

CLIMATE INVESTMENT FUNDS

July 2015

REVISED CTF INVESTMENT PLAN FOR INDIA

CLEAN TECHNOLOGY FUND
INVESTMENT PLAN FOR INDIA

Revision

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INDIA

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List of Abbreviations

ADB	Asian Development Bank
ADB-PSOD	Asian Development Bank Private Sector Operations Department
CEA	Central Electricity Authority
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
CUF	Capacity Utilization Factor
DEA	Department of Economic Affairs
DELP	DSM based efficient lighting program
DISCOM	Distribution Utility Company
DPL	Development Policy Loan
GDP	Gross Domestic Product
GoI	Government of India
GoR	Government of Rajasthan
HP	Himachal Pradesh
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
IP	Investment Plan
JNNSM	Jawaharlal Nehru National Solar Mission
MNRE	Ministry of New and Renewable Energy
MDB	Multilateral Development Bank
NAPCC	National Action Plan on Climate Change
NMEEE	National Mission for Enhanced Energy Efficiency
NSM	National Solar Mission
OPIC	Overseas Private Investment Corporation
PV	Photovoltaic
RE	Renewable Energy
SCB	Scheduled Commercial Bank
SECI	Solar Energy Corporation of India
TFC	CTF Trust Fund Committee
UMPP	Ultra Mega Power Plant
WB	The World Bank

EXECUTIVE SUMMARY

1. This note provides an update on projects and proposes the first revision to the Clean Technology Fund (CTF) Investment Plan (IP) for India, which was endorsed by the CTF Trust Fund Committee (TFC) in November 2011. The IP has an indicative envelope of US\$ 775 million of CTF funding for Phase 1 operations, combined with additional resources from the Multilateral Development Banks (MDBs), the Government of India (GoI), the private sector, and other resources.
2. Significant developments have taken place in the deployment and competitiveness of renewable energy technologies and in terms of India's globally unprecedented ambition to add 100 GW of Solar PV capacity by 2022.¹ This scale-up envisions 60 GW of ground-mounted utility scale solar power projects, and 40 GW in rooftop solar installations, according to the latest meeting with MNRE during the joint ADB-WB mission of CTF IP revision in Nov 2014. As of June 2015, the grid-connected solar capacity of India was 4,050 MW. To facilitate accelerated capacity addition, the Ministry of New and Renewable Energy has rolled out Solar Park Schemes for aggregate capacity of 20 GW in 25 solar parks.

CTF Proposed Allocation and Update of Project Financing Plan

3. In this evolving development landscape, the GoI proposes the reallocation of CTF resources to support the Government's national solar targets which will also promote environmentally sustainable growth. With a view to the transformational changes and the financing needed for India to achieve its ambitious targets, the GoI proposes redeploying CTF resources to specifically catalyze the pace of investment in Solar Parks Infrastructure, Solar Parks Transmission requirements, and Solar Rooftop PV, as well as to support SECI in adding around 500 MW of solar generation capacity in a number of already-identified solar parks. The proposed reallocation of CTF resources is summarized in Table 1 below.
4. The proposed reallocation is aligned with the objectives and priorities of the original IP (see [Table 2](#)) and with India's own national strategy for rapid development of the Solar sector. Solar energy has to play an expanding role in achieving energy security and access in the years ahead.

¹ India Eyes 100 GW Solar Power Capacity; see Clean Technica at [link](#).

Table 1: Proposed re-allocation of CTF Resources (US\$ million)

CTF Project/Program	MDB	CTF Funding (CTF IP Endorsed November 2011)	CTF Funding Reallocation		CTF Funding (CTF IP Revision July 2015)
			WB	ADB	
Himachal Pradesh Environmentally Sustainable Development Policy Loan (HP DPL)	WB	100			100
Super-Efficient Equipment Program (SEEP)	WB	50	(-) 50		0
Partial Risk Sharing Facility for Energy Efficiency (PRSF)	WB	25			25
National Mission on Enhanced Energy Efficiency (NMEEE) – Perform, Achieve, Trade (PAT) – Phase I	WB	50	(-) 50		0
Integrated CSP Hybrid Project	ADB	50		(-) 50	0
Solar Park: Rajasthan	ADB	200			200
Solar Park: Maharashtra	ADB	150		(-) 150	0
Solar Park & Smart Grid: Gujarat	ADB	150		(-) 150	0
Solar Parks Infrastructure	WB/ ADB		+50	+50	100
Solar Parks Transmission	WB/ ADB		+30	+50	80
Solar Rooftop PV	WB/ ADB		+125	+125	250
Solar PV Generation by SECI	WB		+20		20
Total		775			775

Table 2: India CTF Indicative Financing Plan Endorsed in November 2011 (US\$775 million)

CTF Project/Program	CTF		MDB			Others	Total
	WB	ADB	WB	IFC	ADB		
Himachal Pradesh Environmentally Sustainable Development Policy Loan (HP DPL)	100		100			25,800	26,000
Super-Efficient Equipment Program (SEEP)	50		20			1,930	2,000
Partial Risk Sharing Facility for Energy Efficiency (PRSF)	25			50		1,925	2,000
NMEEE – Perform, Achieve, Trade (PAT) – Phase I	50					0	50
Solar Park: Rajasthan		200			50	4,700	4,950
Solar Park: Maharashtra		150			50	2,850	3,050
Solar Park & Smart Grid: Gujarat		150			50	2,850	3,050
Integrated CSP Hybrid Project		50			50	350	450
Total	225	550	120	50	200	40,405	41,550

Table 3: Revised India CTF Indicative Financing Plan After Proposed Reallocation (US\$ 775 million)

CTF Project/Program	CTF		MDB		Others	Total	Actual dates of CTF and Board Approval	
	WB	ADB	WB	ADB			CTF approval date	MDB Board approval date
Himachal Pradesh Environmentally Sustainable Development Policy Loan (HP DPL)	100		100		1,958	2,158	Nov-13	May-14
Partial Risk Sharing Facility for Energy Efficiency (PRSF)	25				153	178	Jul-14	Feb-15
Solar Park: Rajasthan		200		300	300 ²	800	Jul-13	Sep-13
CTF Project/Program	CTF		MDB		Others	Total	Expected dates of CTF and Board Approval	
Solar Rooftop PV ³		250		800	550	1,600	Q4 2015	Q1 2016
Solar Park Infrastructure		100		200	1,000	1,300	Q4 2015	Q1 2016
Solar Park Transmission		80		620	0	700	Q4 2015	Q1 2016
SECI Solar PV Generation		20		480	480	980	Q4 2015	Q1 2016
Total		775		2,500	4,441	7,716		

² Government counterpart financing.

