricity Regulatory Commission (CERC), is used as the basis for solar generation costs; a reduction of 10 percent per year is assumed until the start of 2018, when the actual investments are projected to occur. Cost estimates of transmission and shared infrastructure investments were provided by RUMSL. By subtracting taxes and duties from the base cost, one obtains an economic cost of US\$560 million.

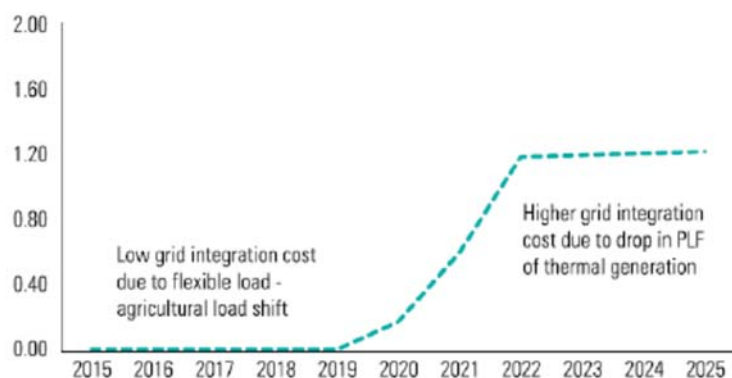
**Table A5.1 Total Subproject Capital Cost**

<i>Investment component</i>	<i>Base cost (US\$ million)</i>	<i>Taxes and duties (US\$ million)</i>	<i>Economic cost (US\$ million)</i>
Shared infrastructure	46	14	32
Transmission	44	13	31
PV generation	572	75	497
<b>Total</b>	<b>662</b>	<b>102</b>	<b>560</b>

11. **Operation and Maintenance Costs.** The O&M costs are estimated as 1.5 percent of the capital costs of generation and shared infrastructure and transmission, which amounts to US\$8.5 million per year.

12. **Grid Integration Costs.** Since the grid is not designed to manage variable sources of generation, solar power can impose additional coping costs on it. These include, but are not limited to, the following: (i) requirements of connecting remotely located generation sources to load centers through transmission lines, (ii) additional O&M costs of thermal plants if they must operate at lower load factors than would otherwise be the case, and (iii) need for standby generation to provide power when there is no sunshine. Grid-integration costs increase along with the level of solar power penetration in the grid. In India, grid-integration costs can be expected to remain low until 2020 because of the relatively low level of solar penetration and the availability of a high level of flexible agricultural load.<sup>43</sup> Thereafter, costs can be expected to increase as the share of solar power in the total installed capacity increases. Accordingly, this economic analysis uses grid-integration costs that increase to about US¢1.8 per kWh (INR 1.20 per kWh) by 2022 (Figure A5.3).<sup>44, 45</sup> These values have been adapted from grid-integration cost estimates provided in Pudjianto et al.<sup>46</sup>

**Figure A5.3 Grid Integration Costs Used in the Economic Analysis (INR/kWh)**



### Subproject Benefits

13. **Fuel Costs of the Thermal Counterfactual Using Coal.** Avoided fuel costs of thermal counterfactual constitutes one of the main economic benefits associated with solar power generation (Table A5.2). These avoided costs are calculated based on the coal requirements for producing electricity equivalent to those produced from Rewa solar park. A capacity utilization factor (CUF) of 19 percent is used for the solar park, based on the analysis carried out in the DPR. Coal is valued at the import price from Australia, which is higher than the domestic price of coal in India. Coal and price forecasts are based on the World Bank’s commodity forecasts (July 2016).

14. **Capacity Value of the Solar Park.** Generation capacity value is the amount of central generation capacity that can be deferred or avoided due to installation of a PV plant. A capacity value equal to the forecast capacity factor of the solar park (19 percent) is used in the base case of the economic analysis. In

<sup>43</sup> KPMG. 2015. The Rising Sun: Disruption on the Horizon.

<sup>44</sup> Source: KPMG India, based on Direct Costs Analysis related to Grid Impacts of Photovoltaics, September 2013.

<sup>45</sup> The multi-year grid-integration study led by NREL and supported by USAID and the World Bank’s ESMAP, currently under way, is expected to shed more light on the grid-integration costs of solar power in India. During project implementation, this economic analysis will be updated with the revised findings of this study.

<sup>46</sup> Pudjianto, D., et al. "Grid integration cost of photovoltaic power generation: Direct costs analysis related to grid impacts of photovoltaics." *Munich, Germany: PV PARITY* (2013).

reality, the ability to avoid or defer generation capacity depends on a variety of such factors as the underlying load growth, timing, quantity, and geographic location of the PV generation plant, as well as the coincidence of PV generation with system peak.

15. **Avoided Global Environmental Damage Cost.** Avoided global externalities constitute another economic benefit of the Rewa solar park, given that solar power replaces coal generation. Emissions of coal-based generation displaced by the solar park are estimated using an emission factor of 827 tons per GWh. Consistent with the Bank’s guidance on the social value of carbon, carbon emission reductions are valued in the base case at US\$30 in 2015, increasing to US\$80 in real terms by 2050. For the sensitivity analysis, the Bank’s suggested guidance for the low (US\$15 in 2015 increasing to US\$50 in 2050) and high (US\$50 in 2015 increasing to US\$150 in 2050) paths is used.

**Table A5.2 Energy Balance of Rewa Solar Park**

			2017	2018	2019	2020
[1]	disbursement	750 [MW]	0.2	0.4	0.4	
[2]	installed capacity					
[3]	year 1	[MW]	150			
[4]	year 2	[MW]		300		
[5]	year 3	[MW]			300	
[7]	energy	capacity factor				
[8]		0.189 [GWh]	248.3	248.3	248.3	248.3
[9]		0.189 [GWh]		496.7	496.7	496.7
[10]		0.189 [GWh]			496.7	496.7
[11]	total PV energy	[GWh]	248.3	745.0	1241.7	1241.7
[12]	displaced diesel self-generation	0 [GWh]	0.0	0.0	0.0	0.0
[13]	displaced grid generation	[GWh]	248.3	745.0	1241.7	1241.7
[14]	displaced gas generation	0 [GWh]	0.0	0.0	0.0	0.0
[15]	displaced coal generation	1 [GWh]	248.3	745.0	1241.7	1241.7

16. **Avoided Local Environmental Damage Costs.** For coal generation plants in India, the emission factors for SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub> are taken from Cropper et al.<sup>47</sup> Damage costs are from the latest version of the World Bank’s Guidelines for Economic Analysis of Power Projects, which are based on the 2015 Update of the Six Cities Study (Table A5.3). The local environmental damage costs of coal are based on modern coal units with state-of-the art pollution control (and tall stacks).

