The World Bank

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PROGRAM-FOR-RESULTS DRAFT APPRAISAL DOCUMENT (QER STAGE)

ON A

PROPOSED IBRD LOAN

IN THE AMOUNT OF US$ 500 MILLION

AND A PROPOSED CLEAN TECHNOLOGY FUND (CTF) LOAN

IN THE AMOUNT OF US$ 120 MILLION

AND A PROPOSED CLEAN TECHNOLOGY FUND (CTF) GRANT

IN THE AMOUNT OF US$ 5 MILLION

AND A PROPOSED GLOBAL ENVIRONMENT FACILITY (GEF) GRANT

IN THE AMOUNT OF US$ 23 MILLION

TO THE

STATE BANK OF INDIA

FOR A

GRID-CONNECTED ROOFTOP SOLAR PROGRAM

NOVEMBER 25, 2015

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ABBREVIATIONS AND ACRONYMS

AD	Accelerated Depreciation
ADB	Asian Development Bank
AIS	Activity Initiation Summary
AT&C	Aggregate Technical and Commercial
BOO	Build Own Operate
BOOT	Build Own Operate Transfer
CEA	Central Electricity Authority
CPS	Country Partnership Strategy
CTF	Clean Technology Funds
DFID	Department for International Development
DLI	Disbursement Linked Indicator
Discoms	Electricity distribution companies
ESSA	Environmental and Social Systems Assessment
FITs	Feed in Tariffs
FM	Financial Management
GEF	Global Environment Facility
GHG	Green House Gas
GoI	Government of India
GRPV	Grid connected rooftop solar PV
GW	Gigawatts
GRSPP	Grid-connected Rooftop and Small Power Plant
IBRD	International Bank for Reconstruction & Development
IPF	Investment Project Financing
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Agency
JNNSM	Jawaharlal Nehru National Solar Mission
Kwh	Kilowatt-Hour
MNRE	Ministry of New & Renewable Energy
MW	Megawatts
NDMC	New Delhi Municipal Corporation
NAPCC	National Action Plan on Climate Change
OM	Operational Manual
O&M	Operate and Maintain
PAP	Program Action Plan
PDO	Program Development Objective
PforR	Program for Results
PIU	Program Implementation Unit
PPA	Power Purchase Agreement
PV	Photovoltaics
SBI	State Bank of India
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commissions
SNA	State Nodal Agencies
TA	Technical Assistance
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
WBG	World Bank Group

PROJECT DATA SHEET

India

Grid Connected Rooftop Solar Program (P155007)

PROGRAM-FOR-RESULTS DRAFT APPRAISAL REPORT (QER STAGE)

SOUTH ASIA

ENERGY AND EXTRACTIVES GLOBAL PRACTICE

Basic Information

Date:	November 15, 2015	Sectors:	Renewable Energy (100%)
Country Director:	Onno Ruhl	Themes:	Climate Change (P)
Practice Manager/Director:	Julia Bucknall Anita Marangoly George		
Project ID:	P155007		
Team Leader:	Mohua Mukherjee		
Project Implementation Period:	Start Date: September, 2016	End Date:	September 2021

Program Financing Data

[X]	Loan	[X]	Grant	[ ]	Other
[ ]	Credit	[ ]			

For Loans/Credits/Others (US$M):

Total Project Cost :	800		Total Bank Financing :	500	
Total Co-financing :	300		Financing Gap : 0		

Financing Source	Amount (USD Million)
BORROWER/RECIPIENT	2
IBRD	500
CTF	125
GEF	23
Private and public sector financing	150
Financing Gap	0
Total	800

Borrower: Government of India

Responsible Agency: Ministry of New and Renewable Energy

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Responsible Agency: State Bank of India			
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INDIA
Grid Connected Rooftop Solar Program

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INDIA: GRID CONNECTED SOLAR ROOFTOP PV

I. STRATEGIC CONTEXT

A. Country Context

1. **India's power system needs to grow rapidly to fuel the country's economic growth and provide electricity to its growing population.** During the last decade, India's economy expanded at an average annual rate of 7.6 percent, placing it among the top 10 of the world's fastest growing nations; projections are for high rates of growth to continue. The demand for power is expected to rise to support the growing manufacturing sector and meet the rising aspirations of its people. Yet power quality is still poor and falls far short of demand. Private investment in diesel generators as a coping mechanism against frequent power cuts is widespread, and estimates of installed diesel generation capacity are as high as 70 GW. An estimated 300 million people are still not connected to the national electrical grid, and those that are connected face frequent disruptions. Power shortages in FY2015 were equivalent to about 3.6% of total energy and 4.7% of peak capacity requirements. Electricity distribution companies (discoms), particularly the majority which are state-owned, typically have high rates of Aggregate Technical and Commercial (AT&C) losses and operating deficits. Discoms' financial difficulties and lack of liquidity are part of the explanation for poor electricity service delivery performance from the grid.

2. **GoI has set an ambitious goal of providing uninterrupted power for all homes, industrial and commercial establishments and adequate power for farmers by 2022 through its 24X7 Power for All program.** The Government of India (GoI) wants a growing share of the country's electricity to come from renewable energy. Currently, India relies on coal as the fuel source for two thirds of its electricity requirements and is the world's third largest carbon emitter, despite relatively low per capita emissions. The energy sector also causes local environmental problems. According to the World Health Organization, 13 of the 20 most polluted cities in the world are in India. Based on its massive energy requirements to match its economic growth aspirations, GoI recognizes that it must supplement non-renewable sources with cleaner and abundant renewable sources. Therefore, the GoI has announced plans to quadruple India's renewable energy capacity to 175 gigawatts by 2022, which is expected to require up to $150 billion in investments in generation alone, as well as substantial complementary investments in strengthening the transmission network for "greening the grid".

B. Sectoral and Institutional Context

3. As part of its push into renewable energy, GoI is aiming to achieve a "solar revolution" by installing 100GW of solar power by 2022 - a thirty fold increase from 4.5GW in 2015. This includes an official target of installing 40GW of grid connected rooftop solar PV (GRPV) by 2022[1]. This target supersedes and significantly increases the previous targets of 20GW of grid connected solar power that were set under the 2008 National Action Plan on Climate Change (NAPCC) and 2011 Jawaharlal Nehru National Solar Mission (JNNSM). Together with large utility scale solar parks and ultra-mega solar projects, the

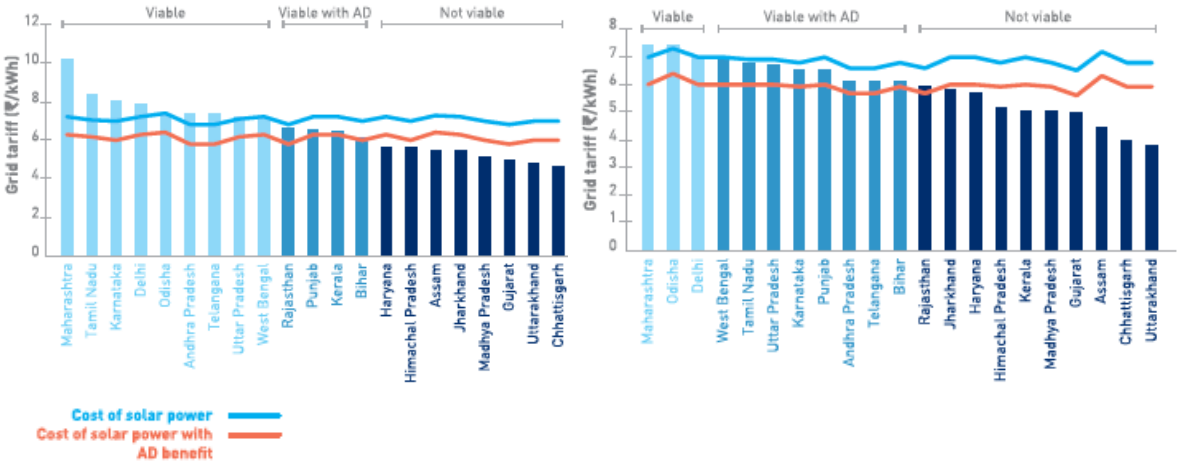
[1] The technical, economic and market potential of rooftop Solar PV in urban areas in India is estimated to be 352GWp and 210GWp and 124GWp, respectively. These estimates are based on MNRE's White Paper on Rooftop Solar PV in India, "Reaching the sun with rooftop solar".

government sees tremendous potential for generating decentralized and distributed solar power by utilizing the rooftops of industrial, commercial, residential and public buildings.

4. Electricity generated from GRPV is becoming increasingly cost competitive with electricity from the grid in many parts of India. This is particularly true for commercial and industrial customers who pay a higher tariff for electricity than other customers due to the cross-subsidy surcharge imposed on them. GRPV has already achieved price parity with the grid for this class of customers in many states[2] (Figure 1). Residential tariffs in India are highly subsidized and continue to be below the cost of rooftop PV generation, which implies that residential consumers will not enjoy electricity cost savings if they invest in Rooftop PV. However, grid electricity prices are projected to increase by 15-20% in the next few years, along with expected discom reforms under a number of GoI schemes that are intended to support the restoration of the discoms' financial health. Tariff increases are therefore expected to be applied to all tariff categories, including residential consumers, making the option of investing in residential Rooftop PV more attractive as well in future. Meanwhile the cost of rooftop solar power is expected to decrease due to reduction in component costs, and therefore price parity with grid for residential customers is likely to be achieved possibly as early as 2017.

Figure 1 - Financial viability of rooftop solar power

i) Commercial consumers ii) Industrial consumers



AD: accelerated depreciation
Source: Bridge to India 2015

5. **Yet there has so far only been a modest uptake of GRPV systems, even for commercial and industrial customers who could immediately save money by generating part of their requirements in-house through an investment in a rooftop solar system.** As of end 2014, only about 385MW (i.e. less than one percent of the target of 40GW) of grid connected solar rooftop PV projects had been completed[3]. There has been very little success in terms of developing scalable business models for grid-connected rooftop PV outside a few states such as Gujarat. The only widely used business model has been the "direct sale" model

[2] Solar power has achieved price parity with commercial tariffs in thirteen states and has done so in another seven states with the consideration of accelerated depreciation (AD) benefit offered by the government. Similarly, for industrial consumers, price parity has been achieved with the grid in thirteen states and after considering AD benefit in another five states.
[3] Bridge to India

where the customers have to pay for the rooftop PV system in full, upfront, to the solar integrator or installer. Consumer awareness is low, and no one wants to be the first mover. Net-metering policies have been enacted in 24 out of 29 states, but implementing guidelines for discoms have been largely absent. The 100% upfront payment requirement for the equipment is a deterrent. The IFC, based on its advisory work in Gujarat's 5MW Rooftop PV Program, had previously identified the absence of commercial debt for rooftop PV as a major constraint. Customers have also had no help in terms of support with technical specifications, warranties, and annual maintenance. Going forward, GoI would like to roll out new business models for GRPV and significantly increase the pace of deployments to meet its official target. This will require some dedicated attention to the investment climate for rooftop PV, in addition to the introduction of a debt fund that allows for flexibility and support to a range of business models.

6. **Barriers to the deployment of Grid Connected Rooftop PV (GRPV) systems:**

- **Financing.** Given legacy issues arising from their past exposure to the power sector, traditional financial institutions are highly risk averse and are unwilling to make large lending commitments to GRPV where there is no track record of technology performance available for banks to assess (and assign prices to) a variety of perceived risks. This reluctance to engage by commercial lenders has led to a lack of easily available debt financing options for GRPV developers, installers and aggregators.
- **Skill Gaps.** State Nodal Agencies (SNAs, public sector bodies who are responsible for coordinating all renewable energy activities in a particular state), State Electricity Regulatory Commissions (SERCs), and financial institutions lack capacity to provide sustained institutional and technical support for continued scale-up efforts for GRPV, including in areas such as the certification and enforcement of quality and technical standards of the GRPV equipment. Similarly, state discoms lack experience with implementation of net metering[4], gross metering[5] and Feed in Tariff (FIT) [6] systems, despite issuance of such policies by respective state electricity regulators. Discoms also need support on setting up application forms, procedures, data requirements, identification of staffing responsibilities and service standards for responding to customer requests for a grid connection of their rooftop PV system. Until these building blocks are in place, significant parts of the rooftop policies that have been announced by state regulators exist only on paper, but are not implemented in practice. Understandably, private investment in rooftop PV is held back.
- **Co-ordination.** There is lack of adequate co-ordination between central and state government agencies as well as between government agencies and private stakeholders that are involved in the implementation of GRPV.

[4] Net metering adjusts what a consumer feeds into the grid against what they take from the grid, and charges the consumer only for the difference. If more is injected into the grid, then the consumer can even earn money through net metering

[5] Gross metering applies two entirely separate billing processes. The consumer is paid in full for what is generated and pumped into the grid and is also charged separately in full for what is consumed from the grid (possibly at different tariff rates)

[6] Feed in Tariffs were used a lot in the past to offer a premium to investors when solar PV equipment was much more expensive and solar producers needed an extra incentive in the form of a higher pre-agreed rate offtake rate per solar kWh. Now that solar PV is approaching "socket parity" (or cheaper) for the rooftop investor in at least a few tariff categories, feed in tariffs are no longer needed as a premium to encourage investment.

- **Consumer awareness.** There is lack of awareness of cost and technical performance characteristics, rooftop requirements[7], economic benefits, financial options, and contractual O&M options among consumers.
- **Financial situation of discoms.** The state-owned discoms in many states are in financial distress, which discourages them from speedily implementing net metering and other GRPV policies that have been announced by state governments and regulators.

7. **GoI and a growing number of state governments and regulators are putting in place policy and regulatory arrangements necessary to support the large scale deployment of GRPV.** So far, 19 out of 29 states have issued solar policies and the SERCs of 24 states have issued net metering regulations. The Central Electricity Authority (CEA) has notified technical standards for GRPV plants. GoI is also providing a number of financial and tax incentives to accelerate the deployment of GRPV in the country[8]. A growing number of discoms are said to be developing plans to implement net metering, but need technical assistance and capacity building, which is not currently widely available. There is strong support to GRPV from the central government but this has not translated into the kind of help required by discoms on the ground. Discoms consider the Ministry of Power to be their line ministry, whereas the Ministry of New and Renewable energy is responsible for meeting the GRPV targets. While coordination between MNRE and MOP has started, concrete support packages for discoms to set up in-house procedures to implement rooftop policies have not yet been developed at either ministry.

8. **The MNRE is leading the implementation of *Grid Connected Rooftop and Small Solar Power Plants Program (GRSPP)* to address the identified barriers and accelerate the adoption of GRPV.** The program is proposed to be implemented in partnership with multiple central and state agencies including State Nodal Agencies for Renewable Energy, Solar Energy Corporation of India, Financial Institutions, Public Sector Units, Municipal Corporations, private sector Channel Partners, and Distribution Companies. The program is applicable to all states of India. The program provides Central Financial Assistance (CFA) equal to 30% of total rooftop solar PV system costs from National Clean Energy Fund to residential and institutional (including PSUs and government departments) customers. The program covers both project and programmatic approaches and all business models of GRPV including the customer owned, third party owned and utility owned models.

9. **The proposed IBRD-supported operation has been designed at MNRE's request to support the GRSPP program by increasing the availability of debt financing for GRPV in India[9].** All categories of customer will be eligible to receive financing for GRPV. The take up of financing is expected to be the greatest from commercial and industrial customers who are not eligible for the 30% CFA offered under MNRE's program. They are most likely to be using large diesel generators and it is noted that the payback periods of rooftop PV investments will be the shortest for commercial and industrial customers, given their high discom tariff rates. The operation responds to findings of market surveys carried out by the Ministry of New

[7]For instance, only cement roofs and certain metal roofs have enough load-bearing capacity to support mounting structures for PV panels and associated equipment and that roofs must also be unshaded to deliver expected performance of the panels.
[8] These include (i) 30% Government subsidy for non-commercial and non-industrial consumers for GRPV systems that use domestic solar panels; (ii) priority sector lending for GRPV; (iii) custom duty concessions and excise duty exemptions for GRPV systems; and (iv)accelerated depreciation benefits for industrial and commercial buildings.
[9] In addition to the World Bank, MNRE has requested KfW and ADB to help set up financing facilities for GRPV.

and Renewable Energy (MNRE) in six Indian cities[10] as well a series of consultations carried out by the World Bank that indicate that there is substantial pent up demand for financing GRPV systems in the country.

10. **In addition, the proposed operation will also focus on the "ease of doing rooftop PV business" for such customers.** It will provide technical assistance to the main stakeholders that are "building blocks" in the implementation of GRPV in the country, who do not make investment decisions themselves but nevertheless form a critical part of the investment climate for rooftop PV. These stakeholders include discoms, SNAs, accredited rooftop PV inspectors (who are in short supply), state power departments and state electricity regulatory commissions, among others. Support to these stakeholders is expected to enable smoother implementation of net metering/gross metering policies in the country as well as to increase consumer education and awareness about GRPV and minimum technical standards. All of this is seen as an essential "doing business" complement to the proposed operation for the creation of a rooftop PV Debt Fund.

C. Relationship to the CAS/CPS and Rationale for Use of Instrument

11. *Alignment with GoI's National priorities:* The program is aligned with GoI's National Action Plan for Climate Change (NAPCC), which was issued in 2008 to enhance India's ecological sustainability and encourage sustainable energy sources. It is also consistent with the Jawaharlal Nehru National Solar Mission (JNNSM) that was launched in 2010 as part of NAPCC to promote the development of solar power in India. GoI has significantly scaled up the target of 20 GW of solar power in JNNSM to 100 GW by 2022. GoI has reiterated these commitments as part of its Intended Nationally Determined Contributions (INDCs) commitment to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030.

12. *Alignment with World Bank's India Country Partnership Strategy (CPS).* The proposed World Bank support to GRSPP is consistent with the current Country Partnership Strategy (CPS) for India (2013-2017). The CPS outlines Bank support to India under the three pillars of integration, transformation and inclusion with a cross-cutting focus on improving governance, environmental sustainability and gender equality. The proposed program is aligned along at least two of these three pillars – transformation, and inclusion. Under transformation, the program will directly help achieve one of the intended outcomes of the CPS, which is to achieve reduction in GHG emissions through renewable energy generation. Under inclusion, the program offers the opportunity to increase access to electricity by increasing the availability of electricity generation in the system and freeing up a share of the bulk power purchase requirements of the State discoms. In addition, the operation conforms to the emphasis of the CPS on GoI's "Finance-Plus" approach whereby the value-added by the Bank goes beyond financing and contributes to the transfer of knowledge and international best practices, reform of processes and systems, strengthening of institutional capacity, and exploring innovative financing mechanisms.

13. Furthermore, the proposed operation supports the World Bank Group's corporate commitment to increase renewable energy lending, and address climate change. The program is also aligned with the WBG's goal of promoting shared prosperity.

[10] Bangalore, Bhubaneswar, Chandigarh, Delhi, Gandhinagar and Pune

14. A number of recent studies, including a 2014 IFC study[11], have identified the absence of commercial loans available to rooftop aggregators and developers as a major and binding constraint to the launch of private investment in GRPV. The Bank can help address the barriers to GRPV noted above by (i) by making long term concessional financing available for the deployment of GRPV; (ii) sharing international knowledge and experience on how large solar rooftop investment programs have been implemented across the world; (iii) providing technical assistance and capacity building support to regulators and discoms and other state agencies; and (iv) using its policy dialogue to support reforms in the sector and in discoms. This Program can also have demonstration effects in other developing countries with solar resources.

15. This Program meets all the recommended preconditions for the adoption of a results based approach in the energy sector[12]. The use of the PforR instrument will add significant value to implementation by:

- ensuring a sharp focus on the results GoI wants to achieve (i.e. establishment of a new rooftop lending program at the largest commercial bank in the country, and an increase in installed GRPV capacity and generation);
- allowing flexibility in implementation and use of funds primarily through streamlined procurement procedures;
- supporting the development of the participating bank's own program, through its own systems and procedures, and reinforcing the institutional capacity needed for the program to achieve its desired results, which will also ensure continuity of the program once the World Bank's support is fully disbursed. The participating bank will provide leadership to other local commercial banks through syndication in Phase Two of the program; and
- strengthening the participating bank's focus on output and outcome monitoring and evaluation, and executing an independent and credible verification system.

II. PROGRAM DESCRIPTION

A. Program Scope

16. **MNRE's Grid Connected Rooftop and Small Solar Power Plants Program:** MNRE is the lead ministry responsible for overseeing the achievement of GoI's 100GW solar power target. Under the umbrella of JNNSM and the *Off-grid and Decentralized Solar Application Scheme,* MNRE is leading the implementation of the GRSPP program. The objective of the GRSPP program is to promote GRPV in the country through action on multiple fronts including provision of subsidies, and development of business models, to create an enabling environment for private investment, and undertake consumer awareness. GoI has allocated a budget of $730 million for the overall scheme over 2015-2017, with $90 million allocated specifically for central financial assistance support to GRSPP.

17. The GoI program is applicable to all states of India. It focusses on promoting grid connected solar rooftops to meet and supplement electricity requirements. The program

[11] An IFC Study issued in 2014, "Harnessing Energy from the Sun: Empowering Rooftop Owners" recommends (i)"financial incentives targeted at the various segments of stakeholders, established to kick-start development of the sector, with a phasing out over time, backed by appropriate policies and regulations"; and (ii) "establishing innovative products, and attracting the commercial lending sector by implementing pilot projects with large third-party developers."

12 These include i) the possibility of monitoring and verifying the results against which payments might be made; (ii) the agent having access to sufficient finance to cover any upfront costs prior to delivery of results and (iii) both principals and agents having sufficient institutional capacity to set up and respond to an RBF incentive.

supports the installation of rooftop solar photovoltaic power generation plant for self-consumption as well as supply to the grid. Both program and project modes of implementation are eligible, with the former limited to systems of less than 50kWp. Monitoring and Evaluation of the program is envisaged through a combination of data from system providers, field inspection reports and impact assessment reports (see Annex 1 for more details).

18. **The proposed IBRD-financed PforR Program is closely linked with the Government program, and provides further value-added contributions:** the World Bank has been requested to lend to the State Bank of India (SBI) and help it to set up and operate a Rooftop Program. This proposed operation adds value to the MNRE's GRSPP Program by helping SBI establish a lending program for rooftop solar PV and making available IBRD financing for GRPV for all category of customers. In Phase Two of the Program, SBI will continue to operate the dedicated unit with its own funding and will offer syndication opportunities to other local banks in order to encourage them to enter the rooftop PV debt market in a risk-mitigated manner, by working with SBI who will have developed the necessary experience and expertise by that time.

19. **GEF funding for this project will be used alongside IBRD and CTF financing to mitigate the risk of lending to GRPV and removing identified barriers to large scale adoption of GRPV in business models, marketing infrastructure, and institutional capacity of discoms.** This will cover technical assistance to the main stakeholders that are involved in the implementation of GRPV in the country such as discoms, SNAs, state power departments and SERCs for the implementation of net metering/gross metering policies in the country and to increase consumer awareness about GRPV, as well as to assist with the creation of large numbers of trained and accredited rooftop PV inspectors whose services will be required by lenders for smooth functioning of the program. GEF funding will also incentivize lending to riskier category of GRPV customers such as Non-Bank Financial Companies (NBFCs) and Small and Medium Enterprises (SMEs). This will facilitate the market development of GRPV and make it possible to deploy GRPV systems at the scale and pace envisioned by GoI for meeting its official targets. GEF support to the program will hence be very important in realizing the GHG emission reductions benefits expected from this program as a result of the displacement of thermal power with clean solar power.