INTRODUCTION

6. The CTF Investment Plan for India (IP) was endorsed by the CTF Trust Fund Committee (TFC) in November 2011 with an allocation of US\$775 million CTF funding subject to the availability of CTF resources for the further implementation of projects. Pursuant to CTF guidance for pipeline management, this note proposes reallocating of funds from the proposed projects in the original plan to new projects, and confirms that there is no adverse impact of the proposed changes on achieving objectives and targets of the initial investment plan. The note also provides an update on the implementation status of projects and programs included in the initial investment plan, and presents a readiness assessment of the upcoming World Bank and ADB-supported projects that are proposed for CTF funding in this second phase.
7. With energy shortages in excess of 10 percent and with more than 300 million people without access to commercial energy services, India faces significant challenges in closing its energy supply gap and reducing dependence on imported fuel to maintain economic growth.
8. Recently, the Government of India (GoI) has elucidated much more ambitious Solar energy generation objectives. In the meantime, significant developments have taken place in the technology, commercial aspects and business models available for deployment of Solar technologies. The Jawaharlal Nehru National Solar Mission (JNNSM) had a target of reaching 20 GW of grid-connected solar power by year 2022. Starting with the state of Gujarat and buoyed by the success of Phase I of JNNSM, several other states have also instituted state-level policies encouraging solar energy. As of early 2015, the grid-connected solar capacity reached over 3,743 MW.⁴
9. Ministry of New and Renewable Energy (MNRE) recently (October 2014) released the revised guidelines⁵ for selection of 3,000 MW grid-connected Solar PV power projects under Batch-II Tranche-I State Specific Scheme under the National Solar Mission Phase II (2013-2017). As per the revised guidelines, the GoI plans to add 15 GW of solar power capacity by Q1 2019. Under the original National Solar Mission target, India had planned to add 9 GW between 2014 and 2017 and an additional 10 GW between 2018 and 2022.
10. In a complete overhaul of earlier targets in order to accelerate the pace of growth of the solar sector in India, the Government has recently raised the target to 100 GW by 2022.⁶ This scale-up envisions 60 GW of ground-mounted utility scale solar power projects, and 40 GW in rooftop solar installations. The ambitious target of reaching 100 GW generation capacity of solar in the next eight

⁴ Source: MNRE.

⁵ See MNRE guidelines at [link](#).

⁶ India Eyes 100 GW Solar Power Capacity; see Clean Technica at [link](#).

years is expected to require US\$ 17 billion of investment every year in solar alone, from the current US\$ 6 billion annual investment in the entire RE sector, as reported by MNRE.

11. India's vision for development outlined in the 12th Five-Year Plan (FY2013-17) calls for a "faster, sustainable and more inclusive growth" and indicates that renewable energy has to play an expanding role in achieving energy security and access in the years ahead.
12. The original IP was developed to support primary energy needs by addressing the increase of RE growth in the decades and substantive success in its demand side management (DSM) and EE programs. The IP proposed CTF co-financing for reducing risks and overall costs of investing in renewable energy and energy efficiency program and supporting India's climate and sustainable growth strategies.
13. The selected activities for CTF co-financing for the Phase I in the original plan included the following:
 - a. Himachal Pradesh: Development Policy Loan on Environmental Sustainability and Climate;
 - b. Supper-Efficiency Equipment Program (SEEP);
 - c. Partial Risk Sharing Facility for Energy Efficiency (PRSF);
 - d. National Mission on Enhanced Energy Efficiency – Perform, Achieve, and Trade (PAT) – Phase I;
 - e. Solar Park: Rajasthan;
 - f. Solar Park: Maharashtra;
 - g. Solar Park & Smart Grid: Gujarat; and
 - h. Integrated CSP Hybrid Project.

STATUS OF ORIGINAL INVESTMENT PLAN IMPLEMENTATION

14. As of July 2015, the CTF TFC has approved US\$375 million out of total US\$775 million. As some of the originally-proposed projects are moving forward without CTF support and some are to be dropped due to various reasons, the reallocations of US\$400 million uncommitted and US\$50 million already approved CTF funds are proposed for new activities. The [Table 4](#) below summarizes the current status of the projects in the original IP.

Table 4: Status of Project Approvals

CTF Project/Program	Actual / Projected TFC Approval Date	Actual / Projected MDB Board Approval Date	CTF Funding (US\$ million)
Himachal Pradesh Environmentally Sustainable Development Policy Loan (HP DPL) (WB)	Nov-13	May-14	100
Super-Efficient Equipment Program (SEEP) (WB)	Mar-13	Cancelled	50
Partial Risk Sharing Facility for Energy Efficiency (PRSF) (WB)	Jul-14	Feb-15	25
National Mission on Enhanced Energy Efficiency – Perform, Achieve, Trade (PAT) – Phase I (WB)	Dropped	n/a	50
Solar Park: Rajasthan (ADB)	Jul-13	Sep-13	200
Solar Park: Maharashtra (ADB)	Dropped	n/a	150
Solar Park: Gujarat (ADB)	dropped	n/a	150
Integrated CSP Hybrid Project (ADB)	Jun-15	n/a	50

➤ “Himachal Pradesh Environmentally Sustainable Development Policy Loan” (World Bank)

16. **Description:** The project is to support the State of Himachal Pradesh in the improved management of its natural resources across growth engines of the economy and to promote inclusive green growth and sustainable development.