**Table A5.3 Emission Factor and Damage Costs**

<i>Factor or cost</i>	<i>Unit of measure</i>	<i>Nitrogen oxide (NO<sub>x</sub>)</i>	<i>Particulate matter (PM<sub>10</sub>)</i>	<i>Sulfur dioxide (SO<sub>2</sub>)</i>
Emission Factor, coal	g/kWh	2.09	0.227	1.44
Damage costs, coal	US\$/ton	16	66	21

17. **Non-Quantified Benefits.** The proposed solar park is expected to have additional benefits that are either uncertain or difficult to quantify. These include (i) energy security, (ii) macroeconomic benefits through the development of solar manufacturing industries, (iii) employment generation, and (iv) learning and economy-of-scale benefits, which can help facilitate further reductions in the cost of solar PV. These benefits have not been included in this economic analysis.

<sup>47</sup> Cropper, M., S. Gamkhar, K. Malik, A. Limonov, and I Partridge, *The Health Effects of Coal Electricity Generation in India*, Resources for the Future, June 2012

## Economic Analysis

18. **Assumptions.** In addition to the costs and benefits previously noted, the economic analysis rests on additional assumptions, as follows:

- a) Discount rate for calculating NPV: The Bank’s guideline on discount rate, issued in May 2016, recommends the use of a discount rate twice the expected long-term per capita growth rate of the country.<sup>48</sup> Since India has grown at an average rate of 5 percent over the last 20 years and can be expected to maintain this rate going forward, a 10 percent discount rate is used in this analysis for the base case, while NPVs for the 6 percent discount rate are presented as a sensitivity analysis.
- b) Subproject cost phasing: In 2017, 100 percent of the costs for shared infrastructure and transmission will be phased in. For PV generation, cost phasing occurs over a three-year period (20 percent in 2017, 40 percent in 2018, and 40 percent in 2019).
- c) Life of the subproject: 25 years

19. **Results.** The baseline ERR of the “with Rewa solar park” scenario is 15.3 percent (NPV US\$156.7 million) (Table A5.4). Local and global environmental benefits add 15 percentage points (NPV US\$365 million) to the ERR.

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<sup>48</sup> The guidance on appropriate social discount rates is anchored in welfare economics. Standard welfare analysis tells us that the net benefits of a project at different points in time should be valued according to their marginal impact on welfare at the time they occur. Higher (lower) growth prospects would normally imply a higher (lower) discount rate for a particular country. Given reasonable parameters for the other variables in the standard Ramsey formula linking discount rates to growth rates, a 3 percent per capita growth rate translates into a 6 percent discount rate, and per capita growth rates of 1–5 percent yield discount rates of 2–10 percent.

**Table A5.4 Summary of Economic Analysis**

			NPV	2017	2018	2019	2020
[1]	<b>Generation Costs</b>						
[5]	MW installed	750.0	[MW]	150.0	300.0	300.0	
[6]	investment cost		[\$USm]	406.6	112.5	202.5	182.3
[7]	cumulative		[\$USm]	113	315	497	
[8]	O&M Costs	1.5%	[\$USm]	55.4	0.8	0.8	4.7
[9]	<b>Shared Infrastructure Costs</b>						
[10]	cost	320.42	[\$USm]	45.7			
[11]	less import duty&tax	0.2	[\$USm]	-9.1			
[12]	economic cost		[\$USm]	33.3	36.6		
[13]	O&M on Shared Infrastructure	1.5%	[\$USm]	4.6	0.0	0.5	0.5
[14]	<b>External Transmission Cost</b>		[\$USm]				
[15]	Cost	305.4	[\$USm]	43.6			
[16]	less import duty&tax	0.3	[\$USm]	-13.1			
[17]	economic cost		[\$USm]	27.7	30.5		
[18]	O&M on transmissison	1.5%	[\$USm]	3.8	0.0	0.5	0.5
[20]	VRE integration cost	0.73	[USc/kWh]	0.0	0.0	0.0	0.2
[21]	VRE integration cost		[\$USm]	133.2	0.0	0.0	0.0
[23]	<b>total costs</b>		[\$USm]	<b>628.6</b>	<b>180.4</b>	<b>204.4</b>	<b>188.0</b>
[25]	<b>Benefits</b>						
[26]	<b>grid(displaced gas)</b>						
[27]	avoided variable costs		[\$USm]	0.0	0.0	0.0	0.0
[28]	avoided capacity costs		[\$USm]				
[29]	<b>grid (displaced coal)</b>						
[30]	avoided variable costs		[\$USm]	330.4	8.1	24.3	40.6
[31]	avoided capacity costs	929 0	[\$USm]	88.9	0	0.0	26.5
[32]							
[33]	<b>total benefits</b>		[\$USm]	<b>419.3</b>	<b>8.1</b>	<b>24.3</b>	<b>67.0</b>
[34]	<b>total economic flows</b>		[\$USm]	<b>-209.2</b>	<b>-172.4</b>	<b>-180.1</b>	<b>-120.9</b>
[35]	ERR		[ ]	0.2%			
[36]	local environmental impacts						
[37]	avoided gas		[\$USm]	0.0	0.00	0.00	0.00
[38]	avoided coal		[\$USm]	14.7	0.2	0.7	1.3
[39]	economic flows including local env.		[\$USm]	-194.6	-172.1	-179.3	-119.7
[40]	ERR including local env.		[ ]	1.2%			
[41]	avoided GHG emissions		[\$USm]	351.3	6.8	21.0	36.0
[42]	<b>economic flows incl. global GHG benefits</b>		[\$USm]	<b>156.7</b>	<b>-165.4</b>	<b>-158.4</b>	<b>-83.7</b>
[43]	ERR including global GHG		[ ]	15.3%			

20. Sensitivity analysis using the low-case (increasing from US\$15 per ton in 2015 to US\$50 in 2050) and high-case (increasing from US\$50 per ton in 2015 to US\$150 per ton in 2050) social values of carbon recommended by the Bank's guidance impacts the returns of the subproject significantly. There is a 12 percentage point difference between the ERRs for the low and high cases, suggesting that climate change and local pollution impacts comprise an extremely important factor in this subproject (Table A5.5).

**Table A5.5 Sensitivity Analysis on Social Value of Carbon**

Case	Social value of carbon	
	NPV (US\$ million)	ERR (%)
Low	-11	10
Base	156	15

Case	Social value of carbon	
	NPV (US\$ million)	ERR (%)
High	395	22

21. Table A5.6 provides the summary calculations of the economic returns for both the 10 percent and 6 percent discount rates.