B. Bank-financed PforR Program Scope

20. The proposed program will support the implementation of MNRE's GRSPP program, with a focus on mobilizing private sector investments and commercial lending, increasing deployment of GRPV, and thereby contributing to the achievement of GoI's GRPV installation targets. The duration of the Program will be five years, with a start date of September 2016, and end date of September 2021. The PforR Program will finance activities in three Result Areas on a country wide eligibility basis: (i) strengthening institutional capacity for GRPV; (ii) market development of GRPV; (iii) expanding GRPV generation.

21. *Activities under results area 1 – Strengthening Institutional Capacity for GRPV:*

- *1a – Strengthening Institutional Capacity of SBI.* SBI will (i) establish a GRPV department as a dedicated team and will design and implement an internal institutional structure to mobilize staff in all the relevant departments and branches; (ii) set up internal procedures for loan origination, risk assessment, and loan approval, and

provide incentives to staff to undertake the financing of solar rooftop PV investments; and (iii) provide training to staff on GRPV financing, particularly those responsible for deal origination and risk assessment; (iv) strengthen internal IT systems to track GRPV transactions; (v) launch awareness building and advertisement programs; (vi) developing/procuring necessary software; and (vii) internalize lessons from first phase of the program and launch the second phase of the program.

- *1b – Strengthening Institutional Capacity of Discoms, SNA and ERCs to contribute to an improved investment climate for GRPV.* Under the P4R Program, SBI will oversee the implementation of a Technical Assistance program to improve the capacity of discoms, SNAs and SERCs and other entities, as required, to promote and manage GRPV in the country. Specific activities under this results area will include (i) capacity building and technical assistance support to selected discoms, regulators and other institutions; and (iii) communication and stakeholder awareness campaigns by State Nodal Agencies on the GRPV program in their respective states; (iii) introduction of training and accreditation programs in more states, for qualified rooftop PV technical inspectors.

22. *Activities under results area 2 - Market Development of GRPV*. The Program will (i) develop and implement market aggregation models for installers and customers who have suitable, unshaded rooftop space (ii) undertake aggressive marketing and business development for deal origination; (iii) provide lending capital for purchase and installation of inventory by private sector developers and aggregators; and (iv) target lending to riskier category of consumers such as NBFCs and SMEs.

23. *Activities under results area 3 - Expanding GRPV generation*. Private investment will support the installation of more than 400 MW of grid-connected solar rooftop PV systems including (optional) batteries for storage in participating Indian states. In case of CAPEX model and RESCO model funded through project mode, the grid connected rooftop solar photovoltaic power generation plants with a minimum capacity of 100 kWp per project or system will be eligible under the Program. In case of RESCO model funded through program mode, the aggregate capacity will have to be at least 1 MW, with each sub project having a capacity not less than 20 kWp.. SBI will appoint a Lender's Independent Engineer to ensure that all installations are compliant with Program requirements and standards. All installations will have to meet technical standards issued by MNRE and/or CEA, which will be specified in the OM of the program. In addition, all installation will need to be insured by the borrower to cover appropriate risks, including force majeure events both during and after the construction period until the loan is outstanding.

C. Program Beneficiaries

24. Program beneficiaries include (a) GRPV customers who will benefit from electricity generated by GRPV systems under a variety of business models; (ii) discoms which will benefit from electricity passed on to their network through net metering or gross metering, and through the technical assistance carried out under the program; (iii) SNAs and SERCs which will benefit from technical assistance and capacity building activities in the program; (iv) the residents of states where GRPV systems are implemented who benefit from improved consumer education and consumer awareness as well as reduced air pollution and the resulting improved health impacts; (v) SBI and its branches across the country through strengthened

institutional capacity; (vi) third party aggregators, developers, and vendors of GRPV systems, through access to debt which allows their business to grow faster; (g) all economic agents engaged in the GRPV supply and delivery chain, particularly sub-contractors for installation and other services, as well as O&M service providers; and (h) the global community who benefits from avoided greenhouse gas emissions.

D. Total Financing

25. The expenditure for Phase 1 of the PforR Program would be at least $800 million, comprising of the World Bank IBRD financing of $500 million, CTF financing of $125 million, GEF financing of 23 million, private and public sector financing of $150 million and SBI financing of $2 million initially. SBI has committed to continuing the program with a contribution of $500m of its own resources in Phase 2. Table 1 summarizes the first phase of Program financing, which will be supported by the World Bank.

26. The CTF funding would comprise of $125 million, of which $120 million will be extended under softer concessional terms and $5 million will be extended in the form of a grant. The CTF loan is offered with a service charge of 0.25% per annum on the disbursed and outstanding loan balance and 40-year maturity, including a 10-year grace period, with Principal repayments at 2% for Years 11-20 and at 4% for Years 21-40. Principal and service charge payments accrue semi-annually. A management fee equivalent to 0.45% of the total loan amount ($540,000) will be charged, to be capitalized from the loan proceeds, following the effectiveness of the loan.

Table 2 – Phase 1 Program Financing (million US$)

Source	**Amount (million $)**	**% of Total**
IBRD	500	63%
CTF	125	16%
GEF	23	3%
Private & Public sector financing	150	19%
SBI	2	0.3%
Total Program Financing	**800**	**100%**

E. Program Development Objective/s (PDO)

27. The PDO is to increase investment in GRPV and strengthen the capacity of relevant institutions. This will contribute to the achievement of GoI's target of 100GW of solar generation capacity by 2022.

F. Program Key Results and Disbursement Linked Indicators

Results Indicators

28. A set of indicators has been carefully chosen, not only to measure achievement of the PDO, but also to measure and track intermediate results or intervening steps towards the PDO. Two types of results indicators have been defined: (i) those that are linked to disbursements,

referred to as 'disbursement-linked indicators' (DLIs), and (ii) those that are not linked to disbursements, referred to as 'other results indicators' (refer to Table 3 for the results chain of the program).

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29. The following outcome indicators will be used to measure achievement of the PDO:

- GRPV capacity connected to the grid (MW)
- CO2 emissions reduced (tons)

30. CTF and World Bank disbursements will be made against achievement of a pre-agreed set of Disbursement-Linked Indicators (DLIs). The choice of DLIs is based on four factors: (a) the importance of the indicator that signals a critical action/output along the results chain; (b) perceived need to introduce a strong financial incentive to deliver the result; (c) practical aspects of verifying achievement; and (d) capacity of SBI to achieve the DLI during the implementation period of the Program. CTF and IBRD loan funds will be disbursed directly to the participating bank, based on the achievement of DLIs.

Table 3 - Results chain of the Grid-connected Rooftop Solar Program

Result Area	Actions	Outputs/ Intermediate	Outcomes	DLI Indicators
Result Area 1: institutional capacity for GRPV	(a) establish GRPV credit department or unit; (b) set up internal credit procedures, and provide incentives to staff for making GRPV loans; (c) provide training to staff; (d) undertake aggressive marketing and business development for deal origination; and (e) develop and pilot innovative financing models and products; (f) implementation of the TA program for discoms, SNAs, SERCs etc.	Innovative financing models and products tailored to industrial and commercial GRPV consumers; Launch of Program Contract signed with consulting firm for the implementation of the TA and capacity building program Different phases of the TA program completed.	Institutional capacity improved and GRPV lending mainstreamed at SBI	(a)GRPV credit department in SBI corporate HQ is functioning (b) operations manual is finalized; (c) IT systems are strengthened to track GRPV loans; (d) contract signed with consulting firm for the implementation of the TA program; (e) different phases of the TA program are completed; (f) next phase of GRPV program with syndication from other Banks is launched.
Result Area 2: Market development of GRPV	Generating market demand for GRPV systems by private investors	Cumulative amount of lending approved by SBI ($ million) and capacity(MW) of GRPV orders	GRPV market deepened by increasing the number of participants	Amount of GRPV lending approved by SBI

	Installing GRPV system on rooftops	placed with SBI's borrowers Cumulative amount of additional financing mobilized by SBI ($ million)		Amount of GRPV lending to NBFCs and SMES by SBI
Result Area 3: Expanding GRPV generation	Scaling up GRPV investments Connecting GRPV systems to the grid	Capacity (MW) of GRPV installed GRPV capacity connected to grid (MW)	CO_2 emissions reduced (tons) approximate GRPV electricity generated (MWh)	GRPV capacity (MW) installed on rooftops

G. Disbursement-Linked Indicators

31. Consistent with the PforR framework, a number of DLIs have been developed in consultation with SBI. The DLIs are designed based on the Results Framework and results chain. The Program will disburse against the achievement of DLIs. Six DLIs have been identified over 6 disbursement periods corresponding to the launch and the five years of the program implementation period. The details of the DLIs are provided in Annex 3.

32. DLI-1 relates to results area 1 and will be triggered at the launch or establishment of a Rooftop Solar PV program at the SBI. At this time SBI will be able to demonstrate development of internal procedures for the identification, risk assessment, appraisal and approval of GRPV projects, as identified in an operations manual and a strengthened IT systems to keep track of GRPV transactions. The establishment of this program is a prior action that SBI plans to complete before the operation is approved. This DLI responds to the critical need to have the necessary resources, policies, procedures, infrastructure, expertise and internal consensus on the objectives of the program prior to the commencement of the program.

33. DLI-2 relates to results area 1 and will be first triggered after SBI signs a contract with a consulting firm to carry out a technical assistance and capacity building program for discoms, SNAs and ERCs. The subsequent disbursement against this DLI in period 2 and period 3 will be against the completion of the first phase and second phase of the TA and Capacity Building program. To ensure that there is clarity on this DLI, the Bank and SBI will reach agreement on the content of the terms of reference for this program prior to Board approval of this program. As requested by SBI, the capacity building and TA program will be implemented close co-ordination with MNRE, World Bank, and other relevant stakeholders such as Ministry of Power.

34. DLI-3 relates to an output indicator under Result Area 2. It is the total value of loans for GRPV approved by SBI. This operation aims to increase the availability of debt financing for third party aggregators, developers, and installers. This access to working capital will allow qualified private sector developers and aggregators to buy the required inventory and aggressively acquire customers, and push for large scale deployment of roof top solar PV

systems among customers using different business models. This DLI keeps track of this critical objective by encouraging SBI to increase lending to the GRPV sector.

35. DLI-4 also relates to Results Area 2 and is closely linked to DLI-3. It is the total value of loans for GRPV to Non-Bank Financial Companies (NBFCs) and Small and Medium Enterprises (SMEs) approved by SBI. NBFCs and SMEs are a risky category of consumers but very important for the rapid take off GRPV market in India. This DLI incentivizes lending to this important category of customers by offering GEF grants for the achievement of this indicator.

36. DLI-5 relates to an output indicator under Result Area 3. It is the total capacity of GRPV installed and commissioned. This is an important indicator for keeping track of the contributions of this program towards meeting GoI's overall GRPV installation target. Since there will be a lag of about a year before the program starts delivering capacity installations, the disbursement of this DLI is expected to start from period 2 against verified GRPV installations from loans made in period 1.

37. DLI-6 relates to results area 1 on the capacity of SBI. This will be triggered when SBI designs, allocates and announces the second phase of the program in which it proposes to fund with its own resources. A key objective of this operation is to improve SBI's understanding of technical and financial risks of the GRPV market and improve its capacity to extend loans to the sector. This trigger will incentivize SBI to internalize the lessons of this program and launch a second phase of the program on a much larger scale and with the participation of other commercial banks through syndication.

H. Key Capacity Building and Systems Strengthening Activities

38. An important element of this operation is to enhance the capacity of SBI and to strengthen its internal systems and procedures for GRPV lending. SBI will establish a GRPV department that will focus on lending to GRPV customers, aggregators, developers and installers. This department will develop appropriate procedures for the identification, risk assessment, appraisal and approval of green lending projects.

39. SBI needs technical assistance to help them develop innovative financial products, tailored to meet the demand from the GRPV market, and manage risks at the same time. In particular, SBI branches around the country need to be trained to make loans to the GRPV sector. SBI is in the process of preparing an operations manual that documents the policies and processes to be followed under the program. As the program develops, the operations manual will be updated to capture learning from the implementation of the program. .

40. SBI will also oversee a technical assistance and capacity building program that is targeted at public sector agencies that are critical for making the program successful. These include discoms, SNAs and SERCs that oversee policies, regulations and processes for connecting rooftop PV systems to the grid. This program will help discoms implement GRPV policies, including net metering and gross metering through institution wide capacity building support. As part of its exploratory dialogue and consultations on GRPV, the Bank has identified

six discoms from all parts of the country as potential candidates to receive TA support, with several more working on meeting the eligibility criteria[13].

41. The Bank has obtained enthusiastic support from various ministries to set up an inter-ministerial Steering Committee in order to provide oversight of the TA and capacity building program to improve the investment climate for rooftop PV investment. The Steering Committee will be chaired by MNRE and will include representatives of (i) Department of Industrial Promotion and Policy (DIPP), which is in charge of the ease of doing business ranking for states and sub-national entities; (ii) Ministry of Power (which is the parent ministry of discoms); (iii) Central Electricity Regulatory Commission (CERC), which convenes the Forum of Regulators and coordinates dialogue within and amongst state electricity regulators; (iv) Central Electricity Authority (CEA) which is the national standards-setting body in the electricity sector; (v) TERI which is a think-tank having expertise in rooftop PV inspection; (vi) AREAS which is a fledgling association of State Nodal Agencies and requires support to be established, initially with a focus on rooftop PV coordination; and (vii) any others, as appropriate.

42. SBI will hire a "master-consultant" for coordination of the TA program, and the agreement is that TA will be provided on a "state-wise" basis, i.e. only to states who are able to organize all their relevant building blocks/entities to receive training and support to create a conducive business environment across the board. The master-consultant will not deliver ad-hoc training to individual discoms or nodal agencies under the World Bank-assisted TA program. This means that a state power department must form a rooftop PV team representing its regulatory agency, its discoms, its nodal agency, its training institutes for creation of suitable numbers of accredited inspectors, etc. When a state is able to demonstrate a cross-cutting commitment to improving its ease of doing rooftop PV business, it will be eligible to apply for a customized training program under the TA facility administered by SBI. The master-consultant must make a detailed report to the Steering Committee every six months. SBI will separately undertake verification of progress and outputs reported by the master-consultant in charge of coordinating the TA program.

43. The above activities have been incorporated into the design of this PforR program by incorporating specific indicators in the Results Framework under Result Area 1 and defining specific DLIs (DLI-1, DLI-2, and DLI-6) to link disbursements with these important capacity building results.

44. Furthermore, SBI needs to strengthen their capabilities in results monitoring and evaluation, particularly verification of DLIs. SBI also needs to enhance their capacity in environment and social systems of the program. Detailed capacity building activities are outlined in the Program Action Plan section.

[13] The Bank held an informal "competition" among discoms in states with net-metering policies, to identify winners who would be included in Phase 1 of the institutional support for implementation of those policies. There was an enthusiastic response and six discoms from all parts of the country have been identified as candidates to receive early support. These six selected discoms service 19 of the 100 cities that have identified for the GoI's Smart Cities Initiative. Another four discoms (from other states) are currently working on their responses to the second round of the competition, to signal their interest in receiving support with implementation of their net-metering policies, and are likely to qualify in the coming months

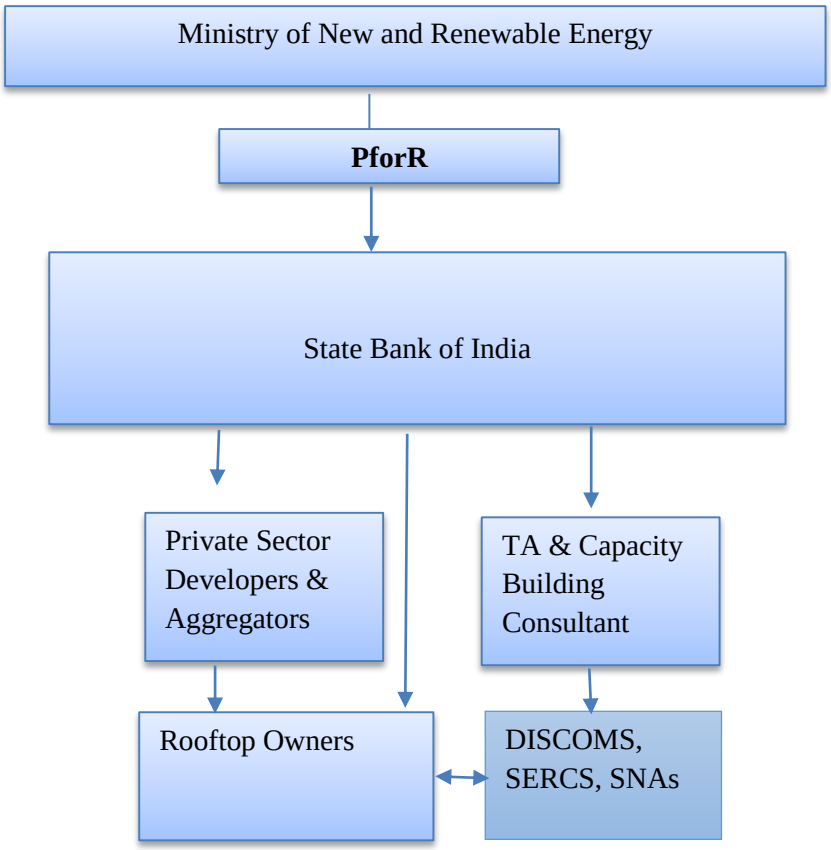
III. PROGRAM IMPLEMENTATION

A. Institutional and Implementation Arrangements

45. **Government**: As the lead ministry responsible for GoI solar power targets and the GRSPP program, MNRE will provide overall policy guidance as well as regular monitoring and supervision. As mentioned in the preceding section, MNRE will chair a steering committee comprising of all relevant agencies, and will liaise with other government agencies to pursue policy and regulatory reform necessary for the GRPV program to be successful. MNRE will also play a lead role in development partner co-ordination (including with parallel GRPV programs supported by KfW and ADB) and in ensuring that the lessons from this program are internalized in other government-supported programs.

46. **State Bank of India. SBI will be the borrower and implementing agency for the PforR component (Component 1) of this operation (see Figure 2).** This operation will enable SBI to lend to qualified intermediaries (qualified in terms of technical capacity, relevant experience, and creditworthiness as per SBI's standards). This access to working capital will allow qualified private sector developers and aggregators to buy the required inventory and aggressively acquire customers, and push for large scale deployment of roof top solar PV systems among customers using different business models. SBI will be responsible for identifying, appraising, and financing eligible investments that meet the criteria in an Operational Manual (OM) that will be developed during preparation. The detailed eligibility criteria, technical performance requirements and appraisal guidelines will be outlined in the OM, agreed between the SBI, MNRE, and the Bank.

Figure 2: Proposed Implementation Arrangements



47. SBI is India's oldest and largest financial services company. It has more than 16,000 branches in the country and 190 foreign offices in 36 countries. It has an active customer base of 270 million. While the Bank is majority owned by the GoI, shares of SBI are traded on the Bombay Stock Exchange and National Stock Exchange of India. Its Global Depository Receipts are listed on the London Stock Exchange. SBI's size and reach make it an ideal partner to roll out MNRE's scheme for grid-connected solar rooftop PV program. SBI is interested in participating in the Program since it offers an entry-point into an area with significant potential for growth in the future but it will not do so without support and hand-holding from an international partner agency with domain experience, because it is (a) unfamiliar with the technical issues of Rooftop PV performance and (b) not in a position to take on the coordination role with state discoms, regulators and nodal agencies who are all key enablers and stakeholders in this program, but who have current performance limitations. However, SBI has assured MNRE that if a successful program is set up with World Bank support then it will be happy to continue the implementation of the program on a nation-wide basis using its own resources for lending to qualified parties in continuation of the previous experience. It is mainly looking for initial World Bank support to launch the program, and help it to set up suitably robust in-house systems. More details on SBI are in Annex 1.

B. Results Monitoring and Evaluation

48. Under this PforR operation, SBI, as the implementing agency, is responsible for results monitoring and evaluation (M&E) and verification of the DLIs, based on the agreed verification methodology, protocols, and procedures outlined in the section below. This PforR Program brings value added to strengthen the focus on results monitoring and evaluation through an independent and credible verification system, since the current M&V system under the MNRE's GRSPP relies primarily on reporting from GRPV system providers and partner agencies rather than verification by independent third parties.

C. Disbursement Arrangements and Verification Protocols

49. **Advances**: SBI has informed the Bank that it would like to receive the advances it is eligible to receive under a PforR operation. Advances up to 25 percent of total Program financing ("advance"), or $162 million, could be made by the Bank to SBI upon effectiveness of the loan. When the DLI(s) against which an advance has been disbursed are achieved, the amount of the advance will be deducted (recovered) from the total amount due to be disbursed under such DLI(s). The advance amount recovered by the Bank is then available for additional advances ("revolving advance"). The Bank requires that the borrower refund any advances (or portion of advances) if the DLIs have not been met (or have been only partially met) by the Closing Date, promptly upon notice thereof by the Bank. In other words, even if all DLIs are met by the end of the project, a reconciliation of eligible expenses incurred will still have to be undertaken by SBI and World Bank at the closing date, and SBI will have to demonstrate that it incurred and can account the full value of the amounts disbursed to it, otherwise it will have to refund the amount in question.

50. If the Bank establishes after the Closing Date that the Withdrawn Financing Balance exceeds the total amount paid for Program Expenditures, exclusive of any such amounts financed by any other financier or by the Bank under any other loan, credit or grant, the Borrower shall, promptly upon notice from the Bank, refund to the Bank such excess amount of the Withdrawn Financing Balance. The Bank shall then cancel the refunded amount of the Withdrawn Financing Balance.

51. **Prior Results**: The Bank will disburse up to $13 million for projects implemented by SBI for prior results, or DLI-1, triggered at the establishment a Rooftop Solar PV program at the State Bank of India (SBI) and development of internal procedures for the identification, risk assessment, appraisal and approval of GRPV projects, as identified in an operations manual and strengthening of internal IT systems to track GRPV transactions. The establishment of this program is a prior action that SBI plans to complete before the operation is approved.

52. **Disbursement Arrangement**: SBI is responsible for verification of the achievements of the DLIs, through independent verification agencies, based on the agreed verification protocol described below. Disbursements will be made upon verification of the results of the DLIs. Since the DLIs 3 and 4, are scalable, the actual disbursement will depend on the verified results.

53. **Verification Protocol**: The verification protocol of DLIs builds on the existing national verification system wherever possible. The verification will be conducted annually. See Annex 3 for details.

- DLI-1 is the establishment of a GRPV program at SBI and the development and implementation of procedures for the identification, risk assessment, appraisal and approval of GRPV projects. The verification of this DLI will be carried out based on an operations manual provided by SBI as well as other related internal document announcing the establishment of the program.
- DLI 2 is the implementation of a technical assistance and capacity building program for discoms, SNAs and ERCs. The verification of this DLI will be carried out based on evidence provided by SBI indicating that contracts for delivery of this program are in place in period 1 and that different phases of the TA program are being implemented in the subsequent periods. To ensure clarity on this DLI, the Bank and SBI will agree on the content of the program (including the different phases) prior to program approval.
- DLI-3 corresponds to the total loans for GRPV approved by SBI. This DLI will be verified on an annual basis based on audited financial reports of the Program. SBI plans to assign a specific code to track all activities funded under the program. This will enable to SBI to accurately track all loans approved under the program.
- DLI-4 relates to the amount of loans approved for Non-Bank Financial Companies and Small and Medium Enterprises by SBI. This DLI will also be verified on an annual basis based on audited financial reports of the Program.
- DLI-5 corresponds to total capacity of GRPV installed and commissioned under the program. SBI will engage an independent verification agency acceptable to the World Bank to verify the achievement of this DLI.
- DLI-6 corresponds to SBI's decision to initiate the next phase of the program using its own resources and in syndication with other commercial banks. This will be verified based on board approved documents indicating the design, allocation and announcement of the next phase of the program.