17. **Rationale:** The operation supported a number of policy and institutionally transformative initiatives that Himachal Pradesh (HP) is undertaking in the areas of benefit sharing, river basin management and land acquisition and rehabilitation. Given the development urgency, the GOI intends to rapidly scale-up the considerable hydropower resources so that it can meet the immediate power demand needs without compromising its climate change objectives. The DPL program was designed to help HP to develop a framework which, if followed, should ensure that energy generation is greener, the dependence on fossil fuels is lower and the impacts on the environment and people are much reduced. CTF has helped to fast-track these developments by addressing some of the barriers that still remain in one of the key hydropower states.
18. **Progress:** The US\$100 million CTF funding has been fully disbursed. The CTF funding was in addition to the US\$100 million World Bank (IBRD) funding through the Development Policy Loan (DPL) to Promote Inclusive Green Growth and Sustainable Development in Himachal Pradesh. While the monitoring activities are continuing, the Government of Himachal Pradesh (GoHP) has demonstrated continued strong ownership of the inclusive green growth agenda and significant progress has been made towards adopting and implementing the action plans as agreed in the two DPL operations. The results indicators also are on track and most of the actions have been completed or are at advanced stage of implementation⁷. Technical assistance provided by the DPL and CTF activities have resulted in a number of policy reforms, with regard to industrial pollution, sustainable tourism, and green accounting and payment for environmental services. GoHP has agreed to adopt the Inclusive green growth and Sustainable Development Program as an integral Program of the Department of Science Technology and Environment (DEST) and has agreed to the continued monitoring and documentation of the outcomes.

➤ “Super-Efficient Equipment Program (SEEP)” (World Bank)

19. **Description:** The project was to reduce peak demand as well as energy consumption by increasing adoption of higher efficiency fans. Given that the cost of super-efficient fans are higher than low efficiency fans by about \$5 a piece, the project was expected to bring down the cost of super-efficient fans to that of low technology fans, resulting the scale-up of the market at scale.
20. **Rationale:** Some of the biggest barriers to wider adoption of energy efficiency measures tend to revolve around higher discounting rates applied by decision-makers to such investment due to high

⁷ These include: (i) 60% operational projects out of 112 projects have adopted and applied the minimum environmental flow policy, (ii) The website, with module for monitoring physical milestones of hydropower projects, (iii) To monitor social parameters, HP is implementing a web based monitoring system, for management of Local Area Development Fund (LADF) and Benefit sharing scheme in hydro projects. (iv) The State’s Strategy and Action Plan on Climate Change (SSAPCC) has been finalized, (v) The Forest Department has included Payment of Ecosystem Services (PES) implementation in the department development plans, (vi) Department of Environment and the state Industry Department and the Pollution Control Board (PCB) have systems in place to monitor the growth rate of industries that have adopted environmental management standards, and (vii) HP has also established a basic compliance information management systems of polluting industries of the state and piloted it for the pharmaceutical industry.

capital costs and uncertainty of the returns in the future. The project planned to assist in overcoming these functional and behavioral barriers while the market-oriented approach initiated by the GoI through National Mission on Enhanced Energy Efficiency was stabilized.

21. **Progress:** The project was approved by the CTF Committee in March 2013. However, the CTF funding for the activity will be dropped and reallocated due to increased private sector sales of super-efficient fans, which has resulted in higher penetration of super-efficient fans in the Indian market, thereby meeting the original intent of the planned CTF activities without the need for financial subsidies and other direct intervention by the Government and the CTF. For instance, a 70 Watt equivalent fan with a power rating of a 41 Watt fan has started selling in India without any support.

➤ **“Partial Risk Sharing Facility for Energy Efficiency (PRSF)” (World Bank)**

22. **Description:** The project was designed to help extend the reach of private financing by supporting the GoI in setting up a Partial Risk Guarantee (PRG) facility and mitigating perceived risk to encourage private sector involvement in deployment of low-carbon energy technologies. The facility will act as a risk-sharing mechanism that will provide commercial banks with partial coverage of their risk exposure, thereby helping investors to get lower cost debt. The PRSF project consists of the following components: Component 1: A risk sharing facility for energy efficiency, managed by Small Industries Development Bank of India (SIDBI),⁸ of US\$37 million, funded from a GEF contribution of US\$12 million and backstopped by a CTF Guarantee, in the form of contingent finance, of US\$25 million, and Component 2: A technical assistance and capacity building component of US\$6 million, funded by GEF, US\$4 million managed by SIDBI and US\$2 million managed by Energy Efficiency Services Limited (EESL).⁹

23. **Rationale:** The CTF would support a proposed PRG mechanism that covers specified technology and associated commercial risks for new technologies in energy efficiency and renewable energy that are not usually priced by commercial banks. The two components described above are designed to strengthen the market-driven “energy efficiency ecosystem” conditions necessary for addressing EE market barriers. Both SIDBI and EESL are leading institutions in India in the area of EE financing and EE and ESCO market development. SIDBI’s experience with guarantees and EESL’s experience of market development and aggregation will complement each other in achieving the objectives of the Project.

⁸ SIDBI, one of the top 30 development banks in the world, has dedicated units of experienced staff which works in the area of EE and guarantees. As of March 2013, SIDBI had provided an aggregate assistance of more than US\$550 million to more than 6,000 MSMEs in India for promoting energy efficiency. More details about SIDBI’s portfolio and performance in EE sector, including its work with both bilateral and multi-lateral development partners, can be found at the [link](#). Further details about SIDBI’s work on energy efficiency with MSMEs is available at the [link](#).

⁹ EESL is a Joint Venture of NTPC Limited, Power Grid Corporation of India Limited (PGCIL), Power Finance Corporation Limited (PFC) and Rural Electrification Corporation Limited (REC) to facilitate implementation of EE projects in India. Under the purview of the Ministry of Power, EESL is leading the market-related actions of the NMEEE, and it complements the objectives of BEE, which is the statutory body created by the Energy Conservation Act of 2001. See [link](#) for more details on EESL.