**Table A5.6 Economic Analysis Results**

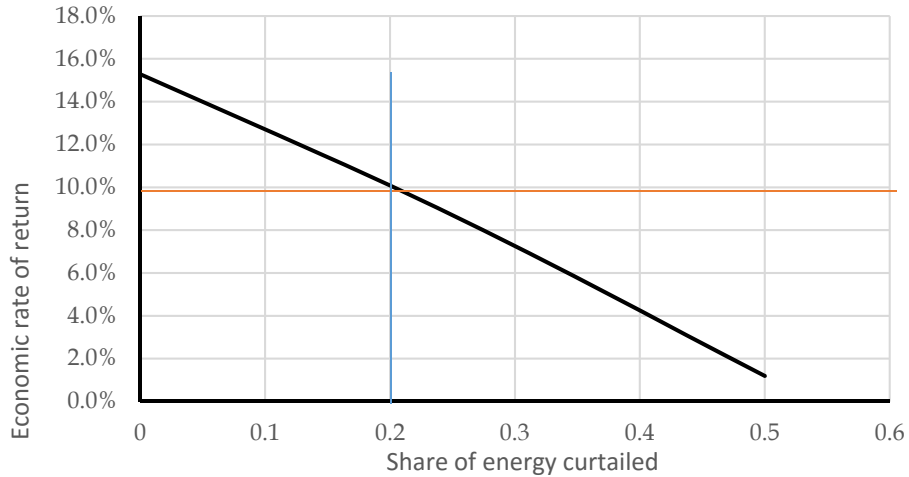
[1]	Discount rate		10.0%	6.0%
[2]	<b>Economic rate of return</b>			
[3]	ERR	[ ]	15.3%	15.3%
[4]	ERR excluding GHG	[ ]	1.2%	1.2%
[5]	ERR excluding GHG and local pollution	[ ]	0.2%	0.2%
[6]	Levelized cost of solar PV	US\$/Kwh	0.06	0.05
[7]	Levelized cost of counterfactual	US\$/Kwh	0.04	0.04
[8]				
[9]	<b>Composition of NPV</b>			
[10]	<i>Costs</i>			
[11]	Generation Costs	[\$USm]	407	439
[12]	Generation O&M	[\$USm]	55	84
[13]	Shared Infrastructure Costs	[\$USm]	33	35
[14]	Shared Infrastructure O&M	[\$USm]	5	7
[15]	Transmission Costs	[\$USm]	28	29
[16]	Transmission O&M	[\$USm]	4	6
[17]	Incremental Grid Integration Costs	[\$USm]	97	157
[18]	<b>total costs</b>	<b>[\$USm]</b>	<b>629</b>	<b>756</b>
[19]	<i>Benefits[avoided thermal generation]</i>			
[20]	Avoided fuel costs: Gas	[\$USm]	0	0
[21]	Avoided fuel costs: Coal	[\$USm]	330	486
[22]	Capacity credit	[\$USm]	89	104
[23]	<b>total benefits</b>	<b>[\$USm]</b>	<b>419</b>	<b>590</b>
[24]	<b>NPV (before environmental benefits)</b>	<b>[\$USm]</b>	<b>-209.2</b>	<b>-166.2</b>
[25]	local environmental benefits	[\$USm]	14.7	23.4
[26]	<b>NPV (incl. Local environmental benefits)</b>	<b>[\$USm]</b>	<b>-194.6</b>	<b>-142.8</b>
[27]	value of avoided GHG emissions	[\$USm]	351.3	539.0
[28]	<b>NPV (including environment)</b>	<b>[\$USm]</b>	<b>156.7</b>	<b>396.2</b>
[29]	Lifetime GHG emissions, undiscounted	mtons CO2	-25.7	-25.7

### Sensitivity Analysis

22. **Energy Curtailment.** During times of power oversupply, unfavorable market conditions, or grid congestion power system operator may curtail energy resources. Curtailment is an obvious forfeiture of energy, and it increases the lifetime cost of electricity from curtailed generators. In southern India, curtailment has been a major factor for wind generation and is a risk for solar power generation as well.

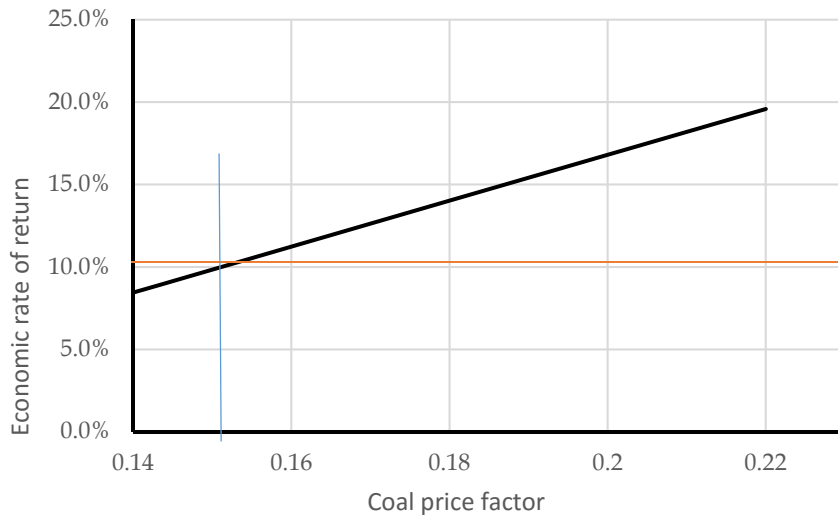
Sensitivity analysis on this important variable shows that the ERR falls from 15.3 percent to 7.7 percent if 25 percent of the electricity generation is curtailed (Figure A5.4).

**Figure A5.4 Economic Rate of Return versus Share of Energy Curtailed**



23. **Capacity Utilization Factor.** Figure A5.5 shows the sensitivity of ERR to different CUFs. A CUF of 14 percent results in an ERR of 7.2 percent, while a CUF of 22 percent results in an ERR of 18.4 percent. The switching value of the CUF is 15 percent, which is below the lower bound of expected values for this variable and thus is highly unlikely.

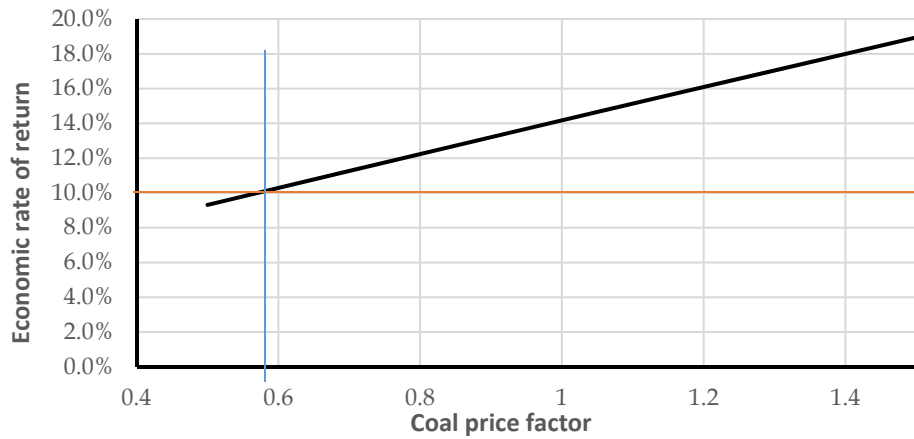
**Figure A5.5 Economic Rate of Return versus Capacity Utilization Factor**



24. **Coal price.** Figure A5.6 shows the sensitivity of ERR to different levels of coal price. The switching value is attained for a coal price factor of 0.52, which is a highly unlikely scenario.