IV. ASSESSMENT SUMMARY

A. Technical (including program economic evaluation)

54. *Strategic relevance*. Meeting the growing electricity demand while reducing air pollutants and carbon emissions through solar energy is a top priority for GoI, particularly given the high costs of unserved electricity demand in the country. The Government has announced an ambitious target of installing 100 GW solar electricity generation capacity by 2022, including 40GW of GRPV. The Program is thus strategically relevant and aligned with GoI's priority.

55. *Technical soundness*. The Program takes into account and confirms to international experience and good practice in rooftop solar PV including (i) technical standard and specifications; (ii) grid integration of rooftop solar PV and (iii) business models. The program will finance technically proven and commercially viable GRPV investments. The SBI has demonstrated experience and proven track record managing green energy programs. In areas such as Monitoring and Evaluation and Environment and Social management where the SBI does not have the required skills and expertise, it will use external expertise as a complement to its own resources. The assessment shows that while the program could negatively impact the financial situation of discoms (and hence their support for the program), the impact is expected to be minimal in the early years of the program. The proposed operation will help discoms and other relevant institutions to better manage GRPV through the implementation of technical assistance and capacity building program. The economic evaluation show the proposed program is economically viable with significant local and global environmental benefits.

56. *Expenditure framework.* The Program will be $800 million, of which $500 million will be debt funding sourced from IBRD, $125 million from CTF and 23 million of grant funding from GEF, with balance made up of contributions of SBI and initial equity contributions from public and private sector developers and their customers. The Program expenditure will occur when SBI meets the indicated Milestones under P4R. The Bank will carry out an assessment of the financial management and governance systems of the new business unit that SBI will set up to manage the rooftop solar debt fund, in order to identify the fiduciary risks and work out the appropriate mitigation measures.

57. *Institutional Capacity.* SBI has demonstrated extensive experience in financing clean energy programs. They have adopted most of the Bank's technical, fiduciary and safeguard requirements in the proposed Program. Under the SBI Program, one area of concern is SBI's capacity in results M&E and verification of DLIs. This risk will be mitigated by SBI engaging independent verification agencies.

58. *Economic evaluation.* The economic analysis[14] indicates that the proposed GRPV program is close to being viable against alternatives that would meet electricity demand through thermal alternatives. The baseline economic return of proposed GRPV program against the "thermal generation scenario" comprising of electricity supply using imported coal and diesel generator set is 10.6% (NPV - US$22 million), which is just below the 12% hurdle rate used for Bank projects[15]. The program also has substantial local and global environmental

[14] A cost-benefit analysis consistent with recent Bank guidance on this topic was carried out for the 400 MW of GRPV investments under the Program. The economic analysis covers 28 years, including 3 years of construction and 25 years of operation. A discount rate of 12% was used for the calculation. The analysis includes a consideration of the relevant negative global and local environmental externalities.

[15] A review of discount rates used in Bank projects is currently underway. The economic analysis will revised once the new guidance on discount rate is finalized.

benefits; consideration of these benefits increases the ERR of the program significantly to 22% (NPV US$184 million).

Table 4 – Summary of Economic Analysis

		Economic rate of return
ERR	%	10.6%
ERR+local externalities+GHG	%	22%
Switching value, avoided GHG emission	$ /ton	1.44
Composition of NPV		
Cost of Rooftop PV		
Capital cost	$USm	284
O&M	$USm	8
Benefits of avoided coal generation		
Avoided coal costs	$USm	179
Capacity credit	$USm	11
Benefits avoided diesel generation		
Avoided diesel costs	$USm	73
Capacity credit	$USm	7
NPV (before environmental benefits)	**$USm**	-22
NPV (incl. local environmental benefits)	$USm	32
GHG emissions @$30/ton	$USm	153
NPV (including environment)	$USm	184
Lifetime GHG emissions undiscounted	Mtons CO2	14.8
Marginal abatement cost MAC	$/ton	1.5

59. **Reduction in GHG emissions.** The analysis indicates that the program will reduce GHG emissions by 14.8 million tons over the life of the project compared to the thermal counterfactual. The marginal abatement cost of GHG emission of the proposed program is quite low at $ 1.5/ton. The program will help avoid local and environmental damage costs equal to $206 million compared to the thermal counterfactual.

60. **Sensitivity Analysis.** The sensitivity analysis calculates the switching values for important variables such as capital costs, Capacity Utilization Factor, capital costs for PV generation, coal prices, capacity, credit and discount rate (Table 5). This analysis shows that GRPV is economically viable only with the consideration of local and global environmental benefits. The economic returns of GRPV are based on a number of important assumptions – some of which have a high degree of sensitivity with regard to the overall returns: for example, the switching value for PV systems costs is only 7% higher than the baseline value. A CUF of 20% for solar PV generation and an average annual increase in coal prices of 2% would likewise push the ERR above the hurdle rate.

Table 5 – Switching Values

Input	**Unit**	**Baseline Value**	**Switching Value**
CUF	%	19%	20%

PV Cost	$M/MW	1.4	1.3
Annual Increase Coal Prices	%	0%	2.0%
Discount Rate	%	12%	11%
Capacity Credit	%	19%	42%
T&D loss	%	12%	25%
Grid Integration Costs	%	0%	-8%

B. Fiduciary Assessment of SBI's Rooftop Program

61. **Summary**: The IBRD, CTF and GEF funds will be disbursed directly into the accounts of SBI upon realizing the disbursement linked indicators (or as advance against DLIs) and will become the Program funds. The Program funds will be on-lent to borrowers based on SBI's commercial practices and the Program specific criteria stated in the OM and agreed with the Bank. SBI will set up code/s for the Program within its existing budgeting and accounting systems to facilitate program specific reporting, and its existing auditing arrangements will be used for the Program financial audit. SBI has a governance and internal control system in place, including internal and external audit. The Program will be included in SBI's monitoring and control scopes. The program-specific financial management and disbursement arrangements are documented in the OM agreed with the Bank. From the World Bank Project perspective, the eligible expenditure under the Program will be the funds on lent as per OM and direct operating costs of the Program. The OM provides details of FM activities to be followed by the Program. The FM activities would broadly comprise Planning, Budgeting, Accounting, Reporting and Internal Controls including Internal and External Audit. Financial management of the Program would be the responsibility of SBI and would be based on SBI's existing FM systems, procedures and controls.

62. **Planning and Budgeting**: Preparation of proper plan and budget plays an important role in timely implementation of a program. There would be an overall Program Plan for the duration of the Program with annual forecasts and estimates. The Plan would help in ensuring that adequate resources – manpower, infrastructure and financial etc are available on a timely basis for the success of the Program. The Plan would cover both sub-loan targets and the corresponding direct administrative expenses for Program implementation backed up by appropriate explanation and justification. The Plan would form the basis for annual Program Budgets. For effective program implementation, the Corporate Planning and Policy Department (CPPD) of SBI shall prepare following:

- An overall plan for the duration of the program;
- Annual plan and budget with quarterly break-ups; and
- Quarterly statements providing variance between planned and actual disbursement and expenditure.

63. The above statements shall be reviewed by CPPD on a periodic basis and shall also be shared with the Bank.

64. **Accounting**: Various modules of SBI's IT systems would provide the required operational and financial data pertaining to the Program through unique code/s. The accounting

(and costing) systems will provide budget performance reports for comparison against Program budgets; half yearly sources and application of funds for the Program; and annual Program Financial Statements. There would be Program chart of accounts which would ensure that the heads of accounts are uniform for budgeting and accounting. Program costs would include direct costs chargeable to the Program. SBI's accounting procedures and controls would ensure that expenditures under the Program are incurred for the purposes of the Program, duly checked and verified as per standard operating procedures and authorized in accordance with the official delegation of powers. Program related documents and records would be kept in safe custody for the duration of the Program and thereafter as per SBI's policy and would be accessible to the World Bank during supervision visits. Monthly Program statements of accounts would be available for review by the IBG.

65. Since specific Program facilities would be funded by IBRD, CTF, GEF, NCEF (collectively referred to as World Bank) SBI would maintain separate ledger accounts in its books to capture inflows of fund. The funds would be part of the larger pool of Program funds. Program eligible expenditures would be those that are specified in the Program OM and related World Bank Loan instruments.

66. **Reporting:** Reporting under the Program will be as agreed with the Bank and will include**:-**

- **Interim Unaudited Financial Reports (IUFR):** CPPD would prepare and submit semester wise interim unaudited financial report (IUFR) within 60 days from the end of semester to the World Bank. The format of the report shall be agreed with the World Bank and provided as annexure to OM. The information would be provided for the semester, year to date, program to date and would be compared with budgets and variances analyzed.

- **Program Annual Financial Statements:** The project annual financial statements will include (a) IUFRs for the fourth quarter; and (b) any other statement agreed with the Bank.

67. **Internal Controls:** SBI conducts internal audit through its Inspection & Management Audit Department. Audit Committee of the Board (ACB) exercises supervision and control over the functioning of I&MAD. I&MA has zonal inspection offices located throughout the country. Inspection officials periodically monitor adherence to controls and procedures and report deviations to facilitate corrective action. Besides I&MA officials, each Circle is assigned an internal audit team and concurrent auditors are assigned to all large branches.

68. SBI carries out mainly two streams of audits – Risk Focused Internal Audit (RFIA) and Management Audit, covering different facets of Internal Audit requirement. SBI's accounting units are subjected to RFIA. SBI's Management Audit covers administrative offices and examines policies and procedures, besides quality of execution thereof. SBI has also implemented a Concurrent Audit System, which is essentially a control process, integral to the establishment of sound internal accounting functions, effective controls and overseeing of operations on a continuous basis. Concurrent Audit System is reviewed on an on-going basis in accordance with RBI directives. The Program would be covered by SBI's existing internal audit systems. Program specific internal audit ToR shall be prepared and provided in the OM. Half yearly internal audit reports will be shared with the Bank for review.

69. **External Audit:** External Audits of the Program need to be carried out by auditors with independence, experience, and capacity and ToR acceptable to the Bank. According to the SBI Act, the accounts of SBI must be audited by external statutory auditors appointed by SBI with

the previous approval of the RBI. The Program's Annual Financial Statement would be audited by the statutory auditors of SBI as per ToR provided in the Operations Manual. The Annual Audit Report would be shared with the Bank within 9 months from the end of the year. The annual audit report would be accompanied by (i) audited program financial statements with management assertion; (ii) an audit report expressing an opinion on (a) the program financial statements; and (b) the accuracy of the IUFRs submitted under the program; and (iii) management letter highlighting significant issues to be reported to the management. The ToR for external audit will be provided in the OM.

70. **Eligible expenditure**: The World Bank's loan agreement will determine the overall eligibility for Bank financing. The eligible expenditure under the Program will be loans provided as per criteria stated in GRPV OM, audit fee, independent verification agent charges and direct operating costs. The amount of World Bank Financing under the Program shall be equal to or less than the total Program expenditures. If by the end of the Program, the cumulative World Bank disbursements (against DLIs) exceed the total amount of Program expenditures, the SBI shall refund the difference to the World Bank.

C. Environmental and Social Systems Assessment

71. The Solar Rooftops program essentially will include SBI on-lending the funds to either owners of the solar roof top plants or aggregators who will bring such owners together. An Environmental and Social Systems Assessment (ESSA) of the Solar Rooftops program is being undertaken by the Bank as per the requirements of Bank OP/BP 9.00. The aim of the ESSA is to review the capacity of existing SBI systems to plan and implement effective measures for environmental and social impact management under the program, including determining if any measures would be required to strengthen them.

72. *Environmental Systems and Social Systems*: The program activities are likely to have manageable environmental and social impacts as the areas where the activities would occur are already affected by human activities and there are no new discharges as no conversion of material is undertaken. The program's existing institutional system within SBI exists but needs strengthening for environmental management and environmental monitoring. Therefore, existing capacities and systems need to be strengthened and streamlined. Nonetheless it is still expected that the overall outcome of the program will have a positive bearing on the environment, and that the proposed activities are unlikely to have any significant adverse impacts on protected or environmentally sensitive areas or culturally and archaeological sites.

73. *Environmental Benefits and Risks and Management*: The nature of the Program is such that the environmental and social risks associated with the Program are low and adequate and frameworks exist in the Program Manual of the SBI on solar roof top to adequately address the impacts. The program proposed by SBI will be assessed as part of the ESSA which focuses on the systems in SBI to handle any land and associated issues along with other residual issues, especially those arising out of Safety of personnel and other users of site, management of chemicals, and rejected/end-of-life equipment/material like PV cells, batteries, etc.

74. SBI has already drafted an Operations Manual that will be used to guide project activities from project selection/appraisal through individual investment / (sub) project implementation supervision. It follows already existing systems within SBI, which were developed in context of its other existing lending to projects, including power sector. This Manual already mentions many of the key requirements to be met at various stages of the (sub)

project cycle. The findings of ESSA will be discussed and systems with respect to environmental and social aspects will be adequately strengthened as part of environmental and social management of the roof top solar program of the SBI.

75. ESSA will ensure consistency with core principles of Operational Policy 9.00 and identify areas for improved risk management in the program. These risks are low and manageable through improved pre identification and ensuring effective implementation through enhanced monitoring and accountability. It is expected that the ESSA will result in a clear set of recommendations for the project activities, for example, through improvements of the Manual, identification of capacity building activities, and any augmentation of policies governing the program. The ESSA draft will be available for review in end November 2015.

76. *Stakeholder Consultations*: The findings and recommendations of ESSA on the SBI's Solar Roof top Program will also be discussed with the stakeholders and based on consultations, recommendations will be refined further to develop a strengthened program with due considerations on environmental and social systems within the program.

77. *Gender:* The program is expected to have positive gender co-benefits. The roll out of GRPV systems among residential households will improve the quality and reliability of electricity supply, which will disproportionately benefit women and children in terms of school work, household work, and improvement in reliability of health services etc. Similarly, the reduction of local environmental pollution from substitution of diesel generation with GRPV generation will yield positive health benefits for women. During consultation and assessment with beneficiaries, surveys and interviews will be designed in a gender sensitive way to ensure that women are given equal opportunities. For eligible sub-borrowers, guidelines will be developed to ensure that women-owned companies will not be discriminated.

78. **Grievance Redressal**. Communities and individuals who believe that they are adversely affected as a result of a Bank supported PforR operation, as defined by the applicable policy and procedures, may submit complaints to the existing program grievance redress mechanism or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address pertinent concerns. Affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB 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. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org

D. Integrated Risk Assessment Summary

Integrated Risk Assessment Summary

Risk	**Rating**
Country *	Low

Stakeholder *	Substantial
Technical	High
Fiduciary	Low
Environmental and Social	Low
Disbursement Linked Indicator	High
Other (Capacity)	High
Overall Risk	Substantial

Note: Sections marked with an asterisk (*) should be removed when the PAD is submitted to Client for Negotiations and for Board presentation.

Risk Rating Explanation

79. There are a number of risks associated with this Program. First, there is a risk associated with verifying that SBI and loan beneficiaries use the funds for purpose intended under the Program and consistent with the guidelines of the Program. This risk will be mitigated through (i) stronger internal controls and regular internal audits; (ii) use of an Independent Verification Agent and appropriate Milestones/Indicators; (iii) performance audit of developers after a critical mass of Rooftop systems have been installed e.g. 400MW; and (iv) inclusion of integrity provisions in the sub-project and application package. Second, operation of the new energy systems may not be sustainable if the deployed systems perform poorly and capital and operating costs are higher than expected. These risks will be minimized in the first implementation period (up to mid-term review of the Program), by limiting the technology choices to those for which performance, reliability and costs have been sufficiently established through actual operating experience in India and in other countries. Third, there is risk that there may not be strong uptake by developers of the low cost pool of loans or guarantees offered by the program. This risk is being minimized by structuring the loan products in consultation with prospective private sector developers and users and by providing support to improve the investment climate for rooftop PV through increased consumer awareness and education. Fourth, there is risk that distribution companies may be slow to implement net metering and/or gross metering regulations that are important for the roll out of GRPV. This risk is being minimized through a series of consultations with discoms during program preparation and through the TA and capacity building component.

80. Given the above mentioned factors, **the Program risk is being rated "substantial" during preparation.** It is expected that there will be a learning curve for MNRE and SBI during the preparation and implementation period. With the intention of facilitating this learning, the Bank team will provide training to the government and SBI's Rooftop unit on PforR operations.

81. The team considers that a close and intensive engagement with stakeholders during the preparation phase has helped in identifying the gaps on different aspects and accordingly has highlighted key elements needed for preparation of a suitable capacity building and action plan to address those gaps. In addition, it is also expected that a continuous dialogue with the GoI

and MNRE will help in resolving uncertainty on regulatory and policy issues. Based on this, the risk is assessed at "Moderate" during implementation.

E. Program Action Plan

82. The Program assessment identified a number of issues, and the Bank team recommended the following action plan for SBI.

83. **Technical:** SBI Bank needs to build in-house capacity for the monitoring, evaluation and reporting of project results and outsource IVAs for validation of DLIs. The bank's OM should include requirements and procedures in results M&E and validation of DLIs and relevant training be provided to staff who would be in charge of M&E.

84. **Procurement:** The mitigation measurement is proposed as follows: (i) The sub-project application and the sub-loan agreement with beneficiaries shall include a mandatory provision that the beneficiaries shall not award contracts to their parent or affiliate companies unless there is an established arms-length arrangement; (ii) SBI shall set up a complaints handling mechanism details of which will be included in the sub-project application package and on SBI's website; (iii) beneficiaries shall confirm as part of the sub-loan agreement that they will not award contracts to firms and individuals on temporary suspension or debarment by the Bank and other Multilateral Development Banks. SBI shall ensure as part of its supervision and the Independent Verification Agent will confirm that the beneficiaries have complied with this requirement; and (iv) SBI shall strengthen its capacity to assess the capacity of beneficiaries to carry out procurement and contract management efficiently as part of sub-project appraisal and provide guidance to beneficiaries with weak procurement capacity. SBI and beneficiary enterprises will undertake to hire expertise as needed for better procurement and contract management.

85. **Financial Management**: To meet the reporting requirements for the Program, the following mitigating measures are agreed with SBI:
    i. **Interim Unaudited Financial Reports (IUFR):** CPPD would prepare and submit semester wise interim unaudited financial report (IUFR) within 60 days from the end of semester to the World Bank. The format of the report shall be agreed with the World Bank and provided as annexure to OM. The information would be provided for the semester, year to date, program to date and would be compared with budgets and variances analysed.
    ii. **Program Annual Financial Statements:** The project annual financial statements will include (a) IUFRs for the fourth quarter; and (b) any other statement agreed with the Bank.

86. **Internal Controls:** SBI conducts internal audit through its Inspection & Management Audit Department. Audit Committee of the Board (ACB) exercises supervision and control over the functioning of I&MAD. I&MA has zonal inspection offices located throughout the country. Inspection officials periodically monitor adherence to controls and procedures and report deviations to facilitate corrective action. Besides I&MA officials, each Circle is assigned an internal audit team and concurrent auditors are assigned to all large branches.

87. SBI carries out mainly two streams of audits – Risk Focused Internal Audit (RFIA) and Management Audit, covering different facets of Internal Audit requirement. SBI's accounting units are subjected to RFIA. SBI's Management Audit covers administrative offices and

examines policies and procedures, besides quality of execution thereof. SBI has also implemented a Concurrent Audit System, which is essentially a control process, integral to the establishment of sound internal accounting functions, effective controls and overseeing of operations on a continuous basis. Concurrent Audit System is reviewed on an on-going basis in accordance with RBI directives.

88. The Program would be covered by SBI's existing internal audit systems. Program specific internal audit ToR shall be prepared and provided in the OM. Half yearly internal audit reports will be shared with the Bank for review.

89. **Environmental and Social Safeguard**: The program activities are likely to have manageable environmental and social impacts as the areas where the activities would occur are already affected by human activities and there are no new discharges as no conversion of material is undertaken. The program's existing institutional systems exist within SBI but need strengthening for environmental management and environmental monitoring. Therefore, existing capacities and systems need to be strengthened and streamlined. Nonetheless it is still expected that the overall outcome of the program will have a positive bearing on the environment, and that the proposed activities are unlikely to have any significant adverse impacts on protected or environmentally sensitive areas or culturally and archaeological sites. The ESSA report makes the following recommendations to address institutional capacity constraints on managing environmental and social risks: (i) strengthening environment and social impact management within the Program by specifying the requirements and procedures in the OM; and (ii) enhancing capacity of SBI staff by allocating staff, resources, operating arrangements and coordination with other departments in the bank.

Annex 1: Detailed Program Description

A. Program Development Objective (PDO)

1. The PDO is to increase private investment in Grid-connected Rooftop Solar PV (GRPV) and strengthen the capacity of relevant institutions. This will contribute to the achievement of GoI's target of 100GW of solar generation capacity by 2022.

B. Government Program

2. **MNRE's Grid Connected Rooftop and Small Solar Power Plants Program:** MNRE is the lead ministry responsible for overseeing the achievement of GoI's 100GW solar power target. Under the umbrella of Jawaharlal Nehru National Solar Mission and the Off grid and Decentralized Solar Application Scheme, MNRE is leading the implementation of the Grid connected Rooftop Solar Small Power Plant Program (GRSPP). The objective of the GRSPP is to promote GRPV in the country through action on multiple fronts including provision of subsidies, development of business models, creation of enabling environment for private investment, and consumer awareness. GoI has allocated a budget of $730 million for the overall Scheme over 2015-2017, with $90 million allocated specifically for central financial assistance support to GRSPP.

3. The GoI program is applicable to all states of India. It focusses on promoting grid connected solar rooftops to meet and supplement electricity requirements. The program supports the installation of rooftop solar photovoltaic power generation plant for self-consumption as well as supply to the grid. Both program and project modes of implementation are eligible, with the former limited to systems of less than 50kWp. Monitoring and Evaluation of the program is undertaken through a combination of data from system providers, field inspection reports and impact assessment reports.

4. The implementation of GRSPP involves coordination with multiple central and state agencies including State Nodal Agencies for Renewable Energy, Solar Energy Corporation of India (SECI), Financial Institutions, Public Sector Units, Municipal Corporations, private sector Channel Partners, Distribution Companies. SECI, in particular, has been an important partner of MNRE in the implementation of this program, and in channeling the available subsidies**.** SECI is implementing this program in 16 cities across the country, primarily on government owned rooftops. It has so far completed the installation of 22MW of GRPV systems under program (see Table 1) and has approvals to install another 900MW. Two business models have been used by SECI:

- Capex Model in which bidders bid in INR/Wp with a ceiling of INR 90/Wp. Bidding results to date indicate the lowest price discovery in the Capex model to be INR 63/Wp for 1.5 MW capacity in the state of Maharashtra, with a 30% capital subsidy to be provided on this cost.

- The Renewable Energy Service Company (RESCO, or third party ownership) Model in which electricity can be sold to interested consumers at a maximum levelised tariff of INR 6.8/kWh with an assured subsidy of INR 2.7 cr/MW from SECI. Under the RESCO model,

the lowest levelised tariff discovered is INR 4.7/kWh, again in Maharashtra for a capacity of 1 MW.