24. **Progress:** The negotiations with GoI, SIDBI and EESL on the project agreement took place in November 2014. The project was approved by the World Bank Board on February 25, 2015. In addition to the \$25 million of CTF support, the project includes \$18 million of GEF financing.

➤ **“National Mission on Enhanced Energy Efficiency – Perform, Achieve, Trade (PAT) – Phase I” (World Bank)**

25. **Description:** The project was to support the PAT scheme which seeks transformational change by altering the energy usage in industries through market-based incentive mechanisms rather than regulation. PAT scheme is mandatory for all large industrial units and facilities, of the following energy-intensive industries in India: thermal power, aluminum, cement, fertilizers, chlor-alkali, steel, paper and pulp and textiles. PAT scheme seeks to provide targets under the Energy Conservation Act to save energy, based on companies’ individually calculated Specific Energy Consumption (SEC).

26. **Rationale** The project was proposed in order to assist overcoming various functional and behavioral barriers while the market-oriented approach initiated by the GoI through NMEEE is stabilized. The CTF intervention would provide an interest financial support incentive to achieve this transformation.

27. **Progress:** the first phase of the PAT scheme launched in 2012 and completed successfully in March 2015. The first phase of PATS has covered 478 installations in 8 energy intensive industrial sectors that account for one-third of total energy consumption. With the successful implementation of the first phase of the PAT scheme without the need for CTF funding, this component of the proposed CTF Investment Plan will be cancelled and the resources re-allocated.

➤ **“Solar Park – Rajasthan” (ADB)**

28. **Description:** The overall Rajasthan Investment Plan for renewable energy envisaged a quantum advance in development of solar and wind power at scale, projected to result in the installation of nearly 5,700 MW of wind and solar power between 2012 and 2018. The ADB supported Rajasthan Renewable Energy Transmission Investment Program will support the development of the in-state transmission network to evacuate and transmit at-least 4,300 MW of new renewable energy capacity over this period. Transmission system expansion to be supported under the ADB Program will be mobilized through a multi-tranche financing facility (MFF), which comprises a series of project loans with total investment of US\$800 million including CTF US\$200 million over a period till 2018.

29. **Rationale:** The Rajasthan state owned transmission company (RRVPL), with legal obligations to connect new RE plants under open access provisions, is required to expand and strengthen the high voltage transmission “backbone” and begin investments in “green grid” technology to facilitate the GW scale-up in RE capacity. Under business-as-usual (BAU), new generation capacity would be

provided by coal and natural gas, with transmission system utilization of about 80%. Under the proposed investment program, the transmission system utilization may be as low as 20-25% with a best case of about 50%, i.e., about 12 hours per day at rated capacity (the ultimate utilization factor will depend on the mix of PV, wind and solar thermal with significant storage). CTF co-financing will offset part of the additional costs of developing long transmission lines from remote resource rich regions particularly in Western Rajasthan to load centers.

30. **Progress:** The Trust Fund Committee approved CTF co-financing on 29 July 2013. ADB's Board of Directors approved the multi-tranche financing facility for the program in September 2013. The first tranche of US\$150 million loan and US\$2 million TA grant was approved in 2013. Disbursements commenced in 2014.

➤ “Solar Park – Maharashtra” (ADB)

31. **Description:** Metropolitan Region Development Authority (MMRDA), Government of Maharashtra (GoM) is aiming to set up a Solar Park on a 117 hectare plot at Taloja, Maharashtra. As per area planning, the requirement of land for processing unit would be around 17 hectares.

32. **Rationale:** The strategy and rationale for Maharashtra solar park development is similar to that for Rajasthan, noted above.

33. **Progress:** The project was prepared with assistance from ADB. The state of Maharashtra has decided to utilize funds from the German financial agency KfW for implementation. Therefore, the project will not require CTF co-financing and will be removed from the IP. The funds will be reallocated to other RE and new solar program support.

➤ “Solar Park & Smart Grid – Gujarat” (ADB)

37. **Description:** The project was intended to support expansion of solar parks including application of advanced transmission and smart grid technologies.

38. **Rationale:** The strategy and rationale were similar to that for Rajasthan (noted above).

39. **Progress:** ADB and Government of Gujarat have maintained extensive dialogue on the scope and timing of the project, which was intended to build on previous investments in grid infrastructure with ADB financing. Gujarat has made significant progress in solar parks development, with support from ADB and JICA/JBIC, with the demand for concessional finance having declined since endorsement of the original IP. The project envisioned in the original IP is not sufficiently advanced with respect to agreed readiness criteria for consideration during calendar year 2015, therefore, the funds will be reallocated to new solar park, solar transmission and solar rooftop development.

➤ **“Integrated CSP Hybrid Project” (ADB)**

34. **Description:** Utility-scale CSP prototype projects closely aligned with research and development activities were envisaged under the National Solar Mission with a view to address issues related to optimization, variability of power output, energy storage constraints, and space-intensity through the use of better technologies including various CSP technologies and CSP-hybrid systems.
35. **Rationale:** CTF would facilitate mainstreaming of utility-scale CSP development to move up the technology learning curve, facilitating expanded deployment of CSP, to drive down installed system costs. This was deemed necessary to accelerate private sector investment on future generation plants.
36. **Progress:** ADB has provided technical assistance for project preparation. GoI and the Ministry of New and Renewable Energy (MNRE) are considering alternative financing modalities and instruments for the project. Solar PV has become the technology of choice for promoting the growth of the solar sector and achieving targets, whereas CSP in India has remained in the experimental realm. The project will be dropped and the resources reallocated.