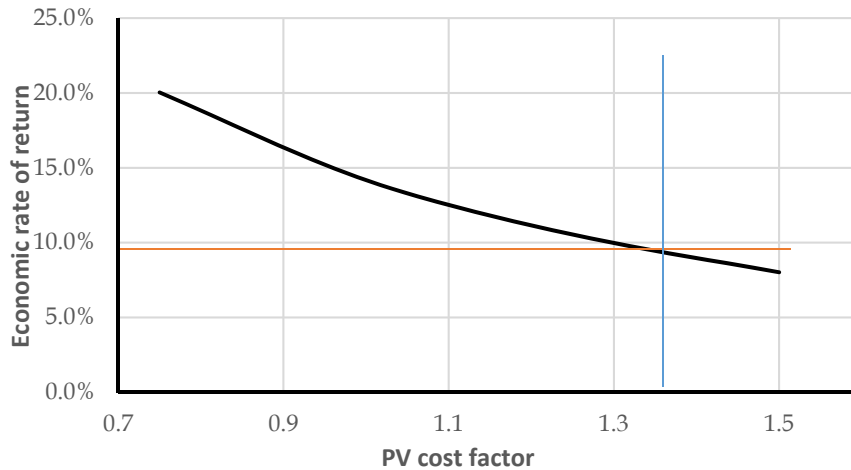
**Figure A5.6 Economic Rate of Return versus Coal Price Factor**



25. **PV Cost.** Since solar power is a relatively new area of development, there continues to be significant uncertainty on cost estimates. While the overall direction of costs in recent years has witnessed a downward trend, it is unclear whether the recent rates of decline will continue to hold.

26. Figure A5.7 shows the sensitivity of ERR to variation in the cost of solar PV. The switching value at which the subproject cost overrun factor causes the ERR (with environmental benefits) to decrease to the hurdle rate of 10 percent is 1.39. By contrast, a cost under-run factor of 0.75 would cause the ERR to increase to 20 percent.

**Figure A5.7 Economic Rate of Return versus PV Cost Factor**



27. **Switching Values.** The switching values analysis is summarized in Table A5.7.

**Table A5.7 Switching Values**

<i>Variable</i>	<i>Baseline</i>	<i>Switching value</i>
PV cost factor	1	1.39
Share of energy curtailed	0	0.20

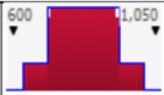
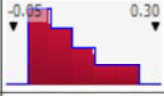


<i>Variable</i>	<i>Baseline</i>	<i>Switching value</i>
Coal price factor	1	0.52
Capacity utilization factor	0.189	0.15

### Risk Assessment Using Monte Carlo Simulation

28. The objective of risk assessment is to derive a probability distribution of economic returns. This is achieved using the Monte Carlo simulation, in which the input variables to the calculation of returns are specified as probability distributions rather than as single “best estimates.” The ERR is then calculated for each random drawing from these probability distributions (repeated 5,000 times in this analysis), from which the probability distribution for economic returns follows. The assumed probability distributions for the uncertainty in input assumptions, as well as the rationale for the hypothesized distributions, are as follows (Table A5.8):

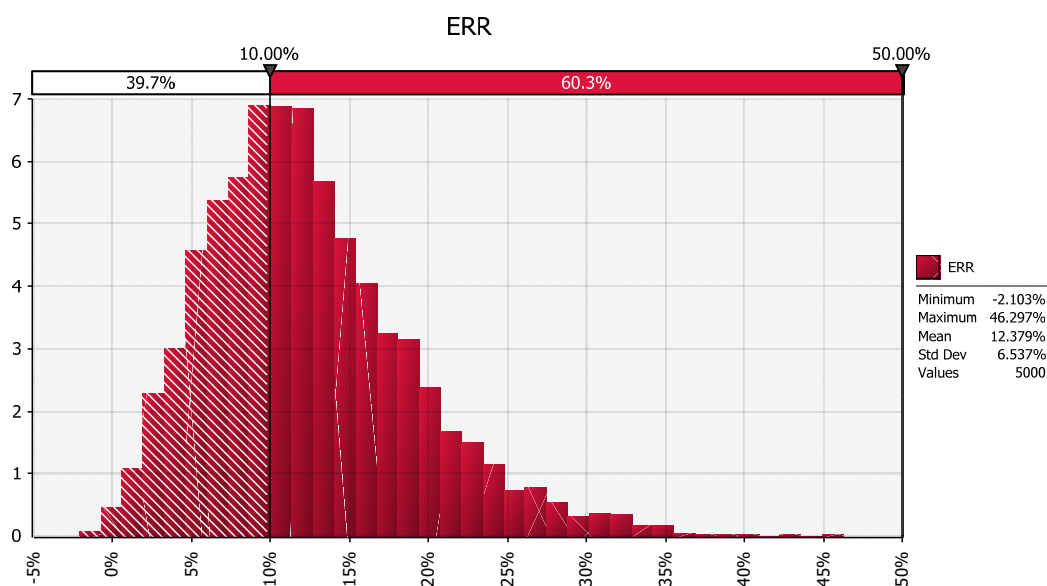
- Capital cost: The probability distribution is skewed to the right, given the experience that capital cost estimates tend to be higher, rather than lower, than assumed.
- Energy curtailed: The probability distribution is skewed to the right, based on India’s past experience with renewable energy projects, which have not always been able to evacuate all the electricity generated to the grid.
- Capacity utilization factor: If the solar park’s O&M is poor, the subproject may find it difficult to maintain the planned CUFs. Likewise, if the number of hours of solar irradiation at the solar park is lower than initially estimated, the CUF may turn out to be lower. Since the downside risk to CUF is higher, the probability distribution is skewed to the left.
- Coal price factor: The probability distribution of the projected annual increase in coal price is centered on the base-case scenario, with equal probability of the price being higher or lower.

**Table A5.8 Assumed Probability Distributions of Input Variables**

Name	Graph	Min	Mean	Max	5%	95%
Capital cost		650.11	825.00	999.96	688.47	961.49
Share of energy curtailed		0.00	0.09	0.25	0.01	0.22
Coal price factor		0.25	1.13	2.00	0.42	1.82
Capacity utilization factor		0.1400135	0.1782222	0.2199968	0.1471814	0.2127833

29. Figure A5.8 shows the results of the Monte Carlo simulation, shown as the probability distribution of economic returns. The probability that returns fall below the hurdle rate is 39.7 percent (the area under the curve to the left of 10 percent), indicating some downside risks to achieving the forecast returns. This causes the mean of the ERR probability functions (12.4 percent) to be lower than the ERR, based on “most likely” values (15.3 percent).

**Figure A5.8 Monte Carlo Simulation**



**Financial Analysis – Rewa Solar Park**

30. The FIRR of the Rewa solar park for RUMSL, the state PIA, is 10 percent (Table A5.9). RUMSL will incur shared infrastructure investment and administrative costs, which will be covered through annual land, infrastructure, and administrative charges to solar park developers and a subsidy from MNRE (Table A5.10).<sup>49</sup> In NPV terms, solar park developers will pay INR 4.5 million per MW of capacity over a 25-year time span.