Table 1 - Status of Grid Connected SPV Rooftop Projects Approved for States/UTs/SECI/PSUs and Other Government Agencies

	Projects approved under MNRE Scheme to SNAs (MW)	National Clean Energy Fund (NCEF) by MNRE (MW)	In principal approval (MW)	Total Sanctioned and approved in principle (MW)	Total Achievement (MW)
States	51	54	310	415	73
SECI		150	750	900	22
Ministry of Railways	0	53	0	53	0
Public Sector Units	0	60	0	60	5
Total	51	316	1060	1426	99

5. **Investments under the program are required to conform to all technical requirements mandated by the respective state regulatory commissions and the Central Electricity Authority (CEA) of India which is the nodal national agency for setting up technical regulations within the country.** These include i) Technical Standards for Connectivity of the Distributed Generation Resources Regulations, 2013 issued by the Central Electricity Authority, which follows global best standards for power quality (DC injection, harmonics and flicker) and safety in terms of anti-islanding; (ii) The 2013 draft amendments to CEA's 'Installation and Operation of Meters' Regulation 2006, which regulates metering standards for distributed solar generation; (iii) CEA/MNRE specifications on the design qualifications and quality standards for both crystalline (c-Si) and thin film modules. Furthermore, the program requires that installation of all bi-directional meters be carried out in consultation with the discom.

6. **The program supports all the major business models of GRPV including the customer-owned, third party-owned and utility-owned models.**

- Customer-owned models. This covers both models where a solar rooftop facility is owned, operated and maintained by the consumer(s) as well as models where the facility is owned by the consumer but operated and maintained by a third party. This is sometimes also referred to as the CAPEX model.
- Third party-owned models.

    - The *Build Own Operate and Maintain* (BOOM) model means that the consumer never makes any investment in the rooftop PV system which sits on his rooftop. It belongs to a third party who meters and sells him electricity units that are generated on his rooftop, in

the manner of an "IPP on the roof". The third party typically enters into a long term power purchase agreement with his customer, to ensure that he is able to recover the cost of his capital investment and O&M expenditures over time. The customer is able to lock in the cost of power over a long period (though his available rooftop space is likely to be a limitation in terms of meeting his full electricity requirements through on-site generation, and he will still need to buy some from the discom). The IPP on the roof will charge him a unit price that is lower than he pays to the discom. In some cases, the IPP provides a minimum "guaranteed" amount of rooftop generation which means that if the actual rooftop generation is lower than contracted for, and the shortfall has to be made up by the customer buying more from the discom, then the IPP will pay a "penalty" to the customer which is to be used for buying those missing units from the discom (at the discom's unit rates).

- The *Build Own Operate Transfer* (BOOT) model is a variation on this, where the third party investor will again make the upfront investment in the rooftop system, and enter a long term agreement with the rooftop owner to sell him power for a certain number of years. However, the sale arrangement in the BOOT model lasts for less than the life of the system. Once the third party owner has recovered his cost of capital and a suitable rate of return, he transfers the ownership of the system to the rooftop owner at a pre-agreed price (which may be a token $1 equivalent, indicating that the full cost has been paid off), e.g. eight or ten years after installation and commissioning. Thereafter, the rooftop owner is responsible only for O&M and he may choose to retain the services of the original third party company or he may find his own arrangements for such O&M requirements. Either way, in the BOOT model, there is a point at which there is a sharp drop in monthly payments for the rooftop system.
- There are also *Rooftop Rental models*, which are third party models for gross metering, where the rooftop owner is paid a "rent" or "lease" amount by a third party who is looking for a place to locate his panels and sell all the output directly to the discom for an agreed rate per kWh on a long-term basis.
- Finally, there is also a *"lease" model* where the rooftop owner allows a third party to place panels on his rooftop and agrees to pay a fixed monthly amount over e.g. 20 years in the form of a monthly "lease" payment for the hardware on his roof and premises. There is no explicit "sale of electricity" as such, and no metering takes place. The equipment owner recovers his investment through the multi-year lease payments. The rooftop owner benefits from whatever is generated on his rooftop, without having put in any contribution to the upfront cost. The risk of how much electricity will be generated from those panels is borne entirely by the rooftop owner, e.g. if there are 20 cloudy days in a row, he cannot claim compensation from the lease counterparty. Conversely, if there is a higher than anticipated rate of electricity output from the panels, his nominal lease payment remains the same, and therefore his unit cost of electricity is notionally very low. The consumer bears the production risk in the lease model, but depending on the unit cost, it may be attractive for him. The owner of the rooftop PV equipment may be benefiting from an accelerated depreciation benefit for his investment in panels, and may be looking for a set of customers who are happy to lease the equipment over a long period with no further claims or penalties. In India at present, there is a service tax on a lease payment, so unless this is modified, the lease model may be the least popular of all of the models mentioned above.

- Utility owned model. This includes both arrangements where the DISCOM installs, owns, operates and maintain the system and alternative arrangements where it retains ownership but delegates the installation and O&M to a third party.

7. **GRSPP has been able to successfully support the customer owned and third party models for GRPV.** However, the scale of overall installations under the program has remained relatively modest at about 99MW as of August 2015 with another 1426 MW currently at different stages of commissioning. The program offers Central Financial Assistance equal to 30% of the overall system costs residential, institutional and government consumers. However, a number of other incentives continue to be available to commercial and industrial consumers to encourage investment in GRPV, including (i) accelerated depreciation benefits for industrial and commercial buildings; (ii) customs duty concessions and excise duty exemptions on equipment; and (iii) ten years of tax holiday.

8. **With the intention of promoting a rapid up take of GRPV systems in the country, MNRE is looking to partner to with financial institutions in the country to increase the amount of debt financing available for GRPV in the country.** At MNRE's request, all major public sector Banks in the country have agreed to cover residential solar rooftop PV systems in the home loan requests of borrowers. MNRE has agreed to form a working group comprising of commercial banks and financial institutions such as SECI, IREDA, and REC to discuss and find solutions to challenges faced by commercial banks in extending lending for GRPV. It has also agreed to carry out capacity building programs for the participating banks and to help the banks in accessing concessional financing from various bilateral International Financial Institutions. As part of these efforts, a loan facility funded by KfW is already operational at IREDA since June 2015. Furthermore, GRPV is now included among sectors that are eligible to be counted under the Priority Sector Lending (PSL) targets applicable to commercial banks in India, as per the April 2015 directive of the Reserve Bank of India. Under PSL, GRPV developers for residential rooftops are now eligible to borrow up to INR150 million and households are eligible to borrow up to INR 10 million.

9. **The proposed IBRD-financed PforR Program is closely linked with the Government program, and provides further value-added contributions:** IBRD has been requested to lend $500m to the State Bank of India (SBI) and help it to set up and operate a Rooftop Program. This proposed operation adds value to the MNRE's GRSPP Program by helping SBI establish a lending program for rooftop solar PV and making available IBRD financing for all category of customers. In Phase Two of the Program, SBI will continue to operate the dedicated unit with its own funding and will offer syndication opportunities to other local banks in order to encourage them to enter the rooftop PV debt market in a risk-mitigated manner, by working with SBI who will have developed the necessary experience and expertise by that time.

10. **GEF funding for this project will be used alongside IBRD and CTF financing to mitigate the risk of lending to GRPV and removing identified barriers to large scale adoption of GRPV in business models, marketing infrastructure, and institutional capacity of discoms.** This will cover technical assistance to the main stakeholders that are involved in the implementation of GRPV in the country such as discoms, SNAs, state power departments and SERCs for the implementation of net metering/gross metering policies in the country and to

increase consumer awareness about GRPV, as well as to assist with the creation of large numbers of trained and accredited rooftop PV inspectors whose services will be required by lenders for smooth functioning of the program. GEF funding will also incentivize lending to riskier category of GRPV customers such as Non-Bank Financial Companies (NBFCs) and Small and Medium Enterprises (SMEs). This will facilitate the market development of GRPV and make it possible to deploy GRPV systems at the scale and pace envisioned by GoI for meeting its official targets. GEF support to the program will hence be very important in realizing the GHG emission reductions benefits expected from this program as a result of the displacement of thermal power with clean solar power.

C. Bank-financed PforR Program Scope

11. The proposed program will support the implementation of MNRE's GRSPP program, with a focus on mobilizing private sector investments and commercial lending, increasing deployment of GRPV, and thereby contributing to the achievement of GoI's GRPV installation targets, while also reducing emissions. The duration of the Program will be five years, with a start date of September 2016, and end date of September 2021. The PforR Program will finance activities in four Result Areas on a country wide eligibility basis: (i) strengthening institutional capacity of SBI; (ii) improving enabling environment among discoms and other state agencies (iii) market development of GRPV; (iv) expanding GRPV generation.

12. *Activities under results area 1 – Strengthening Institutional Capacity for GRPV:*

- *1a – Strengthening Institutional Capacity of SBI.* SBI will (i) establish a GRPV department as a dedicated team and will design and implement an internal institutional structure to mobilize staff in all the relevant departments and branches; (ii) set up internal procedures for loan origination, risk assessment, and loan approval, and provide incentives to staff to undertake the financing of solar rooftop PV investments; and (iii) provide training to staff on GRPV financing, particularly those responsible for deal origination and risk assessment; (iv) strengthen internal IT systems to track GRPV transactions; (v) launch awareness building and advertisement programs; (vi) developing/procuring necessary software; and (vii) internalize lessons from first phase of the program and launch the second phase of the program.

- *1b – Strengthening Institutional Capacity of Discoms, SNA and ERCs to contribute to an improved investment climate for GRPV.* Under the P4R Program, SBI will oversee the implementation of a Technical Assistance program to improve the capacity of discoms, SNAs and SERCs and other entities, as required, to promote and manage GRPV in the country. Specific activities under this results area will include (i) capacity building and technical assistance support to selected discoms, regulators and other institutions; and (iii) communication and stakeholder awareness campaigns by State Nodal Agencies on the GRPV program in their respective states; (iii) introduction of training and accreditation programs in more states, for qualified rooftop PV technical inspectors.

13. *Activities under results area 2 - Market Development of GRPV*. The Program will (i) develop and implement market aggregation models for installers and customers who have suitable, unshaded rooftop space (ii) undertake aggressive marketing and business development for deal origination; (iii) provide lending capital for purchase and installation of inventory by private sector developers and aggregators; and (iv)target lending to riskier category of consumers such as NBFCs and SMEs.

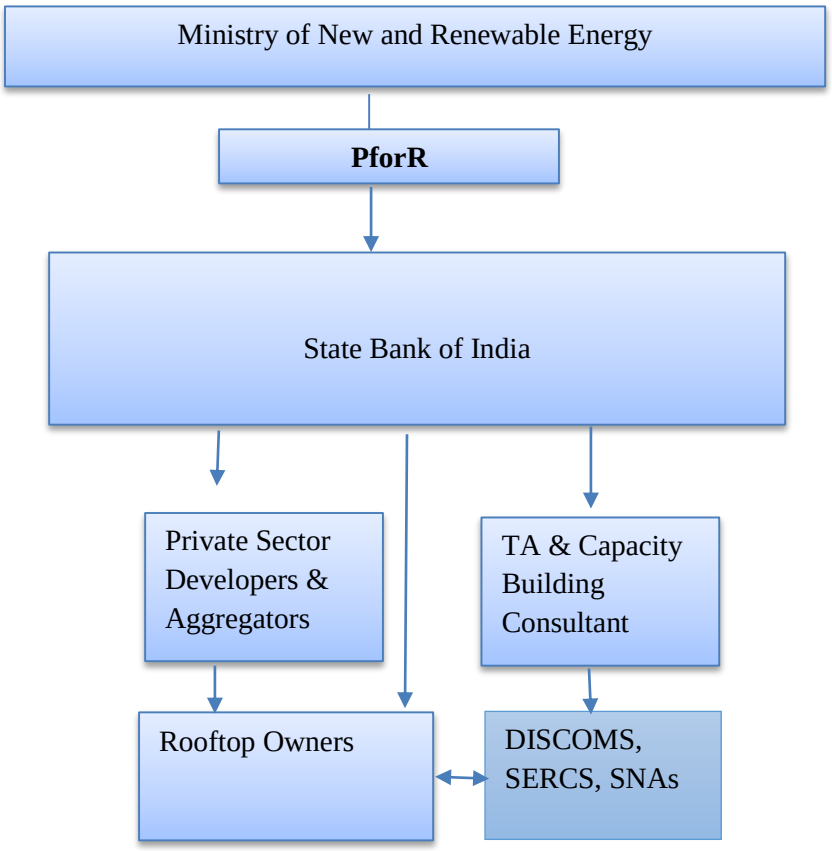
14. *Activities under results area 3 - Expanding GRPV generation*. Private investment will support the installation of up to 400 MW of grid-connected solar rooftop PV systems including (optional) batteries for storage in participating Indian states. In case of CAPEX model and RESCO model funded through project mode, the grid connected rooftop solar photovoltaic power generation plants with a minimum capacity of 100 kWp per project or system will be eligible under the Program. In case of RESCO model funded through program mode, the aggregate capacity will have to be at least 1 MW, with each sub project having a capacity not less than 20 kWp. SBI will appoint a Lender's Independent Engineer to ensure that all installations are compliant with Program requirements and standards. All installations will have to meet technical standards issued by MNRE and/or CEA, which will be specified in the OM of the program. In addition, all installation will need to be insured by the borrower to cover appropriate risks, including force majeure events both during and after the construction period until the loan is outstanding.

D. Institutional and Implementation Arrangements

15. **Government**: As the lead ministry responsible for GoI solar power targets and the GRSPP program, MNRE will provide overall policy guidance as well as regular monitoring and supervision. As mentioned in the preceding section, MNRE will chair a steering committee comprising of all relevant agencies, and will liaise with other government agencies to pursue policy and regulatory reform necessary for the GRPV program to be successful. MNRE will also play a lead role in development partner co-ordination (including with parallel GRPV programs supported by KfW and ADB) and in ensuring that the lessons from this program are internalized in other government-supported programs.

16. **State Bank of India. SBI will be the borrower and implementing agency for the PforR component (Component 1) of this operation.** This operation will enable SBI to lend to qualified intermediaries (qualified in terms of technical capacity, relevant experience, and creditworthiness as per SBI's standards). This access to working capital will allow qualified private sector developers and aggregators to buy the required inventory and aggressively acquire customers, and push for large scale deployment of roof top solar PV systems among customers using different business models. SBI will be responsible for identifying, appraising, and financing eligible investments that meet the criteria in an Operational Manual (OM) that will be developed during preparation. The detailed eligibility criteria, technical performance requirements and appraisal guidelines will be outlined in the OM, agreed between the SBI, MNRE, and the Bank. SBI will also oversee the implementation of technical assistance to the main stakeholders that are involved in the implementation of GRPV in the country such as discoms, state nodal agencies (SNAs) for renewable energy, state power departments and electricity regulatory commissions (Figure 1)

Figure 1: Proposed Implementation Arrangements



17. SBI is India's oldest and largest financial services company. It has more than 16,000 branches in the country and 190 foreign offices in 36 countries. It has an active customer base of 270 million. While the Bank is majority owned by the GoI, shares of SBI are traded on the Bombay Stock Exchange and National Stock Exchange of India. Its Global Depository Receipts are listed on the London Stock Exchange. SBI's size and reach make it an ideal partner to roll out MNRE's scheme for grid-connected solar rooftop PV program.

18. SBI is interested in participating in the Program since it offers an entry-point into an area with significant potential for growth in the future but it will not do so without support and hand-holding from an international partner agency with domain experience, because it is (a) unfamiliar with the technical issues of Rooftop PV performance and (b) not in a position to take on the coordination role with state discoms, regulators and nodal agencies who are all key enablers and stakeholders in this program, but who have current performance limitations. However, SBI has assured MNRE that if a successful program is set up with World Bank support then it will be happy to continue the implementation of the program on a nation-wide basis using its own resources for lending to qualified parties in continuation of the previous experience. It is mainly looking for initial World Bank support to launch the program, and help it to set up suitably robust in-house systems.

Annex 2: Results Framework

Program Development Objective: The PDO is to increase private investment in Grid-connected Rooftop Solar PV (GRPV) and strengthen the capacity of relevant institutions.												
PDO Level Results Indicators	**Core**	**DLI**	**Unit of Measure**	**Baseline**	**Target Values**					**Frequency**	**Data Source/Methodology**	**Responsibility for Data Collection**
					Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**			
PDO Indicator 1: Capacity of GRPV connected to the grid	☐	☐	MW	0	0	50	100	150	200	Annual	SBI	SBI
PDO Indicator 2: Reduction of carbon emissions	☐	☐	thousand tons	0	0	100	300	600	1200	Annual	SBI	SBI
PDO Indicator :	☐	☐										
Intermediate Results Area 1: Improved institutional capacity for GRPV												
Intermediate Results Indicator 1: Launch of Rooftop Solar PV program at SBI and development of internal procedures for the identification, risk assessment, appraisal and approval of rooftop solar projects	☐	**X**		0	Done					Annual	SBI	SBI
Intermediate Results Indicator 2:	☐	X		0								

Implementation of TA and capacity building program for discoms, SNAs, SERCs etc.					Contract signed with consultant	Phase 1 of TA completed	Phase 2 of TA completed			Annual	SBI	SBI
Intermediate Results Indicator : Phase 2 of SBI's Rooftop Solar PV program launched	☐	X		0	NA	NA	NA	NA	Phase 2 of SBI's program designed allocated and announced	Year 5 or upon completion of phase 1	SBI	SBI
Intermediate Results Area 2: Market development of rooftop solar PV												
Intermediate Results Indicator : Amount rooftop solar loans approved by SBI	☐	**X**	($ million)	0	100	250	400	600	600	Annual	SBI	SBI
Intermediate Results Indicator : Amount of additional financing mobilized by SBI	☐	☐	($ million)	0	25	62	100	150	150	Annual	SBI	SBI
Intermediate Results Indicator : capacity of GRPV orders placed with SBI's borrowers	☐	☐	MW	0	75	150	300	450	600	Annual	SBI	SBI
Intermediate Results Indicator :	☐	☐										
Intermediate Results Area 3: Expanding GRPV generation												

Intermediate Results Indicator : Capacity of rooftop solar installed and commissioned under the program (MW)		X	MW	0		100	200	300	400	Annual	Independent Verification Agent	SBI

Annex 3: Disbursement Linked Indicators, Disbursement Arrangements and Verification Protocols

Disbursement-Linked Indicator Matrix

DISBURSEMENT-LINKED INDICATORS	**DISBURSEMENT-LINKED RESULTS**									
	RESULTS TO BE ACHIEVED IN [FY2016/17] (YEAR 1)		**RESULTS TO BE ACHIEVED IN [FY2017/18] (YEAR 2)**		**RESULTS TO BE ACHIEVED IN [FY2018/19] (YEAR 3)**		**RESULTS TO BE ACHIEVED IN [FY2019/20] (YEAR 4)**	**RESULTS TO BE ACHIEVED IN [FY2020/21] (YEAR 5)**
1. *Establishing a Rooftop Solar PV Program at the State Bank of India.*	SBI has: (i) approved and adopted its Program Operations Manual; (ii) established/staffed the PIU; (iii) upgraded its IT modules for Program monitoring and evaluation; and (iv) advertised/launched the rooftop solar PV financing business line.							
Allocated Amounts & Source of Funding	GEF	N/A						
	CTF	USD 5 million						
	IBRD	N/A						
2. *Technical assistance to key stakeholders for the implementation of MNRE's GRPV program*	SBI has entered into a contract with a consulting firm, under terms of reference ("TORs") acceptable to the Bank, for the provision of technical assistance to GRPV		SBI has concluded [Phase 1] of the technical assistance for GRPV, as per the TORs.		SBI has concluded Phase [Phase 2] of the technical assistance for GRPV, as per the TORs.			
Allocated Amounts & Source of Funding	GEF	USD 3 million	GEF	USD 5 million	GEF	USD 5 million		
	CTF	N/A	CTF	N/A	CTF	N/A		
	IBRD	N/A	IBRD	N/A	IBRD	N/A		
	CTF	N/A						
	IBRD	N/A						

DISBURSEMENT-LINKED INDICATORS	DISBURSEMENT-LINKED RESULTS									
	RESULTS TO BE ACHIEVED IN [FY2016/17] (YEAR 1)		RESULTS TO BE ACHIEVED IN [FY2017/18] (YEAR 2)		RESULTS TO BE ACHIEVED IN [FY2018/19] (YEAR 3)		RESULTS TO BE ACHIEVED IN [FY2019/20] (YEAR 4)		RESULTS TO BE ACHIEVED IN [FY2020/21] (YEAR 5)
3. *Aggregate amounts of loans originated by SBI for the financing of solar (PV) rooftop power generation*	SBI has originated loans for the financing of installation of solar (PV) rooftops for an aggregate amount of at least USD 50 million equivalent		SBI has originated loans for the financing of installation of solar (PV) rooftops for an additional aggregate amount of at least USD 10 million equivalent above Year 1.		SBI has originated loans for the financing of installation of solar (PV) rooftops for an additional aggregate amount of at least USD 10 million equivalent above Year 2.		SBI has originated loans for the financing of installation of solar (PV) rooftops for an additional aggregate amount of at least USD 10 million equivalent above Year 3.			
Allocated Amounts & Source of Funding	GEF	N/A	GEF	N/A	GEF	N/A	GEF	N/A		
	CTF	USD 500,000 per USD 1 million equivalent of loans originated	CTF	USD 350,000 per USD 1 million equivalent of loans originated	CTF	USD 150,000 per USD 1 million equivalent of loans originated	CTF	N/A		
	IBRD	USD 500,000, per USD 1 million equivalent of loans originated	IBRD	USD 150,000 per USD 1 million equivalent of loans originated	IBRD	USD 350,000 per USD 1 million equivalent of loans originated	IBRD	USD 500,000 per USD 1 million equivalent of loans originated		
4. *Piloting new business models*	SBI has originated loan for SMEs and NBFCs for the financing of installation of solar (PV) rooftops for an aggregate amount of at least USD 15 million equivalent.									
Allocated Amounts & Source of Funding	GEF	USD 10 million								
	CTF	N/A								
	IBRD	N/A								
5. *Megawatts of solar (PV) rooftop power generation installed and commissioned under SBI financing*			At least 25 megawatts of solar (PV) rooftop power generation capacity financed by SBI have been installed and commissioned		At least 25 megawatts of solar (PV) rooftop power generation capacity financed by SBI have been installed and commissioned over and above the capacity installed and commission up to Year 2.		At least 25 megawatts of solar (PV) rooftop power generation capacity financed by SBI have been installed and commissioned over and above the capacity installed and commission up to Year 3.		At least 25 megawatts of solar (PV) rooftop power generation capacity financed by SBI have been installed and commissioned over and above the capacity installed and commission up to Year 4.	