CIRCUMSTANCES AND RATIONALE FOR INVESTMENT PLAN REVISION

Growing Energy Demand

40. India has more than 260 GW of installed power capacity (as of end June, 2015) and the per-capita consumption of electricity in India is only about one-fourth of the world average. This underscores the need to grow the power system at a rapid pace for the next several decades. In a business-as-usual scenario, by 2035 India would need 5 times the installed capacity of that in year 2005 to provide electricity to meet the increasing demand due to the fast growing manufacturing sector and the rising aspirations of its people. Currently, India relies heavily on coal, both domestic and imported, for its electricity generation. Coal is expected to be the mainstay for the foreseeable future. With demand continuously increasing, India is facing more and more challenge to meet its domestic coal demands. On the other hand, India is currently the world's third largest emitter of global warming pollutants, and its major cities are among the most polluted (with alarming air quality levels), largely due to fossil fuel combustion in the power sector. It is critical that India supplements non-renewable energy sources with cleaner and abundant renewable sources of energy, to improve its energy security and ease its air pollution issues.

Large Shelf of Ready Projects

41. A number of States have been working closely with MNRE and Solar Energy Corporation of India (SECI) in order to obtain central support and assistance to prepare themselves to contribute to the solar energy agenda. **Appendix 1 contains further details of supporting documentation available on all the policies that have been issued, lands that have been identified, and other actions that have been initiated, in order to expedite the achievement of the national solar energy agenda.** In particular, there are four areas of focus in the revised CTF investment plan, and these concern **Solar Parks, Solar Park Evacuation, Solar Rooftops and Solar Generation by SECI.** Appendix 1 documents are related to the readiness of these four areas.

New Renewable Energy Target

42. **India currently has an installed capacity of 32.4 GW of renewable energy (not including large hydro) and stands fifth in the world in terms of overall renewable energy capacity installations¹⁰. The Government has recently raised the target of RE to 175GW by 2022, of which 100GW would come from solar and 60GW from wind power.¹¹** In a complete overhaul of earlier targets in order to accelerate the pace of growth of the solar sector in India, the Government has recently raised the target to 100 GW by 2022.¹² This scale-up envisions 60 GW of ground-mounted utility scale solar power projects, and 40 GW in rooftop solar installations. The ambitious target of reaching 100 GW generation capacity of solar in the next eight years is expected to require US\$17 billion of

¹⁰ MNRE (2014).

¹¹ India Eyes 100 GW Solar Power Capacity; see Clean Technica at [link](#).

¹² India Eyes 100 GW Solar Power Capacity; see Clean Technica at [link](#).

investment every year in solar alone, from the current US\$ 6 billion annual investment in the entire RE sector, as reported by MNRE.

Ambitious Solar Power Capacity Addition Plan

43. On 30 June 2008, the then Prime Minister released the National Action Plan for Climate Change (NAPCC), which outlines a national strategy on climate change for enhancing India's ecological sustainability & encourage sustainable energy sources. As part of NAPCC, the Jawaharlal Nehru National Solar Mission (JNSMM), launched in 2010. JNSMM is a government initiative to promote the development of solar power in India with active participation of States. The Mission has set a goal, amongst others, for deployment of 20 GW grid connected solar power capacity by 2022 in 3 phases: 1 GW in first phase up to 2012-13; 9 GW in second phase from 2013 to 2017; and 10 GW in third phase from 2017 to 2022.
44. MNRE recently released the guidelines for selection of 3 GW grid-connected Solar PV Power Projects under Batch-II Tranche-I State Specific Scheme under Phase-II. As per these guidelines, the Gol aims at speeding up the deployment by adding 15 GW of solar power capacity by Q1 2019, in comparison with the original plan: 9 GW between 2014 and 2017; and 10 GW between 2018 and 2022.

Needs for Expanded Financing and Greater Private Participation

45. Analytical work undertaken by the World Bank explored the performance of the JNNSM Phase-1 across financing, regulatory and technology pillars¹³. The study revealed that the lack of participation of commercial banks has been a roadblock to achieving its targets. The total debt provided by commercial lenders was less than a quarter of the total debt requirement in JNNSM Phase-1, as compared to more than 60% in other infrastructure projects. Going forward, even adding 9 GW of grid-connected solar under JNNSM Phase-II would present a commercial debt market of around US\$9 billion in three years. This financing requirement for JNNSM Phase-II through year 2017 would require around 13 times the total debt available through Scheduled Commercial Banks (SCBs) from year 2010-13; obviously there is substantial demand for catalyzing new and additional financing.
46. International Finance Corporation (IFC), Asian Development Bank Private Sector Operations Department (ADB-PSOD) and Overseas Private Investment Corporation (OPIC) are the prominent international financial institutions that have been financing private sector solar projects in India. Given the increased need for financing, private sector financing will need to increase along with funds from the public sector, complementing funding from India's commercial banks. In general, public funds should continue to support transmission and other grid infrastructure development, (including shared infrastructure in solar parks with evacuation into the inter-state transmission system (ISTS) for transfer of power from solar-rich to solar-poor regions), with commercial funds largely supporting new generation assets, whether on rooftops or inside solar parks. The scale of

¹³ See "Paving the Way for a Transformational Future: Lessons learned from Jawaharlal National Solar Mission Phase I (World Bank, 2013)" at [link](#).

development requires an “all hands on deck” approach to financing, with new business models and financing instruments deployed as necessary.