**Table A5.9 Financial Internal Rate of Return**

	NPV	2017	2018	2019	2020	2021
<b>RUMSL</b>						
<i>benefits</i>						
<b>Share infrastructure charges to developers</b>						
Land charges	1336.8	0.0	162.0	162.0	162.0	162.0
Infrastructure charge	1587.9	0.0	163.0	163.0	163.0	163.0
Administration charge		0.0	23.0	24.2	25.4	26.6
Subsidy payment from MNRE to RUMS		1052.8				
<b>total benefits</b>			348.0	349.2	350.4	351.6
<i>costs</i>						
Shared infrastructure investment Cost	2330.3	2563.4	0.0	0.0	0.0	0.0
Taxes on Shared Infrastructure	582.6	640.8	0.0	0.0	0.0	0.0
Administrative expense			23.0	24.2	25.4	26.6
<b>net cash flows</b>		-3204.2	325.0	325.0	325.0	325.0
<b>aggregate FIRR</b>	10.0%					

<sup>49</sup> The financial plan for RUMSL was developed by the IFC, as part an advisory assignment.

**Table A5.10 Breakdown of Charges to Developers**

<i>Type of charge</i>	<i>Annual charge per MW (INR million)</i>	<i>Time span (years)</i>
Land	0.2	20
Infrastructure	0.2 for 10 years; 0.3 for next 5 years; 0.38 for final 10 years	25
Administration	0.03, with 5 percent increase each year	25

**Financial Analysis – IREDA**

31. The financial analysis of IREDA is focused on its past performance from FY2011 to FY2016. The business plan, which is in draft stage, was referred to review the financial performance of IREDA over this period. As can be observed from Table A5.11, all the parameters and specifically net worth indicating good financial health, saw a double digit growth compounded annually during the period FY2011 to FY2016. With the growth in the business and the increase in profits over this period, IREDA also paid out dividends on a rising trajectory. However, the net percentage of non-performing assets of IREDA have seen an upward trend during this period from 0.79 percent in FY2011 to 4.09 percent in FY2016.

**Table A5.11 Historic Performance of IREDA (US\$ Million)**

<b>Year</b>	<b>2010-11</b>	<b>2011-12</b>	<b>2012-13</b>	<b>2013-14</b>	<b>2014-15</b>	<b>2015-16</b>	<b>CAGR</b>
<b>Loan Sanctions</b>	469	511	562	572	682	1,170	<b>20.08%</b>
<b>Disbursements</b>	184	278	319	370	393	638	<b>28.31%</b>
<b>Investment</b>	544	774	953	1,183	1,278	1,445	<b>21.56%</b>
<b>Capital Employed</b>	554	817	995	1,261	1,445	1,838	<b>27.13%</b>
<b>Net Sales</b>	60	80	109	134	168	176	<b>23.91%</b>
<b>Profit Before Tax</b>	25	31	38	51	57	63	<b>20.16%</b>
<b>Net Profit</b>	18	26	30	36	41	45	<b>19.86%</b>
<b>Net Worth</b>	190	219	253	290	327	344	<b>12.68%</b>
<b>Net Profit/Net Worth</b>	9.5%	11.9%	12.0%	12.4%	12.5%	13.0%	-

32. IREDA is subject to capital to risk asset ratio (CRAR) requirements as prescribed by the Reserve Bank of India (RBI) that prescribes it to maintain it a minimum of 15 percent based on IREDA's total capital to risk weighted assets. IREDA has been able to meet that requirement with the CRAR of 21.8 percent in FY2016. However, the debt-equity ratio, which is a measure of a company's financial leverage, has been increasing since FY2011 and stands at little over 4:1 for FY2016. This is due to the fact that increase in debt raised by IREDA is higher than the increase in its reserves and surplus and share capital.

## Annex 6. Clean Technology Fund Investment Plan

**Table A6.1 Key Indicators for the World Bank Project and Scaled-Up Scheme**

<i>Key Indicators</i>	<i>CTF/World Bank-funded Project-Phase I</i>	<i>CTF/World Bank-funded Project-Phase II</i>	<i>Scaled-up Phase: Solar Park Scheme of MNRE by 2022<sup>50</sup></i>
Installed solar PV generation capacity in supported solar parks (MW)	1,750 MW	1,750 MW	22,050 MW
Tons of GHG emissions reduced or avoided			
- Thousand Tons per year [mtCO <sub>2</sub> eq/yr]	2.4	2.4	30.3
- Thousand Tons over lifetime [mtCO <sub>2</sub> eq / 25 years] <sup>51</sup>	60.1	60.1	757.5
Financing leveraged through CTF financing (US\$ million)	US\$2,003 million - US\$75 million by IBRD - US\$100 million by the GOI and state governments - US\$400 million by public sector for transmission - US\$1,428 million by private and public sector for generation capacity in the solar parks	US\$2,003 million - US\$75 million by IBRD - US\$100 million by the GOI and state governments - US\$400 million by public sector for transmission - US\$1,428 million by private and public sector for generation capacity in the solar parks	US\$29.5 billion - US\$150 million by IBRD - US\$7.3 billion by GOI and state governments - US\$22 billion by private and public sector for generation capacity in the solar parks
CTF leverage ratio	1 : 80	1 : 80	1 : 590
Cost effectiveness			
- CTF cost effectiveness [US\$ <sub>CTF</sub> / tCO <sub>2</sub> eq avoided over lifetime]	0.42	0.42	0.07
- Total project cost effectiveness	33.8	33.8	39.2

<sup>50</sup> The *Scaled-up Phase* assumes that the proposed CTF-funded Project contributes to the achievement of the ‘solar park scheme’ launched by MNRE to facilitate the development of large scale solar power in India. The scheme will install large scale grid-connected solar parks by 2022, with a targeted, collective installed capacity of 20GW (doubled to 40 GW in February 2012).

<sup>51</sup> The lifetime of solar PV generation facilities was hereby assumed at 25 years.

<i>Key Indicators</i>	<i>CTF/World Bank-funded Project-Phase I</i>	<i>CTF/World Bank-funded Project-Phase II</i>	<i>Scaled-up Phase: Solar Park Scheme of MNRE by 2022<sup>50</sup></i>
[US\$ <sup>Total</sup> / <sup>Project</sup> / tCO <sub>2</sub> eq avoided over lifetime]			
Other co-benefits	<ul style="list-style-type: none"> <li>- Support in meeting the electricity demand and contribute to the universal access agenda.</li> <li>- Increased opportunities of local employment.</li> <li>- Contribute to cost reduction in solar PV technologies.</li> <li>- Environmental co-benefit: reduced local air pollution of 74.8 kt of NO<sub>x</sub>, 51.5 kt of SO<sub>x</sub> and 8.1 kt of PM<sub>10</sub> per annum after the <i>Scaled-up Phase</i>.</li> <li>- Gender co-benefit: interventions to be designed to address gender issues in the proposed solar park sites.</li> </ul>		

**I. Introduction**

**Background: country and sector context**

1. Fueling India’s economic growth and providing electricity to its rising population require accelerating the growth of its power system. India is placed among the world’s top ten, fastest-growing nations, having expanded its economy at an average annual rate of 7.6 percent over the past decade.<sup>52</sup> It is projected that such high rates of growth will continue. The country’s demand for power is expected to rise to support the growing manufacturing sector and meet its people’s rising aspirations. With about 314 GW of installed capacity (January 2017 figure),<sup>53</sup> India’s power system is among the largest in the world. Yet per capita electricity consumption is less than one-third of the global average. An estimated 300 million people are not connected to the national electrical grid. Furthermore, those who are, face frequent power disruptions. Industrial establishments and manufacturers still rely on diesel-based backup power supplies, which are significantly more expensive than grid-based electricity. Lack of a reliable electricity supply is also leading to diverting resources to coping costs that could otherwise be used to support growth.