DISBURSEMENT-LINKED INDICATORS	**DISBURSEMENT-LINKED RESULTS**								
	RESULTS TO BE ACHIEVED IN [FY2016/17] (YEAR 1)	**RESULTS TO BE ACHIEVED IN [FY2017/18] (YEAR 2)**		**RESULTS TO BE ACHIEVED IN [FY2018/19] (YEAR 3)**		**RESULTS TO BE ACHIEVED IN [FY2019/20] (YEAR 4)**		**RESULTS TO BE ACHIEVED IN [FY2020/21] (YEAR 5)**	
Allocated Amounts & Source of Funding		GEF	N/A	GEF	N/A	GEF	N/A	GEF	N/A
		CTF	N/A	CTF	N/A	CTF	N/A	CTF	N/A
		IBRD	USD750,000 per megawatt installed and commissioned	IBRD	USD750,000 per megawatt installed and commissioned	IBRD	USD750,000 per megawatt installed and commissioned	IBRD	USD750,000 per megawatt installed and commissioned
6. Sustainability of GRPV program								SBI has [designed, announced and allocated resources] for the carrying out of the [Second Phase] of the program, with the initial $50M equivalent syndicated from other financial institutions.	
Allocated Amounts & Source of Funding								GEF	N/A
								CTF	USD 20 million
								IBRD	N/A

DLI Verification Protocol Table

DLI	*Definition/ Description of achievement*	*Scalability of Disbursements (Yes/No)*	*Protocol to evaluate achievement of the DLI and data/result verification*		
			Data source/agency	*Verification Entity*	*Procedure*
1	Establishing a Rooftop Solar PV program at the State Bank of India (SBI); IT systems strengthened	No	SBI	SBI	SBI will send evidence to the World Bank that the Rooftop Solar Program has been established; it will also share the Operations Manual for the program where the procedures for loan origination, risk assessment, appraisal and loan are documented.
2	TA program for GRPV implemented	No	SBI	SBI	Prior to the Board approval of the program, SBI and World Bank will agree on a detailed terms of reference for this TA program, including the coverage of different phases. In the first year, SBI will send evidence to the World Bank that a contract has been signed with a consulting firm as per the terms of these agreement. In subsequent year, SBI will send evidence that different phases of the TA program have been completed as per original agreement.
3	Loans for Rooftop Solar PV originated	Yes	SBI	Independent Audit Firm (IAF)	The IAF will be engaged by SBI and approved by the World Bank. The IAF will audit the SBI's loan approvals and disbursements for GRPV.
4	Piloting new business models	Yes	SBI	IAF	The IAF will be engaged by SBI and approved by the World Bank. The IAF will audit the SBI's loan approvals and disbursements for GRPV to SMEs and NBFCs.
5	Rooftop PV capacity installed and commissioned	Yes	SBI	Independent Verification Agency (IVA)	The IVA will be engaged by SBI and approved by the World Bank. The IVA will verify the solar PV capacity installed and commissioned for the projects financed by SBI under the program.
6	Rooftop Solar PV Program at SBI sustained	No	SBI	SBI	SBI will send a Board approved document to the World Bank that shows that the next phase of the Rooftop Solar Program has been designed, allocated and announced.

Bank Disbursement Table

#	DLI	Bank financing allocated to the DLI	Of which Financing available for		Deadline for DLI Achievement[1]	Minimum DLI value to be achieved to trigger disbursements of Bank Financing [2]	Maximum DLI value(s) expected to be achieved for Bank disbursements purposes [3]	Determination of Financing Amount to be disbursed against achieved and verified DLI value(s) [4]
			Prior results	Advances				
1	Establishing a Rooftop Solar PV program at the State Bank of India (SBI); IT systems strengthened	5M CTF	Yes		05/31/2016	No	13	TBD
2	TA program for GRPV implemented	13M GEF		Yes	09/30/2021	No	10	TBD
3	Loans for Rooftop Solar PV originated	200M IBRD and 100M CTF		Yes	09/30/2021	50M in first year and 10M in subsequent years	300	TBD
4	New business model piloted	10M GEF		Yes	09/30/2021	5M	10	TBD
5	Rooftop PV capacity installed and commissioned	300M IBRD		Yes	09/30/2021	25MW	300	TBD
6	Rooftop Solar PV Program at SBI sustained	25M CTF		Yes	09/30/2021	No	25	TBD

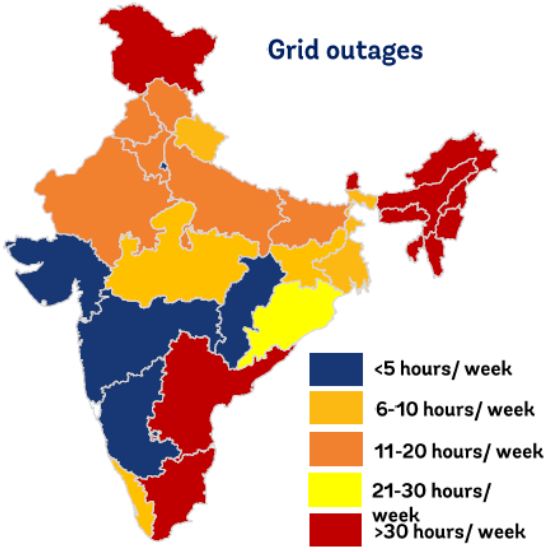
[1] If the DLI is to be achieved by a certain date before the Bank Financing closing date, please insert such date. Otherwise, please insert the Bank Financing closing date.
[2] If the DLI has to remain at or above a minimum level to trigger Bank disbursements (e.g. DLI baseline), please indicate such level.
[3] Please insert the DLI value(s) above which no additional Bank financing will be disbursed.
[4] Specify the formula determining the level of Bank financing to be disbursed on the basis of level of progress in achieving the DLI, once the level of DLI achievement has been verified by the Bank. Such formula may be of various types, including pass/fail, linear, or other types as may be agreed between the Bank and the borrower.

Annex 4: Technical Assessment

A. Strategic relevance

1. India's energy demand is set to grow rapidly as India manages the energy challenges of a rapidly growing economy, 300 million people without reliable access to electricity, and growing energy imports. Furthermore, local environmental pollution is a major issue in India. According to the World Health Organization, 13 of the 20 most polluted cities in the world are in India. Private investment in diesel generators as a coping mechanism against frequent power cuts is widespread (see Figure 1). Renewable energy is increasingly seen as an important contributor to meeting this energy demand in an environmentally sustainable way and to India's energy security.

Figure 1 – Grid outages in India



2. Solar power is India's largest renewable energy resource. Over the past ten years, solar power has grown rapidly driven by government policy and rapidly declining costs, propelling the solar industry into the mainstream of energy policy (Figure 2). From 2009, the Jawaharlal Nehru National Solar Mission and state policies, especially in Gujarat, Karnataka, Rajasthan, Tamil Nadu helped bring down the cost of generation, as reflected in the graph below. With the recent most bid of Rs 5.05 per unit for a utility-scale solar PV project in Madhya Pradesh, solar costs have fallen over 70% from 2010 levels. As figure 3 shows, ground-mounted solar has driven this growth and grown faster both in volume and percentage terms. Rooftop solar is perhaps 3-5 years behind in terms of the maturity of ground-mounted solar in terms of the level of interest, comfort with the technology, availability of finance and the wider ecosystem.

Figure 2 - Tariff for Solar PV projects determined by CERC

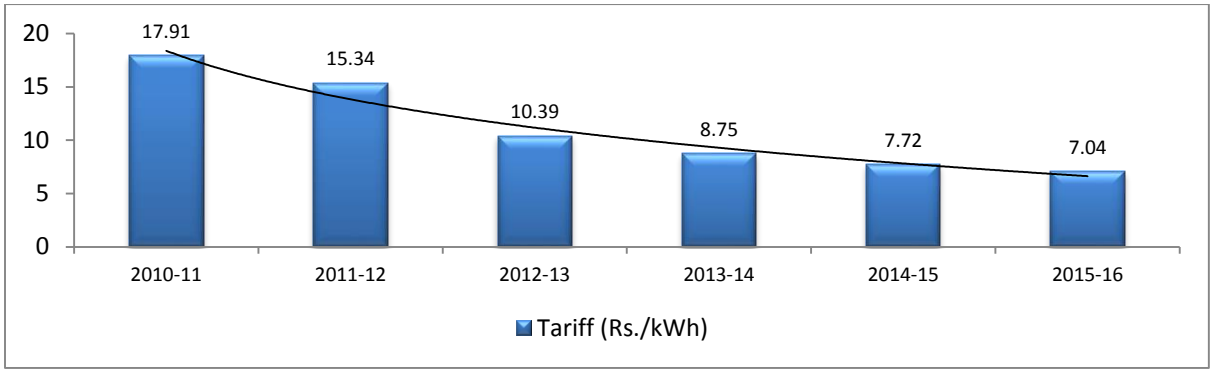
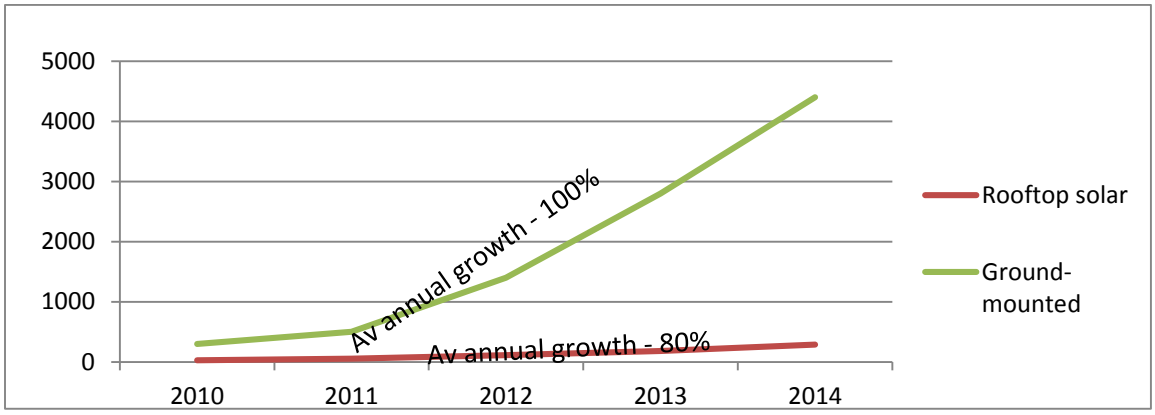


Figure 3 - Cumulative installed capacity for ground-mount and rooftop solar.



3. Rooftop solar has the potential to be a significant addition to India's renewable energy mix, providing at least 120GW domestic of energy production capacity. In the long term as new technologies such as build-integrated photovoltaics become widespread, this potential will increase further. Rooftop solar has particular advantages that make it a valuable energy source for India. It also has clear limitations (see Table 1 for advantages and disadvantages of rooftop solar).

Table 1 - Summary of advantages and disadvantages of rooftop solar in India

Advantages	Disadvantages
Makes use of space that otherwise may be unused, avoids need for additional land dedicated to energy production	Solar an intermittent energy source only producing when sun shining
Produces power near point of consumption, makes use of existing grid infrastructure	Solar makes only a small contribution to India's evening peak demand, so largely does not substitute for peak power requirements
Can grow organically, not dependent on risks to few big projects	Smaller systems mean higher unit costs than for utility scale, ground-mounted solar.

Helps reduce local and global environmental emissions	Rooftop solar creates two-way flows in grid network, requiring changes to grid management and infrastructure
Creates significant numbers of jobs	For utilities, net metered rooftop solar means some reduced demand growth
Will help drive progress towards a smarter grid (higher efficiency, lower loses, higher quality, greater real-time power management)	Rooftops often have multiple uses and trade-offs with other uses may be needed.

4. Government vision and roadmap. In November 2014, the Government of India (GoI) announced its intention to increase its target for solar installed capacity from 20 to 100GW by 2022[16]. This 100GW target, including a target of 40GW from solar rooftops, was formally approved by Cabinet on 17 June 2015.Achieving the 40GW target will require increasing current capacity 114 times which means annualised growth of 97% every year till 2022. This would exceed the 80% a year growth rate in mobile telephone subscribers between 2000 and2009[17]. Achieving this scale of growth will mean getting the market conditions and incentives right and keeping them optimised year on year all the way to 2022.

5. GoI and a growing number of state governments and regulators are putting in place policy and regulatory arrangements necessary to support the large scale deployment of GRPV (Table 2). So far, 19 out of 29 states have issued solar policies and the SERCs of 24 states have issued net metering regulations Amendments currently being tabled in Parliament will increase Renewable Purchase Obligation (RPO) targets, introduce Renewable Generation Obligation (RGO) targets, penalties on RPO and RGO non-compliance, and improve the ease of doing business for renewable micro-grids for rural electrification. Other reforms are also included in these amendments such as separation of carriage and content, which may affect the financial performance of the sector, and the investment context for distributed solar generation in particular

Table 2 – Legislation, policy and regulation for rooftop

	Centre	State
Legislation	Electricity Act 2003 (EA 2003) - mandates state regulators to promote renewable energy by connectivity with grid, sale of electricity and purchase of electricity by distribution licensee	Mandates under the EA 03 have resulted into various policy and regulatory measures promoting renewable energy at the state level, such as, determination of preferential tariffs for procurement of green power, RPO etc.
	Amendment of the Electricity Act 2003	Renewable Generation Obligation equivalent to 10% of the total thermal power installed capacity for Generator The Act allows for exemption of renewable energy generators from paying open access charges

[16] Government of India, 2015 (http://pib.nic.in/newsite/PrintRelease.aspx?relid=122566)
[17] Telecoms Regulatory Authority of India, 2014 (http://trak.in/tags/business/2007/06/19/indian-telecommunication-story-from-10-million-to-150-million-mobile-subscribers-in-5-years/)

	Renewable Energy Act (draft) – potential assessment, creation of Centre and state level funds, implementation thrust to RPO	SERCs mandate yearly solar and non-solar RPO for obligated consumers
Policies	Country-level target for setting up of 40GW of rooftop solar by 2022	Central government has suggested state-level targets in line with overall RPO targets. States may accept these targets.
	Fiscal and financial support (primarily capital subsidy and interest rate subventions)	Some of the state offer additional fiscal support to rooftop solar in the form of Capital subsidy or feed- in tariff
	Other special schemes or programmes – for e.g. rooftop solar on govt. buildings	Institutions, government buildings, etc. are offered in some cases
Regulation	National Electricity Policy 2005 and National Tariff Policy 2006	These are state specific regulations that typically detail out guidelines for business models, eligibility of consumers, connectivity norms, penetration limits at the transformer level, buy back of surplus energy, if applicable, energy accounting and settlement etc.
	Forum Of Regulator guidelines - on business models, procurement of power,	
	CEA – technical standards (e.g. for Connectivity of Distributed Generation Resources.	
	Installation and Operation of Meters' Regulation 2006 and amendments	
	Measures of Safety and Electricity Supply Regulations, 2010	

6. A number of recent studies, including a 2014 IFC study[18], have identified the absence of commercial loans available to rooftop aggregators and developers as a major and binding constraint to the launch of private investment in GRPV. In this context, the proposed operation will help address the barriers to GRPV noted above by (i) by making long term concessional financing available for the deployment of GRPV; (iii) sharing international knowledge and experience on how large solar rooftop investment programs have been implemented across the world; (iv) providing technical assistance and capacity building support to relevant institutions. This Program can also have demonstration effects in other developing countries with solar resources.

B. Technical Soundness

7. The Program takes into account and confirms to international experience and good practice in rooftop solar PV including (i) technical standard and specifications; (ii) grid integration of

[18] An IFC Study issued in 2014, "Harnessing Energy from the Sun: Empowering Rooftop Owners" recommends (i)"financial incentives targeted at the various segments of stakeholders, established to kick-start development of the sector, with a phasing out over time, backed by appropriate policies and regulations"; and (ii) "establishing innovative products, and attracting the commercial lending sector by implementing pilot projects with large third-party developers."

rooftop solar PV and (iii) business models. The program will finance technically proven and commercially viable GRPV investments. The SBI has demonstrated experience and proven track record managing green energy programs. In areas such as Monitoring and Evaluation and Environment and Social management where the SBI does not have the required skills and expertise, it will use external expertise as a complement to its own resources. The assessment shows that while the program could negatively impact the financial situation of discoms (and hence their support for the program), the impact is expected to be minimal in the early years of the program. The proposed operation will help discoms and other relevant institutions to better manage GRPV through the implementation of technical assistance and capacity building program. The economic evaluation show the proposed program is economically viable with significant local and global environmental benefits.

Technical standards and specifications.

8. The Central Electricity Authority (CEA) is responsible for the setting technical standards for rooftop solar systems in India, which have been adopted by MNRE and SBI for this program. SBI will engage a Lender's Independent Engineer to ensure that all investments undertaken as part of the program meet minimum these technical standards. MNRE and SBI will ensure that the investments are in compliance with Indian policies and regulations. The draft standards and certifications that will used for this program are given in Table 3.

Table 3 – Standards and certifications for PV equipment

Solar PV Modules/Panels	
IEC 61215	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61646	Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules
IS 16077	Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules
IEC 62108	Design Qualification and Type Approval for Concentrator Photovoltaic (CPV) Modules and Assemblies
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61725	Analytical expression for Daily Solar Profiles
IEC 61853-1	Photovoltaic (PV) module performance testing and energy rating – Part 1: Irradiance and temperature performance measurements, and power rating
IS 16170 : Part 1	PV module performance testing and energy rating – Irradiance and temperature performance measurement, and energy rating
IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH3) Corrosion Testing
IEC 60721-2-1	Classification of environmental conditions – Part 2-1: Environmental conditions appearing in nature - Temperature and humidity
IEC 61730-1	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction
IEC 61730-2	Photovoltaic (PV) Module Safety Qualification – Part 2: Requirements for Testing
IEC 62804 (Draft Specifications)	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation. IEC TS 62804-1: Part 1: Crystalline silicon
IEC 60904-2	Photovoltaic devices – Part 2: Requirements for photovoltaic reference devices (STC Performance, I-V)
IEC 60891	Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics (STC Performance)
NREL Report	Light-Induced Degradation (LID) of c-Si Solar Cells
IEC 60364-4-41	Low-voltage electrical installations – Part 4-41: Protection for safety - Protection against electric shock
IEC TS 62548	Photovoltaic (PV) Arrays – Design requirements

IEC 61829	Crystalline silicon photovoltaic (PV) array – On-site measurement of I-V characteristics
IEC 62759-1	Photovoltaic (PV) modules – Transportation testing, Part 1: Transportation and shipping of module package units
IEC 62670-1 & IEC 62670-2	Photovoltaic concentrators (CPV) - Performance testing - Part 1: Standard conditions, and Part 2: Energy measurement
Surge Arrestors	
IEC 60364-5-53	DC surge protection device (SPD), class 2
IEC 60364-5-53	AC surge protection device (SPD), class 2
IEC 60364-5-53	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
IS 15086-5	Surge Arresters, Part 5: Selection and Application Recommendations
Cables	
IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
BS EN 50618	Electric cables for photovoltaic systems (BT(DE/NOT)258), mainly for DC cables
IEC 60227-1	Polyvinyl chloride (PVC) insulated cables of rated voltages up to andincluding 450/750 V - Part 1: General requirements
IEC 60502-2	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um =36 kV)
Earthing/Lightning	
IS 3043-1986	Earthing shall be done in accordance with IS 3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm2 copper, 10 mm2 aluminum or, 70 mm2 hot dip galvanized steel
IEC 60364-5-53	The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system; The SPDs shall be of type 2 as per IEC 60364-5-53
IS 3043	Code of practice for earthing (ETD 20: Electrical Installation)
IEC 62561 Series	IEC 62561-1 Lightning protection system components (LPSC) - Part 1: Requirements for connection components IEC 62561-2 Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes IEC 62561-7 Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds
DIN EN 62305-3	Protection against lightning – Part 3: Physical damage to structures and life hazard (IEC 62305-3, modified)
Junction Boxes	
IEC 529	Junction boxes and solar panel terminal boxes shall be of the thermo plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use
IE 62208, IP 54 as per IEC 529	General requirements for junction boxes, charge controllers
Energy Meter	
CEA Regulations	Installation and Operation of Energy Meters Regulations 2006, and asamended in 2010 & 2014
IS 13779	A.C. Static watt-hour Meters Class 1 and 2 — Specification
IS 14697	A.C. Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2 S and 0.5 S — Specification
IS 15884	Alternating Current Direct connected static Prepayment Meters for Active Energy (Class 1 and 2) — Specification
IS 15959	Data exchange for electricity meter reading, tariff and load control — companion specification
IS 16444	A.C. Static direct connected watt-hour Smart Meter Class 1 and 2 — Specification (with Import & Export/Net energy measurements)

System Performance Monitoring	
IS/IEC 61724	Guidelines for PV System Performance Monitoring – Measurement, Data Exchange, and Analysis (Draft of second revision of IEC 61724 is in progress)
Rooftop PV System/Power Plant Inspection	
IEC 62446	Grid Connected Solar PV Systems – Minimum requirements for system Documentation, Commissioning Tests, and Inspection
IEC 61557-1	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements
IEC 60364-6	Low-voltage electrical installations - Part 6: Verification
IEC 61829	Crystalline silicon photovoltaic (PV) array – On-site measurement of I-V characteristics
IEC 60364 Series	Electrical Installations for Buildings – Part 7: Requirements for special installations or locations (Section 712: Solar photovoltaic (PV)power supply systems)
Battery/Electrical Storage	
IEC 61427-1	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 1: Photovoltaic off-grid application
IS 13369	Stationary lead acid batteries (with tubular positive plates) in mono-bloc containers
IEC 61427-2	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications
Solar PV Roof Mounting Structure	
DIN EN 1991-1-4	Actions on structures, Part 1-4: General actions – Wind actions
DIN EN 1991-1-3	Actions on structures, Part 1-3: General actions – Snow loads
	BIS, if any

9. The operation will use the technical assistance and capacity building program to ensure that technical standards evolve to international best practices in this area, that there is consistency across different states in the implementation of these standards and effective dissemination of information allows the standards to be easy to comprehend and enforce. In particular, the following consideration will be taken into account.

- Meters: In the present context there is limited availability of bi-directional meters in India - so states continue to require multiple bidirectional meters which can be avoided by increasing availability of bidirectional meters. The ambition should be to bring the cost of bidirectional meters to the same or lower than existing unidirectional meters. This way, they can become standard making household meters rooftop ready and further reducing costs for all households.

- Inverters: Most inverters available in the Indian market include the following technical features – harmonic current injection, DC injection, Flicker control, and anti-islanding. Additional features of reactive power support, low voltage rise through, and frequency regulation can also be easily added to the existing features of inverters at without any significant extra cost to the consumers.

- Deliberate islanding: Designing rooftop solar systems to operate when the grid fails is known as deliberate islanding. The problem comes in designing so this happens when needed without endangering grid maintenance staff. The need is to find ways to both protect safety (which must be paramount) and to allow systems to operate during grid

outages. This will help expand the market for grid-connected rooftop solar into areas outside the main metros and into smaller towns and cities that face power cuts.