Rationale for the proposed IP Revision

49. Adequately structured financing is still needed to move the solar sector forward, given the financing requirement under Phase-II of JNNSM, the evolutionary nature of solar PV and CSP technologies, their higher upfront cost, and the risk perception among private investors and financiers. Commercial banks mostly shied away from financing projects under Phase-I of JNNSM, with export credit agencies, MDBs, and some nonbanking financial institutions accounting for the bulk of debt financing. Most of the solar generation projects were financed on a limited or full recourse basis. Unless sufficient depth is developed in the commercial banking market to generate an appetite for funding solar investments, it will be a major challenge to meet the targets. Out of the two generation modalities of solar parks and solar rooftops, it is observed that the latter (rooftops) have experienced the greatest reluctance on the part of commercial lenders. For those exceedingly few loans that have been made for solar rooftops, the interest rates have been very high and are clearly not at levels which would promote widespread uptake in order to attain the 40GW target in a very long time, let alone in the next seven years.
50. Based on experiences from Phase-I of JNNSM and projects moving forward with CTF support, direct public funding including concessional resources can be advanced to solar parks for creation of shared infrastructure to bring down the total cost through optimization of such infrastructure including land use, water supply, grid evacuation facilities, and provision of scale to use smart-grid features in grid integration of solar power. Hence, with a view to the transformational changes and financing needed for India to achieve its ambitious target for renewable energy in the next eight years, the GoI has revisited the original IP to consider how the CTF resources could maximize the benefits and leverage more investment in attracting generation capacity into solar parks in a more cost-effective manner. To the extent that such shared infrastructure costs have to be recovered from investors through Solar Park user fees, it is very helpful to have concessional funding in the picture. User fees are in turn reflected in the solar tariff that is quoted by the investor for sale of his solar power to the grid. Concessional funds can help to push solar power costs closer to competitiveness with other power and thereby promote its uptake and affordability for utility companies and eventually the end-users. In other words, having adequate CTF resources as an essential underpinning to the Government’s solar strategy will be an important contributor to the success of that strategy. It is therefore proposed to deploy CTF resources into (i) solar park infrastructure; (ii) transmission of solar power from solar parks into the national grid; (iii) solar rooftop PV; and (iv) incremental generation of 500MW of solar power by the Solar Energy Corporation of India.

PROPOSED CHANGES TO THE INVESTMENT PLAN

51. The proposed reallocation of CTF resources re-emphasizes and expands MDB support for solar programs (World Bank and ADB). Specifically, the proposed changes entail the reallocation of CTF funding toward investments in the creation of shared infrastructure for solar parks, evacuation of power from solar parks to the national power market, expansion of solar rooftop PV, and incremental generation of 500 MW of solar power by the Solar Energy Corporation of India (SECI). To achieve objectives of the IP, the GoI proposes to reallocate CTF resources to new projects as in [Table 5](#) below. Detailed project description of new projects and programs is provided in Annexes I-V.

Table 5: Proposed New Projects (US\$ million)

CTF Program	MDB	CTF Funding (CTF IP Revision July 2015)
Solar Park Infrastructure	WB/ADB	100
Solar Rooftop PV	WB/ADB	250
Solar Park Transmission Evacuation	WB/ADB	80
Solar Energy Corporation of India (SECI) Generation Project	WB	20
Total		450

52. Meanwhile the following projects are proposed to be removed from the original IP:
- a. Supper-Efficiency Equipment Program (SEEP);
 - b. National Mission on Enhanced Energy Efficiency – Perform, Achieve, and Trade (PAT) – Phase I;
 - c. Solar Park: Maharashtra;
 - d. Solar Park & Smart Grid: Gujarat; and
 - e. Integrated CSP Hybrid Project

POTENTIAL IMPACTS OF PROPOSED CHANGES ON INVESTMENT PLAN OBJECTIVES

53. The overall impact expected from the proposed CTF Plan Revision is expected to substantially exceed the impact of activities proposed in the original CTF Plan. The revised IP, due to its sharp focus on actual large scale projects and investments in connection with solar energy, presents significant increases in the potential for GHG emissions reduction. [Table 6](#) compares impacts of the revised IP (July 2015) vis-à-vis the impact expected under the original IP (November 2011).

Table 6: Assessment of Proposed Changes

CTF Investment Criteria	Original Investment Plan (Endorsed November 2011)	Updated Investment Plan (Revision July 2015)
Transformational Impact	Transformational impact expected on both supply and demand side of energy. On the supply side, CTF support for the State Level Hydro Power Development: HP DPL would establish a policy framework for environmentally and socially acceptable hydropower development in one progressive state (with a hydropower potential of 30 GW), which can then be replicated in other mid-Himalayan states (total hydropower potential in India is more 150 GW). CTF would also support scaling up of National Solar Mission to 20 GW by 2022. On the demand side, CTF support for the National Mission for Enhanced Energy Efficiency and Partial Risk Guarantee for Energy Efficiency Technologies would help promote the reduction of energy demand to achieve the ultimate objective of the NMEEE to avoid 19 GW of electricity generation.	In light of proposed increased financing for the solar sector’s investment program, the transformational impact in the revised IP (July 2015) is expected to be greater than in the original IP (November 2011). The use of CTF financing toward supporting investment in three out of four elements of the Government’s strategy to reach the 100GW solar target represents an unprecedented step-change in solar development. The proposed investments will demonstrate the commercial feasibility of implementation of mega-scale grid connected solar installations in solar parks and their grid interaction, promote the “commoditization” of solar Rooftop PV, support direct investment in clean power generation capacity, and thereby enhance the state owned solar power company (SECI)’s institutional capacity to implement the envisioned solar scale-up.