2. The GOI has announced a bold target of installing 100 GW of solar power out of a total renewable-energy target of 175 GW by 2022. For solar power, the target represents about a twelve-fold increase in installed capacity compared to January 2017, which is almost 9 GW.<sup>54</sup> To meet its ambitious targets, the GOI wishes to significantly increase the pace of solar power deployment. It foresees that at least 60 GW of the targeted installations will come from large-scale, ground-mounted solar power plants. Of these, 40 GW will be installed in solar parks: concentrated zones of solar power generation projects that provide developers a well-characterized area, with appropriate infrastructure and access to amenities, where project risks can be minimized.

3. The scaled-up development of large solar-power generation projects within such a short time frame presents significant challenges for India. The main barriers are identified as follows: (i) unavailability of

<sup>52</sup> See World Bank, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2015&locations=IN&start=2005>

<sup>53</sup> See Central Electricity Authority, Monthly Report on Power Sector, January 2017.

<sup>54</sup> In 2009, the installed capacity of solar power was only about 2 megawatt (MW).

large tracts of suitable land; (ii) lengthy land acquisition process; (iii) no single window for obtaining permits and clearances (e.g., land, transmission evacuation, and environment); (iv) limited access to transmission network; (v) relatively low capacity of nascent agencies in the renewable energy sector; (vi) long-term, contractually-binding PPAs of distribution companies with conventional power plants; (vii) higher tariff compared to existing PPAs with conventional power plants, which does not reflect solar power's positive externalities (e.g., environmental and health benefits) and thus is not an obvious choice for the distribution companies; and (viii) grid-integration challenges due to the variable nature of renewable energy.

4. In 2014, the GOI launched the Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects to meet some of the above-mentioned challenges and facilitate the development of large-scale solar-power plants in India.<sup>55</sup> Under this Scheme, 34 large-scale, grid-connected solar parks of varying capacities were sanctioned,<sup>56</sup> together constituting 20 GW to be commissioned by 2022. This target has been doubled to 40 GW in February 2017. The solar parks are being developed through a close partnership between the central government's MNRE, SECI, and respective state governments.<sup>57</sup> This Scheme applies lessons from India's Charanka and Bhadla solar parks, as well as international experience in similar-scale solar-power development projects (e.g., United States and South Africa).

5. The initiative for creating a large-scale solar park under the scheme rests with the individual states, whose first step is to identify and purchase or lease the land for setting up the parks. The states are entitled to receive CFA of up to 30 percent of project costs—about US\$30,000 per MW (INR2 million per MW)—for preparing a DPR and constructing shared infrastructure or common facilities in these sanctioned solar parks.<sup>58</sup> As per the Scheme, the solar parks can be developed and managed by (i) the SNA responsible for promoting renewable energy in the respective state, (ii) a JV company between SNA and SECI (iii) SECI alone, or (iv) private-sector entrepreneurs.

### India's CTF Investment Plan

6. The CTF Investment Plan for India was originally endorsed in November 2011, and subsequently revised in August 2015, with a total indicative allocation of US\$775 million of CTF resources. The revised Investment Plan aims to support GOI's ambitious target of 100 GW of solar installed capacity by 2022. The Plan includes the following proposed activities (Table A6.2).

**Table A6.2 – Revised CTF Investment Plan of India, Indicative Financing Plan (US\$ million)**

<i>CTF Project/Program</i>	<i>MDB</i>	<i>CTF financing (US\$ m)</i>
Himachal Pradesh Environmentally Sustainable Development Policy Loan	World Bank	100
Partial Risk Sharing Facility for Energy Efficiency	World Bank	25
Solar Park: Rajasthan	ADB	200
Shared Infrastructure for Solar Parks	World Bank	50
	ADB	50

<sup>55</sup> <http://mnre.gov.in/file-manager/grid-solar/Scheme-forpercent20development-of-Solar-Park-&-Ultra-Mega-Solar-Power-Project-2014-2019.pdf>

<sup>56</sup> <http://mnre.gov.in/file-manager/UserFiles/List-of-approved-Solar-Parks.pdf>

<sup>57</sup> [http://www.pv-magazine.com/news/details/beitrag/india-to-double-large-scale-solar-target-to-40-gw-by-2020--says-minister\\_100025453/#axzz4JLy9YvAz](http://www.pv-magazine.com/news/details/beitrag/india-to-double-large-scale-solar-target-to-40-gw-by-2020--says-minister_100025453/#axzz4JLy9YvAz)

<sup>58</sup> These include common electrical equipment that allows power generated inside the park to be metered, pooled in substations, and sent out of the park to various customers and common security and lighting arrangements for the park, as well as needed access roads and water supply for cleaning panels.

<i>CTF Project/Program</i>	<i>MDB</i>	<i>CTF financing (US\$ m)</i>
Transmission for Power Evacuation from Solar Parks		
	ADB	50
Grid-Connected Rooftop Solar PV	World Bank	125
	ADB	125
Solar PV Generation by SECI	World Bank	50
<b>Total</b>		<b>775</b>

## **Project Description**

7. The objective of the proposed Shared Infrastructure for Solar Parks Project is to increase India’s solar generation capacity through the establishment of large-scale solar parks in selected states, thereby contributing to achievement of the GOI’s target of installing 100 GW solar power by 2022. Under the project, the World Bank will support the setting up of solar parks in four Indian states—Madhya Pradesh, Chhattisgarh, Haryana, and Odisha—keeping open the option for other states to join if they can meet the established agreed-on conditions, referred to as the project’s Readiness Criteria for subprojects. The first two solar parks are located in the Rewa and Mandasaur districts of Madhya Pradesh, with expected installed capacities of 750 MW and 250 MW, respectively. The estimated investment cost for shared infrastructure in these parks is US\$62 million (of which the project is funding US\$31 million). The state has already secured a majority of the land and has awarded the packages for shared infrastructure facilities for both the solar parks. The Bank will cover financing for shared infrastructure, including access roads, water supply and drainage, telecommunications, and pooling stations inside the solar parks (with 220/66/33 kV or switchyard and respective transformers as may be suitable). Technical assistance will also be provided for capacity building of IREDA, the SNAs and the JVs across participating states.

8. The proposed project is proposed in two phases. This will help to make sure that IBRD and CTF funds are not underutilized and the Borrower doesn’t incur unnecessary commitment fees on undisbursed amounts, as solar parks to be supported under this project are at different stages of development. Currently, the state PIA in Madhya Pradesh has awarded the contracts in its two solar parks while other states are still identifying suitable land areas for establishing solar parks. Therefore, after commitment of funds under Phase-I, the next phase of the project will be submitted to the World Bank Board with each phase having equal funding allocation. The first phase will be submitted for the Bank’s Board approval in March 2017. The second phase is targeted to be submitted within 18 months of the approval of the first phase.