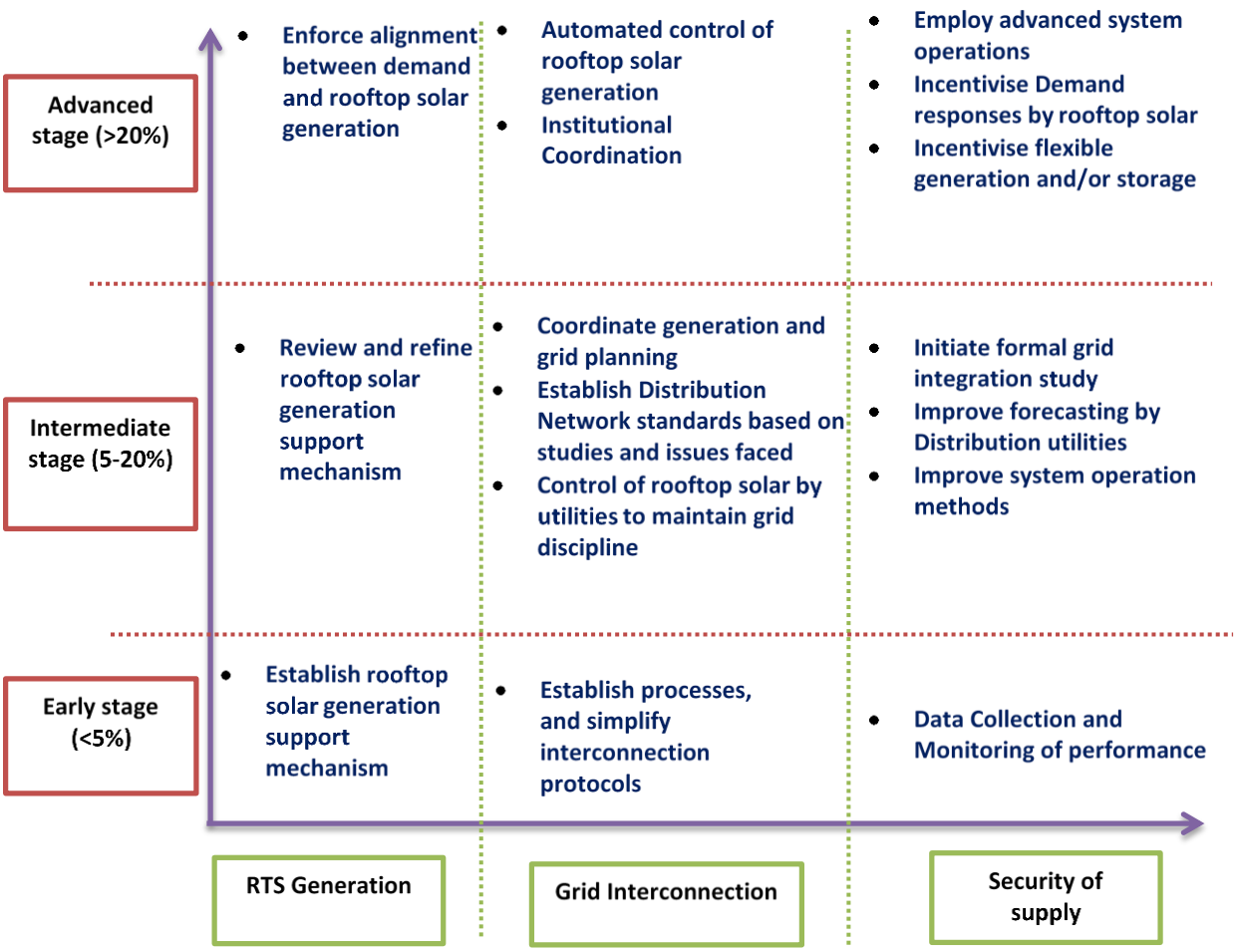
Long terms challenges of integrating rooftop solar into the grid

10. A recent study by NREL suggests that at penetrations up to 5% of variable renewable energy integration of renewable energy does not pose any complex system integration issues. Even if the government target of 40GW of rooftop solar is achieved by 2022, only about 4% of India's power will come from rooftop solar. This level would not require significant change to infrastructure. However, rooftop solar will not be evenly spread and what matters is the level of rooftop solar at local level, not the national average. Therefore, utilities will need to plan for infrastructure change in some areas where rooftop solar is concentrated. The key technical challenges that rooftop solar can create for distribution utilities are:

- Variations in voltage: Fluctuations in rooftop solar output can lead to voltage variations. This can be managed by good inverters. However, rooftop solar generation can also help support the voltage in the grid by increase voltage at the end of distribution lines. This can be particularly useful in rural areas.
- Variations in frequency response: Inverters are mandated to trip if the frequency varies beyond specific limits. However this can result in simultaneously tripping of all the inverters connected to the grid at the same time, making it harder to maintain grid stability. Additional inverter features can be specified to avoid this problem.
- Bi-directional power flow: when rooftop solar systems export power to the grid, it creates reverse flows in the distribution network. This can be a problem as networks have been engineered to be one way only. Changes to the grid are required such as adjusting grid safety features and network controls, upgrading transformers to handle such flows.
- Variability of rooftop solar: as for other variable renewable energy, rooftop solar can fluctuate quickly with cloudy conditions. This can cause the amount of generation from rooftop solar to vary significantly, requiring grid operators to maintain alternative generation capacities.

10. The technical challenges that are anticipated (as discussed) to arise from the rooftop solar penetration above are not without solutions. Design features such as On Load tap Changer for MV/LV transformer, booster transformers along long feeders, and reactive power support through Static Volt-Ampere Reactive (VAR Compensators (SVC) and revised protection settings for bi-directional flows will need to be incorporated in new design criteria. Much of the changes can be introduced over time and integrated into routine maintenance or upgradation programmes to reduce costs. The proposed operation will engage with relevant institutions through the technical assistance and capacity build program to ensure that these considerations are taken in the future planning and development of the grid. Table 4 indicates the responses that will be needed to manage increasing levels of rooftop solar.

Table 4 - Illustrative regulatory actions for increasing rooftop solar deployment



Business Models

11. The rooftop solar market in most countries has been driven by government policy and particularly by level of government subsidy. For instance, a 2004 FiT policy in Germany is widely credited with making Germany the largest solar market globally and FiT specific business models evolved. Similarly, enactment of tax credits in the US helped business models evolve and significantly increased market growth. Backed by FiTs of the German government, prevalent business models in Germany were fairly straightforward and customers installed rooftop solar using easily available bank loans.

12. In the US, while many customers opted to own their rooftop solar installations, companies such as SolarCity created business models to sell power from rooftop installations to customers and for that raised money from institutional investors who could then avail tax credits on their investments. These increased investments led to market growth. The choice of business model is one of several factors that determine the project structure and its finances. There are innumerable variations to the basic structure of these projects. For example, a customer may make part investment in to the project or multiple investors may own a single project or the system may be transferred to the customer through mutually agreeable contractual clauses.

13. A key objective of this program is to facilitate the development and implementation of third party models in addition to customer-owned models which are prevalent in India. This operation will enable SBI to lend to qualified intermediaries (qualified in terms of technical capacity, relevant experience, and creditworthiness as per SBI's standards). This access to working capital will allow qualified private sector developers and aggregators to buy the required inventory and aggressively acquire customers, and push for large scale deployment of roof top solar PV systems among customers using different business models.

Impact on utility finances

14. Distribution utilities are critical to the success of rooftop solar. In India, distribution utilities operate and maintain the network and also supply power to the retail consumers. Therefore, they are critical to interconnecting rooftop solar systems safely into the grid, managing the technical challenges of rooftop solar power and (in most cases) being the purchaser of solar power exported to the grid. Therefore, it is vital to ensure that utilities have the right incentives to support rooftop solar power and to carry out these functions effectively. Without the active support of utilities, it will be impossible to achieve the ambitions of the government for rooftop solar.

Table 5 – Cost and benefit of rooftop solar PV to distribution utilities

	Distribution Utilities
Costs:	(i) Loss of tariff revenue from power that would otherwise have been purchased (ii) Loss of revenue due to payment against injection of power to the grid (the quantum of loss depends upon the rate which the payment is done to the consumers; existing provisions in the states are – FiT, APPC + losses, ACoS (iii) Cost for infrastructure if upgrades needed to integrated into the grid (iv) Program administration cost
Benefits:	(i) Avoided cost of energy (reduced purchase of alternative power) (ii) Avoided cost of infrastructure, where relevant (iii) Reduction in transmission and distribution losses (iv) Avoided distribution infrastructure (v) Reduction in RPO compliance cost

15. Distribution utilities in India face enormous financial challenges unrelated to rooftop solar. These largely stem from political pressure to keep electricity tariffs down – particularly for residential and agricultural consumers and high levels of ATC losses. As a result, most utilities in India are loss-making with some notable exceptions. As a result, some utilities can be very reluctant to accept losses on rooftop solar because it worsens their already dire finances.

16. However, it is important to keep the challenges in perspective. The impact of unrecovered costs will be negligible at low level of penetration. Even at 40 GW, the penetration of rooftop solar will be less than 5%. However, after 2022, as rooftop solar continues to increase, the impact on tariffs could be greater if no action is taken As Table 6 shows, the financial impact of rooftop solar on utilities is modest and will remain so until the penetration of rooftop solar increased greatly. However, utilities should not be asked to make losses on rooftop solar over the medium term. The rooftop solar sector can only thrive with the active participation of utilities and that means ensuring they get a fair share of the benefits from rooftop solar.

17. The biggest financial concern for utilities about rooftop solar is due to cross-subsidy rather than infrastructure or overheads. Utilities have mandated social responsibilities for providing power on demand and meeting their universal service obligation to customers in rural and urban areas. Fulfilling these responsibilities incurs costs. If rooftop solar consumers do not share this cost then a greater share will fall to other customers. The government in [the draft amendment to the Electricity Act has recommitted to reducing cross-subsidy. More market-led pricing of electricity (with appropriate safety nets for the poor) will help rooftop solar and help utilities.

Table 6 – Impact of different levels of penetration of rooftop PV on tariff of other customers

Utility/State	**Penetration level of self-consumption by industrial and commercial consumer categories**				
	5%	10%	20%	35%	70%
Delhi (BRPL)				Increase by 10%	Increase by 22%
Uttaranchal	Increase by 1.7%	Increase by 3.6%	Increase by 7.8%	Increase by 15%	Increase by 45%
Maharashtra *	Increase by 0.9%	Increase by 1.8%	Increase by 3.7%	Increase by 7%	Increase by 17%

SBI Implementation Capacity

18. The SBI has demonstrated experience and proven track record managing green energy programs. In areas such as Monitoring and Evaluation and Environment and Social management where the SBI does not have the required skills and expertise, it will use external expertise as a complement to its own resources. SBI will engage independent verification agencies to verify some of the DLIs. SBI will engage a Lender's Independent Engineer to ensure that all investments undertaken as part of the program meet minimum these technical and environmental standards.

19. SBI is interested in participating in the Program since it offers an entry-point into an area with significant potential for growth in the future but it will not do so without support and hand-holding from an international partner agency with domain experience, because it is (a) unfamiliar with the technical issues of Rooftop PV performance and (b) not in a position to take on the coordination role with state discoms, regulators and nodal agencies who are all key enablers and stakeholders in this program, but who have current performance limitations. However, SBI has assured MNRE that if a successful program is set up with World Bank support then it will be happy to continue the implementation of the program on a nation-wide basis using its own resources for lending to qualified parties in continuation of the previous experience.

C. Expenditure framework.

20. The Program will be $800 million, of which $500 million will be debt funding sourced from IBRD, $125 million from CTF and 23 million of grant funding from GEF, with balance made up of contributions of SBI and initial equity contributions from private sector developers and their customers. The Program expenditure will occur when SBI meets the indicated Milestones under P4R. The Bank will carry out an assessment of the financial management and governance systems of the new business unit that SBI will set up to manage the rooftop solar debt fund, in order to identify the fiduciary risks and work out the appropriate mitigation measures.

D. Results Monitoring and Evaluation

21. Under this PforR operation, SBI, as the implementing agency, is responsible for results monitoring and evaluation (M&E) and verification of the DLIs, based on the agreed verification methodology, protocols, and procedures outlined in the section below. This PforR Program brings value added to strengthen the focus on results monitoring and evaluation through an independent and credible verification system, since the current M&V system under the MNRE's GRSPP relies primarily on reporting from GRPV system providers and partner agencies rather than verification by independent third parties.

E. Economic Justification

Rationale for public action

22. In India, the rationale for public action to support GRPV comes from: (i) market failure (lack of availability of commercial financing for GRPV due to associated risks); and (ii) externalities (GRPV systems have positive environmental and global externalities that are not adequately taken into account by the market).

Bank's value added

23. The Bank's value added comes in the form of the knowledge, capacity building support and concessional long term financing it can bring to the large scale deployment of GRPV in the country.

Economic Impact

24. A cost-benefit analysis consistent with recent Bank guidance on this topic was carried out for GRPV investments under the Program. The economic analysis covers 28 years, including 3 years of construction and 25 years of operation. A discount rate of 12% was used for the calculation[19]. The analysis includes a consideration of the relevant negative global and local environmental externalities.

90. *Economic evaluation.* The economic analysis[20] indicates that the proposed GRPV program is close to being viable against alternatives that would meet electricity demand through thermal alternatives (see Table 7). The baseline economic return of proposed GRPV program against the "thermal generation scenario" comprising of electricity supply using imported coal and diesel generator set is 10.6% (NPV - US$22 million), which is just below the 12% hurdle rate used for Bank projects[21]. The program also has substantial local and global environmental benefits; consideration of these benefits increases the ERR of the program significantly to 22% (NPV US$184 million).

Table 7 – Summary of Economic Analysis

		Economic rate of return
ERR	%	10.6%
ERR+local externalities+GHG	%	22%
Switching value, avoided GHG emission	$ /ton	1.44
Composition of NPV		
Cost of Rooftop PV		
Capital cost	$USm	284
O&M	$USm	8
Benefits of avoided coal generation		
Avoided coal costs	$USm	179
Capacity credit	$USm	11
Benefits avoided diesel generation		
Avoided diesel costs	$USm	73
Capacity credit	$USm	7
NPV (before environmental benefits)	**$USm**	-22
NPV (incl. local environmental benefits)	$USm	32
GHG emissions @$30/ton	$USm	153

[19] A review of discount rates used in Bank projects is currently underway. The economic analysis will revised once the new guidance on discount rate is finalized.

[20] A cost-benefit analysis consistent with recent Bank guidance on this topic was carried out for the 400 MW of GRPV investments under the Program. The economic analysis covers 28 years, including 3 years of construction and 25 years of operation. A discount rate of 12% was used for the calculation. The analysis includes a consideration of the relevant negative global and local environmental externalities.

[21] A review of discount rates used in Bank projects is currently underway. The economic analysis will revised once the new guidance on discount rate is finalized.

NPV (including environment)	$USm	184
Lifetime GHG emissions undiscounted	Mtons CO2	14.8
Marginal abatement cost MAC	$/ton	1.5

91. **Reduction in GHG emissions.** The analysis indicates that the program will reduce GHG emissions by 14.8 million tons over the life of the project compared to the thermal counterfactual. The marginal abatement cost of GHG emission of the proposed program is quite low at $ 1.5/ton. The program will help avoid local and environmental damage costs equal to $206 million compared to the thermal counterfactual.

92. **Sensitivity Analysis.** The sensitivity analysis calculates the switching values for important variables such as capital costs, Capacity Utilization Factor, capital costs for PV generation, coal prices, capacity, credit and discount rate (Table 8). This analysis shows that GRPV is economically viable only with the consideration of local and global environmental benefits. The economic returns of GRPV are based on a number of important assumptions – some of which have a high degree of sensitivity with regard to the overall returns: for example, the switching value for PV systems costs is only 7% higher than the baseline value. A CUF of 20% for solar PV generation and an average annual increase in coal prices of 2% would likewise push the ERR above the hurdle rate.

Table 8 – Switching Values

Input	**Unit**	**Baseline Value**	**Switching Value**
CUF	%	19%	20%
PV Cost	$M/MW	1.4	1.3
Annual Increase Coal Prices	%	0%	2.0%
Discount Rate	%	12%	11%
Capacity Credit	%	19%	42%
T&D loss	%	12%	25%
Grid Integration Costs	%	0%	-8%

Annex 5: Fiduciary Systems Assessment

I. BACKGROUND

1. SBI is a Government owned, listed public sector bank. In 2015, SBI was ranked 260 on Fortune's 500, up from 303 in previous year. SBI has won the 2015 "Brand of the Year" Award given by World Branding Forum. SBI is a publicly traded company, traded in BSE & NSE, and the Central Government holds 58.6% of the shares. SBI's audit reports are clean and its compliant with corporate governance practices which are mandated under law. SBI's FM systems, procedures and controls are well established. It has strong risk management and internal control including internal audit systems. SBI is the Implementing Agency for the GRPV Program with funding support from the World Bank in tune with the overall purposes of the Program. A detailed Operations Manual (OM) has been prepared by SBI for the GRPV Program which takes care of requirements of World Bank where appropriate.

II. CORPORATE GOVERNANCE AT SBI

2. SBI has complied with the provisions of Corporate Governance as per Clause 49 of the Listing Agreement with the Stock Exchanges, and the directives issued by GOI/RBI. There are nine Board Level Committees. These Committees provide effective professional support in the conduct of Board level business in key areas of operation & review. Committees meet periodically to deliberate on Policy issues and/ or review domain performance. The Committees also call external specialists, besides drawing upon the services of top executives from the Bank, as and when needed. The minutes and proceedings containing brief reports on the discussions held at the meetings of the Committees are placed before the Central Board.

III. PROGRAM MONITORING AND IMPLEMENTATION ARRANGEMENTS

3. **Program Monitoring and implementation arrangements**: The responsibility of implementing the GRPV Program across the country would rest with several administrative and operational units of SBI as specified in the OM. CPPD (Credit Policy and Procedure Department) would be responsible for the overall coordination and monitoring of the activities carried out by the various units as well as interactions with the World Bank. The broad activities of CPPD would be as follows:

- Policy formulation
- Drafting and finalization of Operation Manual and its amendments
- Coordinating within the organization for building system capability and required training for the staff for successful implementation of Program
- Coordination within the organization for setting up sub-accounts
- Monitoring and Evaluation of the Program
- Coordination for creation of standardized document e.g. standardized appraisal format, standardized term sheets, loan agreement, standardized PPA etc.

- Data collection and reporting to WB in the agreed format
- Coordination and review of Program with WB

4. The International Banking Group (IBG) would be specifically tasked with submission of periodic drawdown requests to the World Bank, servicing the World Bank Loan etc.

5. Program Loan Components and Fund Flow

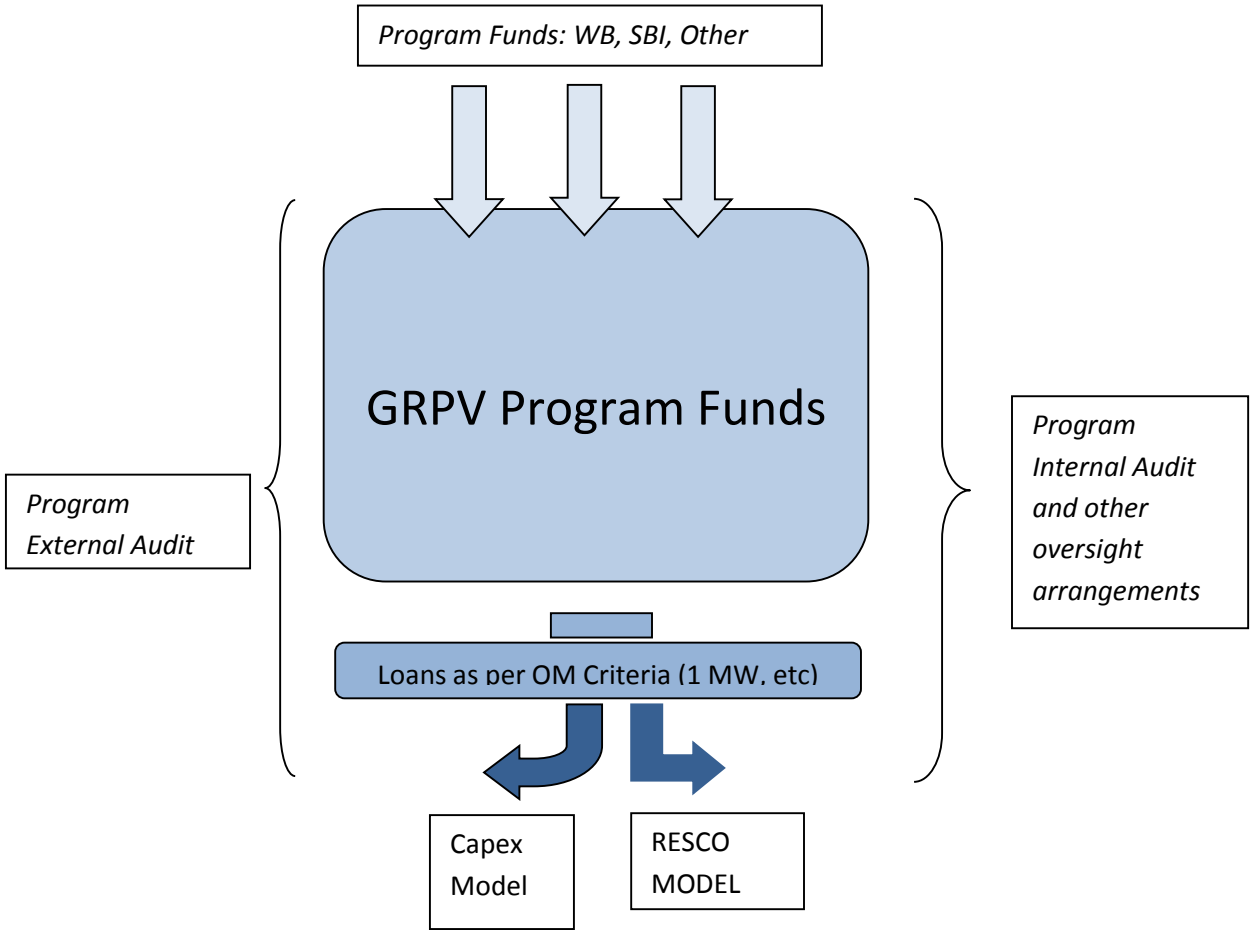
Component 1: World Bank facility of USD 648 million to SBI to be funded as follows –

- USD 500 million (IBRD Loan)
- USD 125 million (CTF Loan)
- USD 23 million jointly as GEF grant

The facility would be utilized for (i) onward lending in local currency for financing the Program; meeting operating and administrative expenses (including compliance requirement) incurred during implementation and onward lending under the Program (ii) and creating a reserve for meeting losses incurred by SBI in funding GRPV projects (for maximum amount of 5% of the loan facility)

Component 2: Technical assistance and capacity building component of Discoms and other stakeholders for USD 13 million to be funded by GEF and managed by SBI.

6. Fund Flow: Based on DLIs, funds will be disbursed by the World Bank in an offshore branch of SBI (Hong Kong) (To be confirmed). As soon as the funds are disbursed by WB, SBI will create Program (Notional) Accounts in its Program Books of Account (Ledger Account/s) and an equivalent amount of local currency will be reflected as credit in that account. Equivalent local currency will be calculated based USD/ INR exchange rate published on RBI website on the date of disbursement). SBI will on lend the money to the borrowers and will also release payments against program expenditure.



IV. PROGRAM FINANCIAL MANAGEMENT ARRANGEMENTS

7. **Summary**: The IBRD, CTF and GEF funds will be disbursed directly into the accounts of SBI upon realizing the disbursement linked indicators (or as advance against DLIs) and will be pooled with contributions from SBI or other financing sources to become the Program funds. The Program funds will be on-lent to borrowers based on SBI's commercial practices and the Program specific criteria stated in OM and agreed with the Bank. SBI will set up code/s for the Program within its existing budgeting and accounting systems to facilitate program specific reporting, and its existing auditing arrangements will be used for the Program financial audit. SBI has a governance and internal control system in place, including internal and external audit. The Program will be included in SBI's monitoring and control scopes. The program-specific financial management and disbursement arrangements are documented in the OM agreed with the Bank. From the World Bank Project perspective, the eligible expenditure under the Program will be the funds on lent as per OM and direct operating costs of the Program. The OM provides details of FM activities to be followed by the Program. The FM activities would broadly comprise Planning,

Budgeting, Accounting, Reporting and Internal Controls including Internal and External Audit. Financial management of the Program would be the responsibility of SBI and would be based on SBI's existing FM systems, procedures and controls.

8. **Planning and Budgeting**: Preparation of proper plan and budget plays an important role in timely implementation of a program. There would be an overall Program Plan for the duration of the Program with annual forecasts and estimates. The Plan would help in ensuring that adequate resources – manpower, infrastructure and financial etc are available on a timely basis for the success of the Program. The Plan would cover both sub-loan targets and the corresponding direct administrative expenses for Program implementation backed up by appropriate explanation and justification. The Plan would form the basis for annual Program Budgets. For effective program implementation, CPPD,SBI shall prepare following:

a. An overall plan for the duration of the program;
b. Annual plan and budget with quarterly break-ups; and
c. Quarterly statements providing variance between planned and actual disbursement and expenditure.