<p>Potential for GHG Emissions Savings</p>	<p>Proposed interventions target sectors with highest margin of CO₂e emissions, with total emissions savings potential of 8.83 MtCO₂e/yr. The breakdown of emission savings estimated at the IP was as follows:</p> <ul style="list-style-type: none"> ▪ 1.00 MtCO₂e/yr from <i>Himachal Pradesh DPL</i>, ▪ 2.00 MtCO₂e/yr from <i>Partial Risk Guarantee Scheme for New Technologies in Energy Efficiency</i>, ▪ 2.61 MtCO₂e/yr from <i>Rajasthan Solar Park</i>, ▪ 1.53 MtCO₂e/yr from <i>Gujarat Solar Park</i>, ▪ 1.53 MtCO₂e/yr from <i>Maharashtra Solar Park</i>, and ▪ 0.15 MtCO₂e/yr from <i>Integrated Solar-hybrid Pilot Project</i>. <p>Emissions savings were not quantified for the <i>National Mission on Enhanced Energy Efficiency – Super Efficient equipment Programme</i> and <i>National Mission on Enhanced Energy Efficiency – PAT Phase I</i>.</p>	<p>The estimated total GHG emissions reduction is 13.12 MtCO₂e/yr. The breakdown by program is given below.</p> <ul style="list-style-type: none"> ▪ 3.60 MtCO₂e/yr from <i>Himachal Pradesh DPL</i>, ▪ 0.78 MtCO₂e/yr from <i>Partial Risk Guarantee Scheme for New Technologies in Energy Efficiency</i>, ▪ 2.61 MtCO₂e/yr from <i>Rajasthan Solar Park</i>, ▪ 2.30 MtCO₂e/yr from <i>Solar Rooftop PV</i>, ▪ 3.07 MtCO₂e/yr from <i>Solar Parks Infrastructure</i>, and ▪ 0.77 MtCO₂e/yr from <i>SECI Solar PV Generation</i>. <p>The transmission infrastructure developed under the <i>Solar Parks Transmission Evacuation Project</i> will be utilized for evacuating power under the <i>Solar Parks Infrastructure Project</i>. Therefore, emissions savings from the <i>Solar Parks Transmission Evacuation Project</i> were not included to avoid double-counting.</p>
<p>Cost-effectiveness</p>	<p>Cost effectiveness at the IP level considering CTF funding only is 4.4 US\$/tCO₂e. When both CTF and expected leveraged financing are considered, cost effectiveness at the IP level is 235.4 US\$/tCO₂e. The magnitude of the latter indicator is largely affected by significant amounts of investments (e.g., Govt, private) associated with the Himachal Pradesh DPL.</p>	<p>Assuming the project lifetime is 10 years for the EE projects and 20 years for RE, the total GHG reduction will be around 254.6 MtCO₂e over the lifetime of investments. Therefore, the cost effectiveness at the IP level considering CTF funding only is 3.04 US\$/tCO₂e. When both CTF and expected co-financing are considered, cost effectiveness at the IP level increases to 30.31 US\$/tCO₂e.</p>
<p>Demonstration Potential at Scale</p>	<p>The CTF IP would support interventions whose demonstrational impact has vast potential for large-scale expansion of energy supply and replicability of energy demand interventions throughout the country.</p>	<p>In addition to the demonstrational potential envisioned in the original IP, the revised IP will contribute to reduced cost of solar development. The scale of implementation under the proposed solar program will reduce the cost of installations with long-term concessional finance, by showcasing</p>

		<p>500 MW of directly funded grid-connected solar, around 1,500MW of rooftop PV and the creation of solar parks able to host at least 2,000MW of solar generation capacity brought in by investors. Likewise, the funding of inter-state transmission systems at the doorstep of the solar parks also provides access to a national market for investors in solar parks, and again contributes to reduced uncertainty, while increasing the attractiveness of solar generation investments to be made in these designated areas. With a target of 100 GW, the replication and scale up potential is near 15:1.</p>
<p>Development Impact</p>	<ul style="list-style-type: none"> ▪ Energy efficiency investments directly provides benefits to consumers; ▪ Development of indigenous solar manufacturing base and employment in clean energy; ▪ Improving energy security; ▪ Support paradigm shift from conventional socio-economic development to true low-carbon development in one State; ▪ Avoided coal generation; and associated health benefits 	<p>The development impact of the revised IP is expected to be greater than the original IP, mainly due to increased investments and subsequent impact under the solar program.</p>
<p>Implementation Potential</p>	<ul style="list-style-type: none"> ▪ The carbon neutral and energy efficiency policies have been developed with substantial stakeholder analyses and inputs, and experience in other countries; and ▪ The proposed solar parks are first-of-its-kind in terms of scale and design, which present first-mover risks. Significant private sector interest in generation. Proposed operations support national programs with strong country ownership. 	<p>The policy framework has been strengthened since the original IP was endorsed in 2011, facilitating more ambitious national objectives for solar energy development. Recent experience on solar parks provides a foundation for massive scale-up and replication of utility scale solar power.</p>

CTF Additionality	<ul style="list-style-type: none"> ▪ Leverage significant private sector investments through public-private partnerships, reducing cost of commercial lending, improving investment climate, and providing essential infrastructure 	With updated RE objectives including the solar program, CTF additionality is more compelling than the original IP.
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54. The overall risk of the revised CTF IP for India is **Moderate**. In addition to the risks and mitigation measures identified in the original CTF IP, the following risks should be considered:

Table 7: Risks and Mitigation Measures

Risk	Mitigation Measure	Residual Risk (low/moderate/high)
Development of successful partnership frameworks	<p>Solar Program: For the component of decentralized solar application, development of partnership frameworks with various off-takers, primarily financially weak distribution companies, is a key design issue. The mitigation measure is to offer alternative off-takers and aggregators such as Solar Energy Corporation of India, so that investors are not only limited to selling their solar power to the utility of the state that they are generating in. An additional mitigation measure is the access to the national market that is provided by having the national grid at the doorstep of the solar parks to be supported. This allows investors to bypass the state transmission utility if they wish, and sell their power anywhere in the country. The financial woes of a particular distribution utility as the “only potential customer” can therefore no longer pose a risk to a particular solar generation investment.</p>	Low

<p>Replicability of investment components</p>	<p>Solar Program: The updated GoI objectives are unprecedented in the developing country context. India is becoming a testing ground for solar scale-up with worldwide impact. The proposed projects will also test out centre-state JVs, cross-collaboration amongst government ministries and departments, Financial institution, State Nodal Agencies to implement bulk solar installations. This could pave the way for other sectors as well. This will be done through introduction of flexible payment plans with low, easy monthly installment payments by the customer for the rooftop system, corresponding to the customer’s monthly electric bill payable to the utility.</p>	<p>Moderate</p>
<p>Project readiness</p>	<p>Solar Program: There is substantial pressure for an accelerated project delivery, as the end of target year for 100 GW addition of solar power is approaching taking into account lead time necessary for project implementation. The mitigation measure here consists in the fact that this IP revision has focused only on activities and areas where there is a high degree of readiness in terms of policies already enacted, land already identified, detailed project reports (DPRs) already underway, and all key stakeholders identified and included in the proposed program of support. (See Appendix 1 for supporting documentation on Readiness).</p>	<p>Moderate to Low</p>