9. The first phase of the proposed project will mobilize US\$200 million, including US\$75 million from IBRD, US\$25 million from CTF and US\$100 million from the GOI and state governments. The solar parks supported by the project are expected to mobilize additional US\$1,828 million of private and public sector financing for solar PV generation capacity and transmission. The CTF funding would comprise US\$23 million to be extended under softer concessional terms and US\$2 million to be extended in the form of a grant.

10. The second phase of the project is also expected to mobilize the same amount, with the same composition of IBRD, CTF and other financing sources. For the total project, including both Phase I and II, a sum of US\$150 million from IBRD, US\$50 million from CTF and US\$200 million from public sector will support Shared Infrastructure for Solar Parks, leveraging additional US\$3.6 billion from public and private sectors for generation and transmission capacity.



## II. Assessment of the Proposed Project with CTF Investment Criteria

### Potential for GHG Emission Savings

11. **Emission reduction potential of investment.** The total emissions reduction potential in Phase I has been estimated at 60 million tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e) over the assumed 25-year lifetime of the solar PV power-generation facilities within the supported solar parks. These estimates are based on the installation of 1,750 MW of solar PV power-generation capacity, with a capacity factor of 18.9 percent, displacing an equivalent of 2,897 gigawatt hour (GWh) per year of thermal-based power in the baseline scenario.<sup>59</sup> The emission factors under the baseline scenario have been estimated at 827 kilogram per megawatt hour (kg/MWh),<sup>60</sup> which is more conservative than the grid emission factor for India.<sup>61</sup> Using this emissions factor, the CO<sub>2</sub> savings have been estimated at 2.4 million tCO<sub>2</sub>e per year. Savings have been calculated in accordance with the CTF and World Bank guidelines.<sup>62</sup>

12. **Technology development status.** The large-scale solar PV generation is already technically proven and commercially viable. Over the past decade, solar power has grown rapidly, driven by government policy and rapidly declining costs, propelling the solar industry into the mainstream of energy policy. From 2009, the JNNSM and state policies—especially in the states of Gujarat, Karnataka, Rajasthan, and Tamil Nadu—helped bring down the cost of generation. With the most recent bid (INR4.34 per kWh),<sup>63</sup> through reverse auction for one of six projects of 70 MW each to be set up in Rajasthan under the National Solar Mission, solar costs have fallen over 70 percent from 2010 levels. Since India lies in the high solar insolation region, declining cost trends in solar PV, along with innovations in energy storage technology, offer exciting opportunities for India to address its challenges in the energy sector.

13. The key technical issue for the project is the availability of a sound internal and external evacuation system for solar parks. Based on the LTA application from Rewa and Mandsaur solar parks, POWERGRID has conducted detailed grid evacuation and impact studies and established augmentation/additions needed to the existing network so that the generation can be absorbed without any adverse effect. These studies cover load flow analysis, reactive power flow patterns, and measures and corrective actions to be implemented by the grid partners. The studies also assess the health of the consolidated system in case of outage of any network element of the grid, including solar park generation. The findings of these studies are presented in the Standing Committee chaired by CEA, for deliberations and clearance.

### Cost-effectiveness

14. The cost effectiveness is US\$0.42 per tCO<sub>2</sub>e for CTF funding and US\$33.8 per tCO<sub>2</sub>e considering total project funding. In the scaled-up phase, the cost effectiveness will improve to US\$0.07 per tCO<sub>2</sub>e for CTF funding and US\$39.2 per tCO<sub>2</sub>e when considering total funding.

15. **Marginal Abatement Cost.** In October 2013, the CTF Trust Fund Committee suggested providing information on the estimated marginal abatement cost (MAC) for projects for which it is likely to exceed US\$100 per tCO<sub>2</sub>e. This decision draws from the CTF criteria, which specify that CTF co-financing will not be available for investments in which the marginal cost of reducing a ton of CO<sub>2</sub>e exceeds US\$200, which reflects the lower-end estimate of the incentive needed to achieve the objectives of the BLUE Map Scenario.<sup>64</sup>

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<sup>59</sup> The baseline scenario assumes that imported coal is used for thermal-based power generation.

<sup>60</sup> 830 kg per MWh for coal generation from supercritical plants.

<sup>61</sup> 980 kg per MWh from CO<sub>2</sub> Baseline Database for the Indian Power Sector, Central Electricity Authority.

<sup>62</sup> See World Bank, Guidance Manual: Greenhouse Gas Accounting for Energy Investment Operations, 2015.

<sup>63</sup> <http://pib.nic.in/newsite/PrintRelease.aspx?relid=134602>

<sup>64</sup> As indicated in the International Energy Agency (IEA), *Energy Technology Perspectives 2008 Report*.

16. The MAC of the proposed project based on the economic analysis of the 750 MW Rewa *Solar Park* is 8.1 US\$/tCO<sub>2</sub>eq. These calculations confirm that the MAC will not exceed the aforementioned US\$100 threshold value per ton of CO<sub>2</sub>eq. The project will help avoid local and environmental damage costs equal to US\$ 366 million compared to the thermal counterfactual.

17. The MAC is computed as the project's NPV divided by lifetime CO<sub>2</sub>e (LCO<sub>2</sub>) avoided emissions, expressed as follows:

$$MAC = \frac{NPV}{LCO_2},$$

Where, NPV stands for Net Present Value and LCO<sub>2</sub> stands for lifetime CO<sub>2</sub>e emissions.

### **Demonstration Potential at Scale**

18. *Scope of avoided GHG emissions through replication.* India's ambitious target calls for the installation of 60 GW of large-scale, ground-mounted solar power plants by 2022. MNRE's Solar Park Scheme aims to develop these large-scale, grid-connected solar parks through public-private partnership arrangements, with a cumulative installed capacity of about 20 GW of solar power by 2020. The proposed project will directly contribute toward these targets, thus contributing to significant emissions reduction. It is expected that CTF and IBRD support for the selected solar parks will create market confidence that will catalyze further support from other investor groups to help the GOI achieve its targets. The expected emissions reduction from achieving the scaled-up phase is estimated at 30 million tCO<sub>2</sub>e per year or 755 million tons over the assumed 25-year lifetime of the technologies.

19. *Transformation potential.* The proposed project has a high transformational potential as it will contribute to the accelerated development of large-scale solar PV generation and the rapid increase in the share of renewable energy in India's power sector. Developing solar parks will provide the enabling infrastructure for large-scale development of solar power, including common infrastructure (e.g., large areas of land, power-pooling substations and intra-park transmission infrastructure, access roads, and security arrangements). This will facilitate investment in solar-power development by private- or public-sector developers, who may be able to shorten the time from contract award to commissioning from 20 months to less than 10 months. MNRE's Solar Park Scheme also aims to reduce the number of approvals required by developers to set up solar generation plants and thus attract private investments in such plants. In fact, strong response to solar parks in Rajasthan and Andhra Pradesh has resulted in invited bids from the private sector. This trend is expected to continue for installations being developed inside the parks, which will help the solar parks in transforming the power sector.