9. The above statements shall be reviewed by CPPD on a periodic basis and shall also be shared with the Bank

10. **Accounting**: Various modules of SBI's IT systems would provide the required operational and financial data pertaining to the Program through unique code/s. The accounting (and costing) systems will provide budget performance reports for comparison against Program budgets; half yearly sources and application of funds for the Program; and annual Program Financial Statements. There would be Program chart of accounts which would ensure that the heads of accounts are uniform for budgeting and accounting. Program costs would include direct costs chargeable to the Program. SBI's accounting procedures and controls would ensure that expenditures under the Program are incurred for the purposes of the Program, duly checked and verified as per standard operating procedures and authorized in accordance with the official delegation of powers. Program related documents and records would be kept in safe custody for the duration of the Program and thereafter as per SBI's policy and would be accessible to the World Bank during supervision visits. Monthly Program statements of accounts would be available for review by the IBG. Since specific Program facilities would be funded by IBRD, CTF, GEF, NCEF (collectively referred to as World Bank) SBI would maintain separate ledger accounts in its books to capture inflows of fund. The funds would be part of the larger pool of Program funds. Program eligible expenditures would be those that are specified in the Program OM and related World Bank Loan instruments.

11. Reporting: Reporting under the Program will be as agreed with the Bank and will include**:-**

a. **Interim Unaudited Financial Reports (IUFR):** CPPD would prepare and submit semester wise interim unaudited financial report (IUFR) within 60 days from the end of semester to the World Bank. The format of the report shall be agreed with the World Bank and provided as annexure to OM. The information would be

provided for the semester, year to date, program to date and would be compared with budgets and variances analysed.

b. **Program Annual Financial Statements:** The project annual financial statements will include (a) IUFRs for the fourth quarter; and (b) any other statement agreed with the Bank.

Internal Controls: SBI conducts internal audit through its Inspection & Management Audit Department. Audit Committee of the Board (ACB) exercises supervision and control over the functioning of I&MAD. I&MA has zonal inspection offices located throughout the country. Inspection officials periodically monitor adherence to controls and procedures and report deviations to facilitate corrective action. Besides I&MA officials, each Circle is assigned an internal audit team and concurrent auditors are assigned to all large branches.

12. SBI carries out mainly two streams of audits – Risk Focused Internal Audit (RFIA) and Management Audit, covering different facets of Internal Audit requirement. SBI's accounting units are subjected to RFIA. SBI's Management Audit covers administrative offices and examines policies and procedures, besides quality of execution thereof. SBI has also implemented a Concurrent Audit System, which is essentially a control process, integral to the establishment of sound internal accounting functions, effective controls and overseeing of operations on a continuous basis. Concurrent Audit System is reviewed on an on-going basis in accordance with RBI directives.

13. The Program would be covered by SBI's existing internal audit systems. Program specific internal audit ToR shall be prepared and provided in the OM. Half yearly internal audit reports will be shared with the Bank for review.

14. **External Audit:** External Audits of the Program need to be carried out by auditors with independence, experience, and capacity and ToR acceptable to the Bank. According to the SBI Act, the accounts of SBI must be audited by external statutory auditors appointed by SBI with the previous approval of the RBI. The Program's Annual Financial Statement would be audited by the statutory auditors of SBI as per ToR provided in the Operations Manual. The Annual Audit Report would be shared with the Bank within 9 months from the end of the year. The annual audit report would be accompanied by (i) audited program financial statements with management assertion; (ii) an audit report expressing an opinion on (a) the program financial statements; and (b) the accuracy of the IUFRs submitted under the program; and (iii) management letter highlighting significant issues to be reported to the management. The ToR for external audit will be provided in the OM.

15. **Eligible expenditure**: The World Bank's loan agreement will determine the overall eligibility for the Bank financing. The eligible expenditure under the Program will be loans provided as per criteria stated in GRPV OM, audit fee, independent verification agent charges and direct operating costs. The amount of World Bank Financing under the Program shall be equal to or less than the total Program expenditures. If by the end of the Program, the cumulative World Bank disbursements (against DLIs) exceed the total amount of Program expenditures, the SBI shall refund the difference to the World Bank.

IUFR Format

Format 1

Sources and Uses

	For the Semester	For the Year	Since Inception
Sources			
WB – Tranche 1			
WB – Tranche 1			
WB – Tranche 1			
WB – Tranche 1			
SBI and other sources			
Uses			
Loans under Capex Model			
Loans under Resco Model			
Audit and Independent Verification Agent Exp.			
Direct Operating Expenses			
Balance			

Format 2

Name of the Borrower / Expense	Project / Expense Details	Address	Total Capacity	Installed Capacity	Sanctioned Amount	Disbursed / Incurred Amount

Annex 6: Summary Environmental and Social Systems Assessment

1. The Solar Rooftops program essentially will include SBI on-lending the funds to either owners of the solar roof top plants or aggregators who will bring such owners together. An Environmental and Social Systems Assessment (ESSA) of the Solar Rooftops program is being undertaken by the Bank as per the requirements of Bank OP/BP 9.00, which is expected to be complete before program appraisal. The aim of the ESSA is to review the capacity of existing SBI systems to plan and implement effective measures for environmental and social impact management under the program, including determining if any measures would be required to strengthen them.

2. *Environmental Systems and Social Systems*: The program activities are likely to have manageable environmental and social impacts as the areas where the activities would occur are already affected by human activities and there are no new discharges as no conversion of material is undertaken. The program's existing institutional system within SBI exists but needs strengthening for environmental management and environmental monitoring. Therefore, existing capacities and systems need to be strengthened and streamlined. Nonetheless it is still expected that the overall outcome of the program will have a positive bearing on the environment, and that the proposed activities are unlikely to have any significant adverse impacts on protected or environmentally sensitive areas or culturally and archaeological sites.

3. *Environmental Benefits and Risks and Management*: The nature of the Program is such that the environmental and social risks associated with the Program are low and adequate and frameworks exist in the Program Manual of the SBI on solar roof top to adequately address the impacts. The program proposed by SBI will be assessed as part of the ESSA which focuses on the systems in SBI to handle any land and associated issues along with other residual issues, especially those arising out of Safety of personnel and other users of site, management of chemicals, and rejected/end-of-life equipment/material like PV cells, batteries, etc.

4. SBI has already drafted an Operations Manual that will be used to guide project activities from project selection/appraisal through individual investment / (sub) project implementation supervision. It follows already existing systems within SBI, which were developed in context of its other existing lending to projects, including power sector. This Manual already mentions many of the key requirements to be met at various stages of the (sub) project cycle. The findings of ESSA will be discussed and systems with respect to environmental and social aspects will be adequately strengthened as part of environmental and social management of the roof top solar program of the SBI.

5. ESSA will ensure consistency with core principles of Operational Policy 9.00 and identify areas for improved risk management in the program. These risks are low and manageable through improved pre identification and ensuring effective implementation through enhanced monitoring and accountability. It is expected that the ESSA will result in a clear set of recommendations for the project activities, for example, through improvements of the Manual, identification of capacity building activities, and any augmentation of policies governing the program. The ESSA draft will be available for review in end November 2015.

6. *Stakeholder Consultations*: The findings and recommendations of ESSA on the SBI 's Solar Roof top Program will also be discussed with the stakeholders and based on consultations, recommendations will be refined further to develop a strengthened program with due considerations on environmental and social systems within the program.

Annex 7: Integrated Risk Assessment

Stage: Pre-Appraisal

<table>
<tr><td colspan="5">1. OPERATING ENVIRONMENT RISKS (Note for information: this section is not disclosed at negotiation and Board presentation stages)</td></tr>
<tr><td>1.1. Country (Note for information: this section is not disclosed at negotiation and Board presentation stages)</td><td>Rating:</td><td colspan="3">Low</td></tr>
<tr><td rowspan="2">Description :
Macroeconomic risks: According to the IMF, India’s near-term growth outlook has improved, and the balance of risks is now more favorable, helped by increased political certainty, several positive policy actions, improved business confidence, and reduced external vulnerabilities. India’s vulnerabilities have receded more than those of most emerging markets and sentiment has been revived, with growth rebounding to 5.5 percent in the first half of FY2015 (ending in March), and the recovery strengthening gradually. Furthermore, CPI inflation has declined from 9.5 percent in FY 2014 to 5 percent in December 2014. Robust capital inflows in conjunction with the sharp current account deficit correction have provided for an increase in international reserves of about $30 billion over the last year, reaching US$320 billion Growth is projected at 5.6 percent for FY 2014/15, picking up to 6.3 percent in FY 2015/16 (at factor cost), as a result of the revival in industrial and investment activity.</td><td colspan="4">Risk Management: No mitigation measure required</td></tr>
<tr><td>Resp:</td><td>Stage: :</td><td>Due Date :</td><td>Status:</td></tr>
<tr><td>1.2. Stakeholder Risk (Note for information: this section is not disclosed at negotiation & Board presentation stages)</td><td>Rating:</td><td colspan="3">Substantial</td></tr>
<tr><td></td><td colspan="4"></td></tr>
</table>

Description: The operation's key stakeholders are MNRE, SBI, GRPV developers and aggregators; industrial, commercial and residential consumers, electricity discoms, state electricity regulatory commissions. Key stakeholder risks include: i) opposition from electricity utilities, which stand to lose business from their most lucrative customers; and ii) inadequate coordination and cooperation between MNRE and SBI. Stakeholder risk at concept stage is considered substantial.	Risk Management: A GEF funded technical assistance program is proposed to be implemented to manage this risk. A series of consultations have been carried out by the Bank with discoms, SNAs, private sector developers, financial institutions, customers, and other stakeholders. Stakeholders have expressed strong support for the program. Based on the application of a readiness criteria, six discoms have been pre-selected to receive the GEF technical assistance under the program. Additional discoms are expected to be added to this list in the coming days in consultation with MNRE, SNAs, Ministry of Power and state governments.			
	Resp:	**Stage:**	**Due Date :**	**Status:**
2. PROGRAM RISKS				
2.1 Technical Risk	**Rating:**	**Substantial**		
Description: Deployed GRPV systems may perform poorly; capital and operating costs may be higher than expected; developers may not provide adequate O&M services	**Risk Management:** This risk will be minimized by using the Operations Manual to using technology standards to limit technology choices to those for which performance reliability and costs have been sufficiently established through actual operating experience in India and in other countries; protocols for service standards under the Program will also be established.			
	Resp: Bank	**Stage: Project Preparation**	**Due Date :**	**Status:**
2.2 Fiduciary Risk	**Rating:**	**High**		
Description: SBI and loan beneficiaries may not use the funds for purpose intended under the Program and consistent with the guidelines of the Program. SBI may have difficulty in reporting on the Program on a timely basis.	**Risk Management:** This risk will be mitigated through (i) stronger internal controls and regular internal audits; (ii) use of an Independent Verification Agent and appropriate DLIs; (iii) performance/value for money audit; and (iv) inclusion of integrity provisions in the sub-project and application package.			
	Resp: Clients	**Stage: Preparation and Implementation**	**Due Date :**	**Status:**
2.3 Environmental and Social Risk	**Rating:**	**Moderate**		
Description: The proposed operation is expected to have limited environmental and social impacts during implementation, with some concerns about the safety of GRPV installers and utility workers as a result of "islanding" when the grid fails.	**Risk Management:** Given the limited and well-known potential adverse environmental and social impacts, the Bank team will conduct the ESSA and ensure that the mitigation measures are implemented			
	Resp: Bank	**Stage: Preparation and Implementation**	**Due Date :**	**Status:**
2.4 Disbursement linked indicator risks	**Rating:**	**High**		
Description: (a) if there isn't a strong early uptake loans by developers, it may be difficult to achieve the DLI's on GRPV capacity on time and (b) DLIs, particularly the	**Risk Management:** These risk is being minimized by (i) structuring the loan products in consultation with prospective private sector developers and users; (ii) using DLIs to provide strong financial incentives for the participating banks to align their internal structure and incentives to deal origination; (b) selecting independent third-party verifiers of DLIs (c) carefully			

<table>
<tr><td rowspan="2">capacity of GRPV installed under the prograk, may be difficult to verify.</td><td colspan="4">discussing DLIs with the implementing agencies; and (d) further developing and refining DLIs during preparation.</td></tr>
<tr><td>Resp: Bank and Client</td><td>Stage: Preparation and Implementation</td><td>Due Date :</td><td>Status:</td></tr>
<tr><td>2.5 Other Risks (Optional)</td><td colspan="4">Rating: Substantial</td></tr>
<tr><td rowspan="2">Description: States not politically aligned with GoI may not enthusiastically support the GRPV Program. Experience from the ongoing projects suggests lack of institutional capacity to implement the necessary reforms. These are due to reasons of leadership, unclear, directions, and gaps in technology offerings in difficult areas. The proposed Program seeks to address these; however the resources of this Program may not be significant enough to change institutional incentives. The risks in achieving change are termed Substantial at concept stage.</td><td colspan="4">Risk Management: The proposed Program has components to support and address the deficiencies noted in implementation and sustainability. The design Program Action Plan will also prove critical in providing a roadmap for implementation capacity improvements, successful outcomes and sustaining these. The design of the concurrent monitoring protocols and annual assessments and the credible implementation of will be provided adequate emphasis in project preparation.</td></tr>
<tr><td>Resp:</td><td>Stage:</td><td>Due Date :</td><td>Status:</td></tr>
<tr><td colspan="5">3. OVERALL RISK RATING : Substantial</td></tr>
<tr><td>Description:

Given use of PforR instrument for the first time in the energy sector in India, proposed investments covering many locations, SBI’s lack of familiarity with Bank policies and processes, policy and regulatory uncertainty on GRPV, lack of tested business models for GRPV deployment, the possibility of opposition and lack of cooperation from utilities which may lose their most lucrative customers, the risk is being maintained at "Substantial" during project preparation. It is expected that there will be a learning curve for the government and the implementing agencies during project preparation and implementation period.</td><td colspan="4">Risk management:

The team expects that a close and intensive engagement with stakeholders during the preparation will help in identifying the gaps on different aspects and accordingly prepare a suitable Program Action Plan to address those gaps. In addition, it is also expected that a continuous dialogue with the GoI and MNRE will help in resolving uncertainty on regulatory and policy issues. The Bank team will provide training to the government and the implementing agencies on PforR operations.
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Annex 8: Program Action Plan

1. **Technical:** SBI Bank needs to build in-house capacity for the monitoring, evaluation and reporting of project results and outsource IVAs for validation of DLIs. The bank's OM should include requirements and procedures in results M&E and validation of DLIs and relevant training be provided to staff who would be in charge of M&E.

2. **Procurement:** The mitigation measurement is proposed as follows: (i) The sub-project application and the sub-loan agreement with beneficiaries shall include a mandatory provision that the beneficiaries shall not award contracts to their parent or affiliate companies unless there is an established arms-length arrangement; (ii) SBI shall set up a complaints handling mechanism details of which will be included in the sub-project application package and on SBI's website; (iii) beneficiaries shall confirm as part of the sub-loan agreement that they will not award contracts to firms and individuals on temporary suspension or debarment by the Bank and other Multilateral Development Banks. SBI shall ensure as part of its supervision and the Independent Verification Agent will confirm that the beneficiaries have complied with this requirement; and (iv) SBI shall strengthen its capacity to assess the capacity of beneficiaries to carry out procurement and contract management efficiently as part of sub-project appraisal and provide guidance to beneficiaries with weak procurement capacity. SBI and beneficiary enterprises will undertake to hire expertise as needed for better procurement and contract management.

3. **Financial Management**: To meet the reporting requirements for the Program, the following mitigating measures are agreed with SBI:

ii. **Interim Unaudited Financial Reports (IUFR):** CPPD would prepare and submit semester wise interim unaudited financial report (IUFR) within 60 days from the end of semester to the World Bank. The format of the report shall be agreed with the World Bank and provided as annexure to OM. The information would be provided for the semester, year to date, program to date and would be compared with budgets and variances analysed.

iii. **Program Annual Financial Statements:** The project annual financial statements will include (a) IUFRs for the fourth quarter; and (b) any other statement agreed with the Bank.

4. **Internal Controls:** SBI conducts internal audit through its Inspection & Management Audit Department. Audit Committee of the Board (ACB) exercises supervision and control over the functioning of I&MAD. I&MA has zonal inspection offices located throughout the country. Inspection officials periodically monitor adherence to controls and procedures and report deviations to facilitate corrective action. Besides I&MA officials, each Circle is assigned an internal audit team and concurrent auditors are assigned to all large branches.

5. SBI carries out mainly two streams of audits – Risk Focused Internal Audit (RFIA) and Management Audit, covering different facets of Internal Audit requirement. SBI's accounting units are subjected to RFIA. SBI's Management Audit covers administrative offices and examines policies and procedures, besides quality of execution thereof. SBI has also implemented a Concurrent Audit System, which is essentially a control process, integral to the establishment of sound internal accounting functions, effective controls and overseeing of operations on a continuous basis. Concurrent Audit System is reviewed on an on-going basis in accordance with RBI directives.

6. The Program would be covered by SBI's existing internal audit systems. Program specific internal audit ToR shall be prepared and provided in the OM. Half yearly internal audit reports will be shared with the Bank for review.

7. **Environmental and Social Safeguard**: The program activities are likely to have manageable environmental and social impacts as the areas where the activities would occur are already affected by human activities and there are no new discharges as no conversion of material is undertaken. The program's existing institutional systems exist within SBI but need strengthening for environmental management and environmental monitoring. Therefore, existing capacities and systems need to be strengthened and streamlined. Nonetheless it is still expected that the overall outcome of the program will have a positive bearing on the environment, and that the proposed activities are unlikely to have any significant adverse impacts on protected or environmentally sensitive areas or culturally and archaeological sites. The ESSA report makes the following recommendations to address institutional capacity constraints on managing environmental and social risks: (i) strengthening environment and social impact management within the Program by specifying the requirements and procedures in the OM; and (ii) enhancing capacity of SBI staff by allocating staff, resources, operating arrangements and coordination with other departments in the bank.

Annex 9: Implementation Support Plan

Strategy and Approach for Implementation Support

1. Implementation of this operation will require considerable focused support from the Bank team. This is the first PforR operation in the energy sector in India, it is expected that there will be a learning curve for the government and the implementing agency during the implementation period. This annex lays out the key activities that the Bank team will implement to appropriately mitigate the risks identified during operation implementation.

2. Bank implementation support will be focused on implementation quality and on making the results-based incentive system work to its full potential. This will include (a) reviewing implementation progress (including that of the Program Action Plan) and achievement of Program results and DILIs; (b) providing support on resolving emerging Program implementation issues and on building institutional capacity; (c) monitoring the adequacy of system performance, and compliance with fiduciary and safeguard requirements; (d) providing ongoing technical support. The key to effective implementation support will be providing timely support to planning and verification of results for payment request to the World Bank.

Implementation Support Plan

3. Formal implementation support missions and field visits covering all aspects of implementation will be carried out semi-annually during the early stage of implementation, complemented by occasional visits by small missions on an as-needed basis. Estimated inputs from different specialists at different stages of implementation are outlined below.

Table A9.1. Implementation Support Input Requirements

Time	***Focus***	***Skills Needed***	***Resource Estimate***	***Partner Role***
First twelve months	• Team and program leadership • Program design and technical implementation support • FM & Procurement • Safeguards implementation support	• Technical • FM • Procurement • Safeguards	6-7 staff, 2 trips per staff	NA

	• Results M&E and verification of DLIs • Capacity building			
12-48 months	• Implementation support • FM, Procurement & Safeguards • Results M&E and verification of DLIs	• Technical • Safeguards • FM • Procurement	6-7 staff, 1-2 trips per staff annually	NA

Annex 10: Clean Technology Fund (CTF) Annex

India: Grid-connected Rooftop Solar Program (GRSP)

Key Indicators	CTF/World Bank-funded GRSP Phase 1	*Scaled-up Phase:* State Bank of India (SBI)-funded GRSP Phase 2[22]
Installed solar PV capacity for power generation (MW)	400 MW	1,000 MW
Tons of GHG emissions reduced or avoided - Tons per year [$mtCO_2eq/yr$] - Tons over lifetime [$mtCO_2eq$ / 25 years][23]	0.6 14.8	1.5 37.0
Financing leveraged through CTF financing (US$ million)	US$ 675 million - US$ 500 million by IBRD - US$ 23 million by GEF - US$ 2 million by SBI - US$ 150 million by private and public sector	US$ 1,375 million - US$ 500 million by IBRD - US$ 23 million by GEF - US$ 502 million by SBI - US$ 350 million by private and public sector
CTF leverage ratio	1 : 5.4	1 : 11
Cost effectiveness - CTF cost effectiveness [$\$_{CTF}/tCO_2eq$ avoided over lifetime] - Total project cost effectiveness [$\$_{Total\ Project}/tCO_2eq$ avoided over lifetime]	8.4 54.0	3.4 40.5
Other co-benefits	- Support in meeting the electricity demand and contribute to the universal access agenda. - Increased opportunities of local employment. - Contribute to cost reduction in solar PV rooftop technologies. - Environmental co-benefit: 5,185t of NO_x, 2,815t of SO_x and 435t of PM10 to be reduced annually after the installation of the Phase 2. - Gender co-benefit: benefit to women and children on education, health and household works.	

[22] The *Scaled-up Phase* assumes that the proposed CTF-funded GRSP Program Phase 1 contributes to the further expansion of solar PV rooftop technologies through the launching of the SBI-funded GRSP Phase 2. The results expected in this scenario correspond to the installation of 1,000 MW of solar PV capacity, of which 400 MW are installed through the CTF-funded Phase 1 and an additional 600 MW through the SBI-funded Phase 2 of the Program.

[23] The lifetime of solar PV rooftop technologies was hereby assumed at 25 years.

I. Introduction

Background: country and sector context

1. India's power system needs to grow rapidly to fuel the country's economic growth and provide electricity to its growing population. During the last decade, India's economy expanded at an average annual rate of 7.6 percent; projections are for high rates of growth to continue. The demand for power is expected to rise to support the growing manufacturing sector and meet the rising aspirations of its people. Yet power quality is still poor and falls far short of demand. Power shortages in FY2015 were equivalent to about 3.6% of total energy and 4.7% of peak capacity requirements. An estimated 300 million people are still not connected to the national electrical grid, and those that are connected face frequent disruptions. Private investment in diesel generators as a coping mechanism against frequent power cuts is widespread, and estimates of installed diesel generation capacity are as high as 70 GW. Furthermore, local environmental pollution is a major issue in India. According to the World Health Organization, 13 of the 20 most polluted cities in the world are in India. Renewable energy is increasingly seen as an important contributor to meeting this energy demand in an environmentally sustainable way and to India's energy security.

2. The Government of India (GoI) announced its intention to increase its target for solar installed capacity from 20 to 100GW by 2022[24]. This 100GW target, including a target of 40GW from grid connected rooftop solar PV (GRPV), was formally approved by Cabinet on 17 June 2015. Together with large utility scale solar parks and ultra-mega solar projects, the government sees tremendous potential for generating decentralized and distributed solar power by utilizing the rooftops of industrial, commercial, residential and public buildings.

3. Electricity generated from GRPV is becoming increasingly cost competitive with electricity from the grid in many parts of India, particularly for commercial and industrial customers who pay a higher tariff for electricity than others. GRPV has already achieved price parity with the grid for this class of customers in many states (Figure 1). Meanwhile price parity with grid for residential customers is likely to be achieved possibly as early as 2017, given that the cost of rooftop solar power is expected to decrease due to reduction in component costs and that grid electricity prices are projected to increase by 15-20% in the next few years.