### **Development Impact**

20. *Support to Bridge the Energy Supply Gap and Contribute to the Universal Access Agenda.* Power shortages in FY2015 were equivalent to about 3.6 percent of total energy and 4.7 percent of peak-capacity requirements. As previously mentioned, an estimated 300 million people are still not connected to the national electrical grid, and those that are connected face frequent power disruptions. Meeting the growing energy demand of a rapidly growing economy while reducing air pollutants and carbon emissions through solar energy is a top priority for the GOI, particularly given the high costs of the country's unserved electricity demand and growing energy imports. The development of solar energy will have significant benefits in terms of the reliability and security of electricity supply to consumers. The project is also likely to contribute indirectly to the significant expansion of electricity access as a result of the increased

availability of electricity in all project states, where project-supported investments are expected to lead to increased hours of supply to existing customers and greater availability of supply, which may enable the utilities to connect and serve new customers.

21. ***Increased opportunities of local employment.*** The development of large-scale solar parks will attract significant investments from project developers/generators which will generate employment opportunities for the local population. Local contractors, engaged through international competitive bidding, will carry out supply, installation, and erection works. JV created under the Scheme will develop the capacity required to operate and maintain the assets created under this project, which can provide long-term employment opportunities.

22. ***Environmental Co-benefits.*** Currently, India relies on coal to meet two-thirds of its electricity requirements and is the world's third-largest carbon emitter. Private investment in diesel-based backup power supplies is widespread. The energy sector also causes local environmental problems. The project's environmental co-benefits would be substantial. After the scaled up phase, at the local level, air pollutant emissions under the thermal counterfactual are estimated at 74.8 kt of NO<sub>x</sub>, 51.5 kt of SO<sub>2</sub> and 8.1 kt of PM<sub>10</sub> per year, which will be reduced by displacing imported coal for power generation with an increased supply of electricity from the solar parks developed under the Scaled-Up Phase.

23. ***Gender Co-benefit.*** The project is expected to bring positive gender co-benefits by incorporating gender impacts into this intervention. Most of the women's status indicators, including those pertaining to health, literacy, and labor force participation, show that gender equity and women's empowerment remain serious issues in the affected areas of the proposed solar parks. As part of the SMF, a GDF and a Gender Action Plan (GAP) will be designed to help analyze gender issues in the project-affected areas and design interventions to address women's needs. Gender analysis will be part of the SIA.

### **Implementation Potential**

24. The project is aligned with GOI's NAPCC, which was issued in 2008 to enhance India's ecological sustainability and encourage sustainable energy sources. It is also consistent with the JNNSM, launched in 2010 as part of the NAPCC to promote India's development of solar power. The GOI has significantly scaled up JNNSM's 20 GW solar power target to 100 GW by 2022. The GOI has reiterated the commitment as part of its NDC to achieve about 40 percent cumulative installed-power capacity from non-fossil-fuel energy resources by 2030.

25. There is strong project ownership at the highest levels of government, including MNRE, IREDA, the participating states, the distribution companies, and the JVs responsible for project implementation. This commitment has been demonstrated through these stakeholders' intensive engagement and involvement throughout the project preparation. As previously mentioned, the GOI and state governments are pushing through a number of policy and regulatory reforms, implementation mechanisms, and incentives to ensure that solar power costs are kept low and that sufficient demand for the offtake of solar power is generated under the project. The strong private-sector response to the solar park bids recently developed in Madhya Pradesh, Rajasthan and Andhra Pradesh proves that this modality will continue to work, helping to ensure the financial sustainability of the solar parks.

26. POWERGRID's involvement gives reasonable assurance that the project's design and implementation will be of high standards. This institution is capable of ensuring that the investments are made on time and are not left stranded. Over the past decade, POWERGRID has acquired and developed the skills required for successfully planning and implementing large-scale capital investment programs through its mandate to develop India's inter-state transmission network and by acting as Consultant to states needing assistance in developing their transmission and distribution networks (i.e., planning, design, and implementation).

Some of the subprojects envisaged under this operation are being designed, procured, and implemented by POWERGRID, which owns, operates, and maintains the national grid. In association with POSOCO, POWERGRID will take all due measures required to ensure grid stability. It will also handle all environmental and social issues with adequate expertise and attention, building on its implementation track record established under earlier World Bank-funded projects.

27. **Leverage.** The total project investment (Phase I and Phase II) are to be funded through the CTF (US\$50 million), IBRD (US\$150 million), central and state governments (US\$200 million), and public- and private-sector participation in solar PV generation facilities in the solar parks and transmission lines (US\$3,656 million). The CTF leverage ratio will be 1 to 80. The CTF leverage ratio will increase to 590 when considering the *Scaled-up Phase* by 2022. The leverage effect is expected very high, as this proposed project will effectively mobilize large amounts of investment in generation capacity by utilizing public sector financing for the development of required infrastructure which is a relatively small portion of total investment but will reduce the risk of the investment.

### CTF Additionality

28. The use of CTF concessional financing under the project is essential to develop solar parks that will enable large-scale deployment of solar PV generation in a short time frame. Solar parks can effectively address a number of challenges in accelerating the scale-up of solar PV generation capacity, which was committed by the GOI, but it requires public sector investment in transmission and other shared infrastructures within the parks. Given the specific transmission requirements of solar power and the risk of stranded assets, private sector investors continue to see the availability of state of the art transmission infrastructure to connect their solar generation project to load centers across the country, as a precondition to major investment decisions. By using concessional financing for the investment, the GOI will be able to establish the required infrastructure with a reduced cost of capital, which will be translated into a lower cost to private sector developers who will invest in generation capacity within the solar parks.

29. The economic rate of return of the solar park is calculated at 0.2 percent, which is lower than the hurdle rate of 12 percent. This estimate is based on the baseline scenario before taking into account environmental externalities and can be affected by a range of risk factors. The use of CTF concessional financing to enable the establishment of shared infrastructure in the solar parks is hence essential for improving the financial viability of the project and to fully capture the environmental benefits associated with this project.

### Implementation Readiness

30. Among all of the proposed subprojects, the solar parks in the most advanced stage of readiness are Rewa and Mandsaur (Madhya Pradesh), respectively. Based on LTA applications from RUMSL for these initial two solar parks, POWERGRID has already conducted detailed evacuation studies. Since the other proposed solar parks have not been finalized, investments under this project will be allocated in a phased manner. The GOI is keen to move this proposed project forward to help achieve its ambitious target on solar generation capacity.

**Table A6.3 – Tentative List of Solar Parks Allocated to the World Bank Project**

<i>S. No</i>	<i>State</i>	<i>Location (Capacity)</i>
<b>1</b>	Madhya Pradesh	Rewa (750 MW)
		Mandsour (250 MW)
		Neemuch (250 MW)
		Agar-Shajapur (500 MW)

<i>S. No</i>	<i>State</i>	<i>Location (Capacity)</i>
		Rajgarh-Morena (500 MW)
		Chhattarpur (500 MW)
<b>2</b>	Chhattisgarh	Rajnandgaon, Janjgir, Champa districts (500 MW)
<b>3</b>	Haryana	Hisar, Bhiwani, Mahendergarh districts (500 MW)
<b>4</b>	Odisha	Balasore (650 MW)