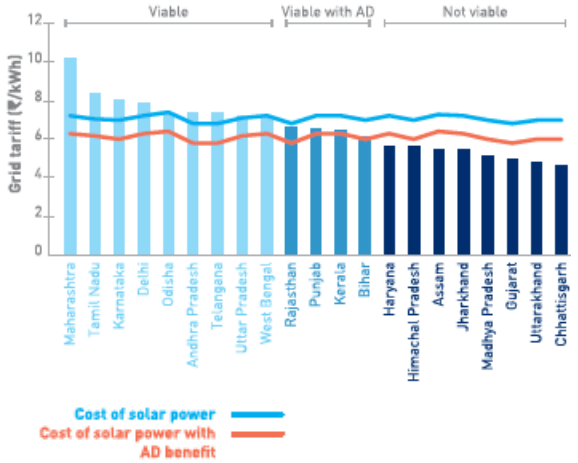
4. Yet there has so far only been a modest uptake of GRPV systems, even for commercial and industrial customers who could immediately save money through an investment in a rooftop solar system. As of end 2014, only about 385MW of grid connected solar rooftop PV projects had been completed. There has been very little success in terms of developing scalable business models for grid-connected rooftop PV outside a few states such as Gujarat. Barriers to the deployment of GRPV systems include: i) lack of commercial loans available to rooftop aggregators and developers; ii) lack of capacity of State Nodal Agencies (SNAs, public sector bodies who are responsible for coordinating all renewable energy activities in a particular state), State Electricity Regulatory Commissions (SERCs), and financial institutions to provide sustained institutional and technical support for continued scale-up efforts for GRPV; iii) lack of adequate co-ordination among central government agencies, state government agencies and private stakeholders; iv) lack of awareness of cost and technical performance characteristics, rooftop requirements, economic

[24] Government of India, 2015 (http://pib.nic.in/newsite/PrintRelease.aspx?relid=122566)

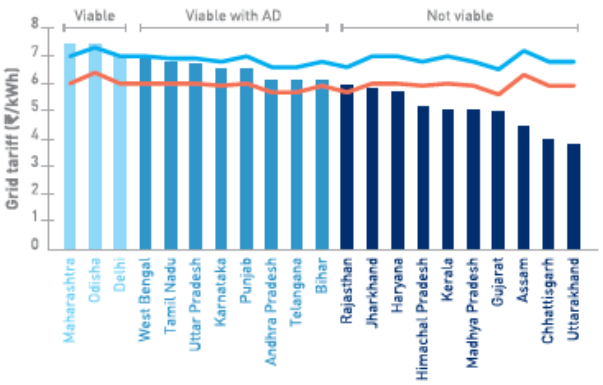
benefits, financial options, and contractual O&M options among consumers; and v) financial distress of electricity distribution companies (discoms).

Figure 1 – Financial viability of rooftop solar power

ii) Commercial consumers



ii) Industrial consumers



AD: accelerated depreciation
Source: Bridge to India 2015

5. The Ministry of New and Renewable Energy (MNRE) is leading the implementation of Grid Connected Rooftop and Small Solar Power Plants Program (GRSPP) to address the identified barriers and accelerate the adoption of GRPV. The program is proposed to be implemented in partnership with multiple central and state agencies including State Nodal Agencies for Renewable Energy, Solar Energy Corporation of India, Financial Institutions, Public Sector Units, Municipal Corporations, private sector Channel Partners, and Distribution Companies. The program is applicable to all states of India. The program provides Central Financial Assistance (CFA) equal to 30% of total rooftop solar PV system costs from National Clean Energy Fund to residential and institutional customers. The program covers both project and programmatic approaches and all business models of GRPV including the customer owned, third party owned and utility owned models.

6. The World Bank has been requested to lend to the State Bank of India (SBI) and help it to set up and operate a Rooftop Program. This proposed operation adds value to the MNRE's GRSPP by helping SBI establish a lending program for rooftop solar PV and making available CTF and IBRD financing for GRPV for all category of customers. The take up of financing is expected to be the greatest from commercial and industrial customers, who are not eligible for the 30% subsidy under the program. This will enable significant scale up of lending products for GRPV for reaching GoI's ambitious GRPV target.

India's CTF Investment Plan

7. The CTF Investment Plan for India was originally endorsed in November 2011, and subsequently revised in August 2015, with a total indicative allocation of USD 775.0 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 1).

Table 1 – Revised CTF Investment Plan of India, Indicative Financing Plan (US$ million)

CTF Project/Program	MDB	CTF financing (US$ m)
Himachal Pradesh Environmentally Sustainable Development Policy Loan (HP DPL)	World Bank	100
Partial Risk Sharing Facility for Energy Efficiency (PRSF)	World Bank	25
Solar Park: Rajasthan	ADB	200
Solar Parks Infrastructure	World Bank	50
	ADB	50
Solar Parks Transmission	World Bank	30
	ADB	50
Solar Rooftop PV	World Bank	125
	ADB	125
Solar PV Generation by Solar Energy Corporation of India (SECI)	World Bank	20
Total		**775**

Program Description

8. The objective of the Grid-connected Rooftop Solar Program (GRSP) is to increase investment in GRPV and strengthen the capacity of relevant institutions. The Proposed Program will support the implementation of MNRE's GRSPP, with a focus on mobilizing private sector investments and commercial lending, increasing deployment of GRPV, and thereby contributing to the achievement of GoI's GRPV installation targets of 40 GW by 2022.

9. The GRSP Program will deliver financing through World Bank's Program-for-Results (P4R) Financing, which disburses loans and grants on the basis of the achievement of key results (including prior results) under the Program. The proposed GRSP Program will be the first-ever CTF-funded project that uses an innovative financing instrument, P4R, focusing on supporting government programs and achieving outcomes.

10. This P4R Program will finance activities in three Result Areas on a country wide eligibility basis and subject to the achievement of 'disbursement-linked indicators' (DLIs) that are pre-agreed for each of the following Result Areas: (i) strengthening institutional capacity for GRPV; (ii) market development of GRPV; and (iii) expanding GRPV generation.. More details on the activities under each Result Area and the result chains from the Result Areas to 'disbursement-linked indicators' (DLIs) can be found on page 7-8 (para. 21-23) and page 11-12 (para. 31-37).

11. The GRSP Program will mobilize US$ 800 million, including US$ 500 million from IBRD, US$ 125 million from CTF, and US$ 23 million from GEF, as well as US$ 150 million of private and public sector financing and US$ 2 million of SBI financing. The CTF funding would comprise of US$ 120 million will be extended under softer concessional terms and US$ 5 million will be extended in the form of a grant.

12. The aforementioned US$620 million of IBRD and CTF lending will be on-lent through SBI to customers, private sector aggregators and developers and US$ 28 million of CTF and GEF grant will finance the technical assistance component. Detailed information on DLIs, disbursement arrangements, and verification protocols can be found in Annex 3.

II. Assessment of the Proposed Project with CTF Investment Criteria

Potential for GHG Emission Savings

13. **Emission reduction potential of investment.** The total emission reduction potential was estimated at 14.8 million tonnes of CO_2 equivalent over the lifetime of GRPV technologies, hereby assumed 25 years. These estimates were based on the construction of 400 MW of GRPV with 18.9 percent capacity factor, displacing an equivalent of 662 GWh per year of "thermal-based" power in the baseline scenario. The baseline scenario assumes "thermal-based power generation" using a combination of imported coal and diesel generation sets. The weighted average of emission factors under the baseline scenario was estimated at 895 kg/MWh[25], which is more conservative than the grid emission factor for India[26]. Using this emission factor, the CO_2 savings were estimated at 0.6 million tonnes of CO_2 equivalent per year. Savings have been calculated in accordance with CTF and World Bank guidelines[27]. In the Phase 2 of the Program, the annual emission reduction, taking into account GRPVs installed under both Phase 1 and 2, was estimated at 1.5 million tonnes of CO_2 equivalent, which is translated to 37.0 million tonnes of CO_2 equivalent over the 25-year lifetime of GRPV technologies.

14. **Technology development status.** The GRSP Program will finance technically proven and commercially viable GRPV investments. Over the past ten years, solar power has grown rapidly driven by government policy and rapidly declining costs, propelling the solar industry into the mainstream of energy policy (Figure 2). From 2009, the Jawaharlal Nehru National Solar Mission and state policies, especially in Gujarat, Karnataka, Rajasthan, and Tamil Nadu helped bring down the cost of generation, as reflected in the graph below. With the most recent bid of Rs 5.05/kWh for a utility-scale solar PV project in Madhya Pradesh, solar costs have fallen over 70% from 2010 levels. As Figure 3 shows, ground-mounted solar has driven this growth and grown faster both in volume and percentage terms. Rooftop solar is perhaps 3-5 years behind in terms of the maturity of ground-mounted solar in terms of the level of interest, comfort with the technology, availability of finance and the wider ecosystem. The Program is expected to promote the further expansion of the GRPV market, and therefore help reduce technology cost as experienced with ground-mounted solar PV.

[25] 830 kg/MWh for coal generation from supercritical plants; 650 kg/MWh for diesel generation sets; 10.7% of T&D losses; the emission factor was computed assuming 8 hours of electricity consumption comprised of 7 hours of grid connection supplied by coal and 1 hour use of captive diesel generation set, taking into account T&D losses in the grid; the actual calculation is as follow: 830/(1-10.7%) *7/8 + 650*1/8 = 895

[26] 980 kg/MWh, from CO2 Baseline Database for the Indian Power Sector, Central Electricity Authority

[27] World Bank, Guidance Manual: Greenhouse Gas Accounting for Energy Investment Operations, 2015

Figure 2 – Tariff for Solar PV projects determined by CERC

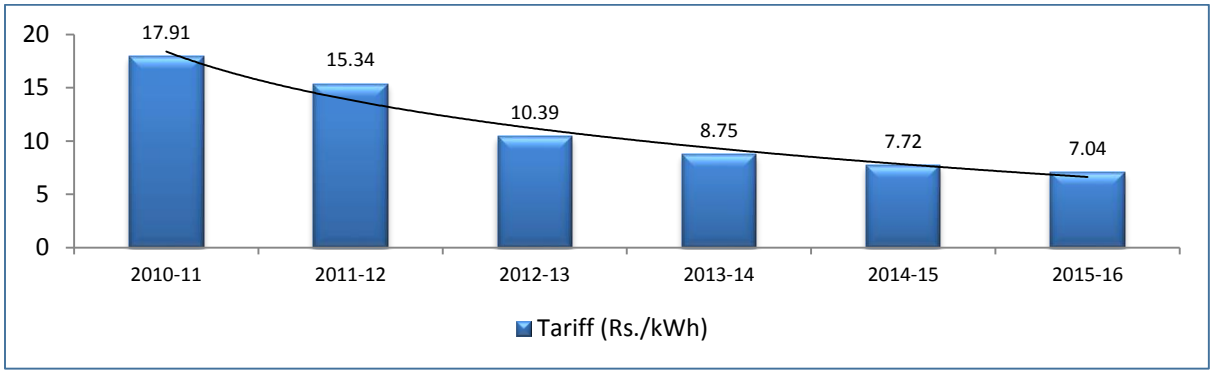
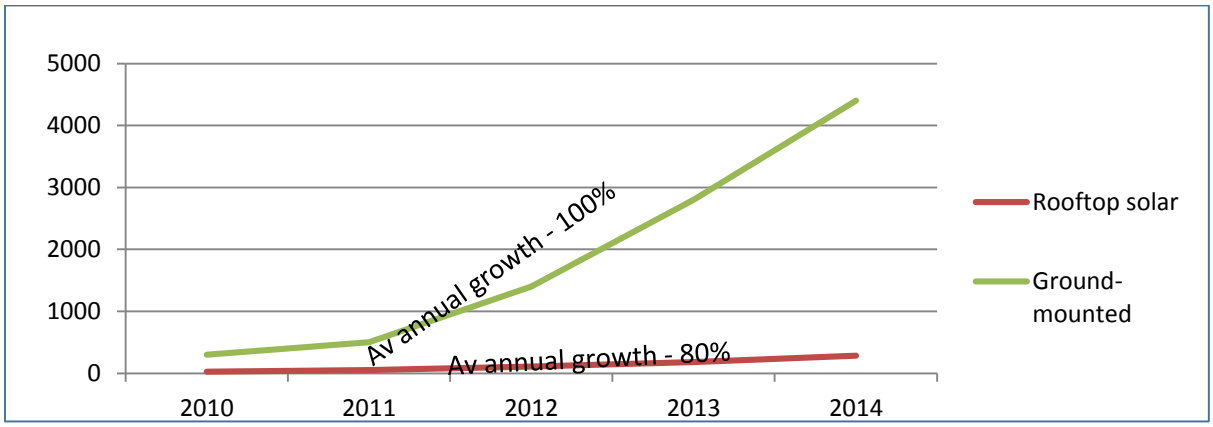


Figure 3 – Cumulative installed capacity for ground-mount and rooftop solar



15. The minimum technical requirements and quality standards for grid interactive SPV power plants and systems, inverters, meters, cables, mounting structures and other balance of systems specified by CEA and MNRE for GRSPP will also be used for this operation. Standards will also be set for after-sales service of PV systems in India. SBI will engage a Lender's Independent Engineer to ensure that all investments undertaken as part of the Program meet minimum these technical standards. The SBI has demonstrated experience and proven track record to evaluate and appraise the credit qualifications of proposed aggregators and developers, and will comply with the specifications in the OM. MNRE and SBI will ensure that the investments are in compliance with Indian policies and regulations.

Cost-effectiveness

16. The cost effectiveness is 8.4 US$/tCO$_2$eq for CTF funding and 54.0 US$/tCO$_2$eq considering total funding for the GRSP Program. In the *Scaled-up Phase*, the cost effectiveness will improve to 3.4 US$/tCO$_2$eq for CTF funding and 40.5 US$/tCO$_2$eq when considering total funding.

17. **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 the marginal abatement cost is likely to exceed US$100 per ton of CO2eq. This decision draws from

the CTF criteria which specifies that CTF co-financing will not be available for investments in which the marginal cost of reducing a ton of CO2eq exceeds US$200, which reflects the lower-end estimate of the incentive needed to achieve the objectives of the BLUE Map Scenario as indicated in the *International Energy Agency's Energy Technology Perspectives 2008 Report*.

18. The MAC of the proposed Program based on the economic analysis is 1.5 US$/tCO$_2$eq. These calculations confirm that the MAC for the Program will not exceed the aforementioned US$100 threshold value per ton of CO2eq. The Program will help avoid local and environmental damage costs equal to $206 million compared to the thermal counterfactual (see para. 58 on page 17).

19. The marginal abatement cost is computed as the project's NPV divided by lifetime CO2eq (LCO2) avoided emissions:

$$MAC = \frac{NPV}{LCO2},$$

where NPV stands for Net Present Value and LCO2 stands for Lifetime CO2eq emissions.

Demonstration Potential at Scale

20. *Scope of avoided GHG emissions through replication*. India's ambitious target calls for the installation of 40 GW of GRPV by 2022. The proposed GRSP Program will directly contribute towards this target, therefore contributing to significant emission reduction. The GRSP Program also directly support the launch of the SBI-funded GRSP Phase 2 by having it as one of the DLIs. The GRSP Phase 2 will support the installation of at least 600 MW of GRPV technologies. The expected emission reduction of both Phase 1 and 2 is estimated at 1.5 million tonnes of CO_2 equivalent per year, or 37.0 million tonnes over the 25-year lifetime of GRPV technologies.

21. *Transformation potential.* The proposed Program has high transformational potential as it will enable and contribute to the large-scale deployment of rooftop solar PV technologies in India. First, the GSPV Program will help establish the GRPV market in India through the provision of lending products for customers and the establishment of a dedicated unit for GRPV lending in SBI. While crowing in commercial financing to the GRPV market, the proposed GSPV Program will improve SBI's understanding of technical and financial risks of the GRPV market and improve its capacity to extend loans to potential beneficiaries. The P4R design of the Program will incentivize SBI to internalize the lessons of the proposed GSPV Program and launch the Phase 2 on a much larger scale. SBI will continue to operate the dedicated unit with its own funding and will offer syndication opportunities to other local banks in order to encourage them to enter the rooftop PV debt market in a risk-mitigated manner, by working with SBI who will have developed the necessary experience and expertise by that time. Second, the GSPV Program will lay the foundation to further integrate rooftop solar into the grid. A recent study by NREL suggests that the integration of up to 5% of variable energy sources does not pose any major issues to the operation of the energy system. Even if the government target of 40 GW of rooftop solar is achieved by 2022, only about 4% of India's power will come from rooftop solar. However, rooftop solar will not be evenly spread and what matters is the level of rooftop solar at local level, not the

national average. Therefore, utilities will need to plan for infrastructure change in some areas where rooftop solar is concentrated. This Program will engage with relevant institutions through the technical assistance and capacity build program to ensure that key technical challenges that a high penetration of GRPV can create for distribution utilities are taken into consideration in the future planning and development of the grid.

Development Impact

22. **Support to bridge the supply gap of energy and contribute to the universal access agenda.** Power shortages in FY2015 were equivalent to about 3.6% of total energy and 4.7% of peak capacity requirements. An estimated 300 million people are still not connected to the national electrical grid, and those that are connected face frequent 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 GoI, particularly given the high costs of unserved electricity demand in the country 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.

23. **Increased opportunities of local employment.** Scale-up of the GRPV market will boost opportunities of local employment and strengthen the foundation for sustainable development. By supporting a wide range of business models, beneficiaries would include third party aggregators, developers, and vendors of GRPV systems as well as economic agents engaged in the GRPV supply and delivery chain, particularly sub-contractors for installation, O&M and other services. Furthermore, encouraging SBI, and subsequently other local commercial banks, to expand the line of business into the GRPV market will promote the expansion of local financial institutions and job creation.

24. **Environmental Co-benefits.** Currently, India relies on coal as the fuel source for two thirds of its electricity requirements and is the world's third largest carbon emitter. Private investment in diesel-based back-up power supplies is widespread. The energy sector also causes local environmental problems. The Program has substantial local environmental benefits. At local level, air pollutant emissions under the thermal counterfactual are estimated at 5,185t of NO_x, 2,815t of SO_x and 435t of PM10 per annum, which will be reduced by displacing coal and diesel in power generation after the installation of the Phase 2 is completed. The local and global environmental benefits are estimated at US$ 206 million (see para. 58 on page 17).

25. **Gender Co-benefit.** The Program is expected to have positive gender co-benefits. The roll out of GRPV systems among residential households will improve the quality and reliability of electricity supply, which will disproportionately benefit women and children in terms of school work, household work, and improvement in reliability of health services etc. Similarly, the reduction of local environmental pollution from substitution of diesel generation with GRPV generation will yield positive health benefits for women. During consultation and assessment with beneficiaries, surveys and interviews will be designed in a gender sensitive way to ensure that women are given equal opportunities. For eligible sub-borrowers, guidelines will be developed to ensure that women-owned companies will not be discriminated.

Implementation Potential

26. The Government has set an ambitious goal of providing uninterrupted power for all homes, industrial and commercial establishments and adequate power for farmers by 2022 through its 24X7 Power for All program. GoI wants a growing share of the country's electricity to come from renewable energy. Based on its massive energy requirements to match its economic growth aspirations, GoI recognizes that it must supplement non-renewable sources with cleaner and abundant renewable sources. Therefore, it has announced plans to quadruple India's renewable energy capacity to 175 gigawatts by 2022, which is expected to require up to $150 billion in investments in generation alone, as well as substantial complementary investments in strengthening the transmission network for "greening the grid".

27. As part of its push into renewable energy, GoI is aiming to achieve a "solar revolution" by installing 100GW of solar power by 2022 - a thirty fold increase from 4.5GW in 2015. This includes an official target of installing 40GW of GRPV by 2022. This target supersedes and significantly increases the previous targets of 20GW of grid connected solar power that were set under the 2008 National Action Plan on Climate Change (NAPCC) and 2011 Jawaharlal Nehru National Solar Mission (JNNSM). Together with large utility scale solar parks and ultra-mega solar projects, the government sees tremendous potential for generating decentralized and distributed solar power by utilizing the rooftops of industrial, commercial, residential and public buildings.

28. The Proposed Program is strategically relevant and aligned with GoI's priority to increase the share of the country's electricity to come from renewable energy, to address both energy security and environmental issues. The Government is supportive for this Program as it makes long term concessional financing available for the deployment of GRPV and it strengthens capacities of institutions, stakeholders and market participants to enable scale-up of the GRPV market beyond what is financed through the Program.

29. **Leverage:** The total investment of the Program would be funded through the CTF (US$ 125 million), IBRD (US$ 500 million), GEF (US$ 23 million), SBI (US$ 2 million) and public and private sector equity contributions (US$ 150 million). The CTF leverage ratio will be 1 to 5.4. At the end of this Program, SBI will launch the Phase 2 of the Program, which comprises US$ 500 million of its own resources and an additional US$ 200 million from public and private sector. The CTF leverage ratio will increase to 11.0 when considering the Phase 2. Further, this Program would facilitate continued expansion of the GRPV market that would invite more private sector investments and local commercial banks to achieve the ambitious target.

CTF Additionality

30. The use of CTF concessional financing under the Program is essential to address the prevalent barrier hindering the development of the GRPV market, namely the lack of availability of commercial financing for GRPV. CTF support will not only provide the currently unavailable concessional long term debt financing, but also encourage SBI to engage in the GRPV market. The CTF allows SBI receive support and hand-holding from an international partner agency with domain experience, given that SBI is (a) unfamiliar with the technical issues of Rooftop PV performance and (b) not in a position to take on the coordination role with state discoms, regulators

and nodal agencies who are all key enablers and stakeholders in this program, but who have current performance limitations.

31. The economic rate of return of this Program is calculated at 10.6%, which is lower than the hurdle rate of 12% (see page 18). 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 will be essential to scale up GRPV by recognizing the value of low carbon technologies and improving the economic rate of return of the proposed Program beyond the hurdle rate.

32. The use of CTF concessional financing will also enable the development of the GRPV market by offering SBI an entry-point into an area with significant potential for growth in the future which otherwise would have not been explored. The CTF-funded GRSP Program will incentivize SBI to scale-up the promotion of GRPV technologies under Phase 2, using own resources and syndication with other commercial. The failure to encourage first movers to enter into the unexplored GRPV market would postpone the whole learning-by-doing procedures, undermining the achievement of India's ambitious plan on GRPV and solar power more broadly.

Implementation Readiness

33. As the lead ministry responsible for GoI's solar power targets and the GRSPP program, MNRE has a full ownership on this Program and will provide overall policy guidance as well as regular monitoring and supervision. MNRE will chair a steering committee comprising of all relevant agencies, and will liaise with other government agencies to pursue policy and regulatory reform necessary for the GRPV program to be successful. MNRE will also play a lead role in development partner co-ordination (including with parallel GRPV programs supported by KfW and ADB) and in ensuring that the lessons from this program are internalized in other government-supported programs.

34. SBI will be the borrower and implementing agency for on-lending component of this Program. SBI is India's oldest and largest financial services company. It has more than 16,000 branches in the country and 190 foreign offices in 36 countries. It has an active customer base of 270 million. While the Bank is majority owned by the GoI, shares of SBI are traded on the Bombay Stock Exchange and National Stock Exchange of India. Its Global Depository Receipts are listed on the London Stock Exchange. SBI's size and reach make it an ideal partner to roll out MNRE's scheme for grid-connected solar rooftop PV program. This Program will enable SBI to lend to qualified intermediaries (qualified in terms of technical capacity, relevant experience, and creditworthiness as per SBI's standards). SBI will be responsible for identifying, appraising, and financing eligible investments that meet the criteria in an Operational Manual (OM) that will be developed during preparation. The detailed eligibility criteria, technical performance requirements and appraisal guidelines will be outlined in the OM, agreed between the SBI, MNRE, and the Bank.

35. SBI has demonstrated extensive experience in financing energy efficiency, clean energy, and pollution abatement technologies. They have adopted most of the Bank's technical, fiduciary and safeguard requirements in the proposed Program. Under the SBI Program, its capacity in

results M&E and verification of DLIs will be supplemented by engaging independent verification agencies. SBI is interested in participating in the Program since it offers an entry-point into an area with significant potential for growth in the future, with initial support from the World Bank, and assured MNRE that once a successful program is set up with World Bank support then it will be happy to continue the implementation of the program on a nation-wide basis using its own resources for lending to qualified parties in continuation of the previous experience.