<p>Implementation Capacity</p>	<p>Solar Program: As part of project preparation for Solar Rooftop PV Project, a readiness checklist will be prepared for each stakeholder group and only when all stakeholders in a given geographical meet the readiness criteria, will they be eligible for funding as a group. Upfront messaging by state nodal agencies will be undertaken only in states which have already announced a net metering policy for solar PV. For the Solar Parks and SECI Generation of 500MW, there is clear identification of experienced stakeholders and replication of a business model (solar parks) which has succeeded in the most solar-rich states of India, i.e. Gujarat and Rajasthan. For the Solar Park Transmission Evacuation, the implementation agency is PowerGrid, acknowledged to be among the most capable agencies in its field by global standards, and currently engaged in providing consultancy services to many developing countries. Hence, the overall implementation risk is Moderate to Low for the first group of activities and Very Low for PowerGrid</p>	<p>Moderate - low</p>
<p>Overall risk after mitigation</p>	<p>Moderate</p>	

MONITORING AND EVALUATION

55. Table 8 below presents the summary of the expected Results Indicators and their target values, comparing the expected results in the original CTF IP (November 2011) and proposed revision. For each project, the monitoring and evaluation will be carried out by the implementing agency as part of the monitoring process for the entire project, including co-financing and other contributions.

Table 8: Results Framework

Results Indicator	Baseline	Expected Results in Original IP (November 2011)	Expected Results in Revised IP (July 2015)
Tons of GHG emissions reduced or avoided - Annual (tCO ₂ e/yr) - Lifetime (tCO ₂ e/lifetime)	0 (Annual) 0 (Lifetime)	8.83 million (Annual) ¹⁴ 180 million (Lifetime) ¹⁵	13.12 million (Annual) 254.6 million (Lifetime)
Financing leveraged through CTF funding (US\$ million)	0 (public, private)	370 (MDB), 40,405 (Others) ¹⁶	2,500 (MDB) 4,441 (Others)
Installed capacity as a result of CTF interventions (MW)	0	4,300 MW ¹⁷	7,034 MW ¹⁸
Energy savings as a result of CTF interventions - Annual (GWh/yr) - Lifetime (GWh/lifetime)	0 (Annual) 0 (Lifetime)	2,778 (Annual) 27,778 (Lifetime)	1,067 (Annual) 10,665 (Lifetime) ¹⁹

¹⁴ Total 8.83 M tCO₂e: 1 M tCO₂e (HP DPL); 2 M tCO₂e (NMEEE); and 6 M tCO₂e (Solar Parks).

¹⁵ Total 180 M tCO₂e: 20 M tCO₂e (HP DPL); 40 M tCO₂e (NMEEE); and 120 M tCO₂e (Solar Parks).

¹⁶ Note that US\$25,800 million was expected co-financing (i.e., GoI, private) for the Himachal Pradesh DPL. The co-financing amounts have been revised following the approval of the HP DPL by the CTF Committee and WB Board.

¹⁷ Total 4,300 MW: 500 MW (HP DPL); 1,000 MW (Gujarat Solar Park); 1,700 MW (Rajasthan Solar Park); 100MW (Integrated Solar-hybrid Pilot Project); and 1,000 MW (Maharashtra Solar Park).

¹⁸ Total 7,034MW: 1,334 MW (HP DPL); 1,700 MW (Rajasthan Solar Park); 1,500 MW (Solar Rooftop PV); 2,000 MW (Solar Parks Infrastructure); and 500 MW (SECI Solar PV Generation).

¹⁹ Assuming 10 years' lifetime for EE projects.

ANNEX I: (new) Solar Rooftop PV Project (World Bank/ADB)

63. **Problem Statement.** GoI has set a target of 40 GW of grid-connected solar rooftop installation by 2022. At present there are a number of structural barriers which prevent the sub-sector from taking off: (i) no appetite from commercial banks to lend for the rooftop sector, neither to customers nor to installers; (ii) rooftop PV product is not well understood and seen as a risky investment with unclear pricing and rules of the game; and (iii) distribution companies are not prepared (technically, commercially or financially) to play their part in grid-connected solar rooftop PV.
64. **Proposed Transformation. The Solar Rooftop PV Project combining CTF and MDB financing would support** MNRE to set up a program implemented by a financial institution, which seeks to “commoditize” solar rooftop PV into a “must-have” item, initially for commercial and industrial customers and subsequently for other customer categories. This will be done through introduction of flexible payment plans with low, easy monthly installment payments by the customer for the rooftop system, corresponding to the customer’s monthly electric bill payable to the utility. The customer can immediately benefit from the rooftop energy generated and sale of surplus to the utility, or alternatively, energy storage for use during peak hours if a battery is also part of the investment. The transformational method by which this is proposed, through directly tackling the barriers mentioned above, is as follows: the MDB loan and CTF financing (either in the form of loan or guarantee) will be used to catalyze a source of affordable credit for rooftop installers as well as when needed to mitigate off-taker’s risk. Today they have no access to credit. The transformational aspect is to provide affordable long term credit which will allow the installer to pass on the benefits to his customers
65. The funds will be administered by a financial institution. The CTF funding will leverage funds from the commercial bank and private sector beneficiaries and most importantly, will lower the cost of funding to those who borrow for rooftop PV investment. Today such potential borrowers have no access to credit for rooftop PV.
66. Distribution companies, whose cooperation is needed in order to have a successful grid connected rooftop PV program, will also be assisted technically and commercially for any minor investments required on their part, with CTF support. Finally, MNRE will undertake a widespread communication and awareness raising effort amongst customers in selected states, in local languages, through its network of state nodal agencies in addition to also provide some resources for distribution utility companies (DISCOMS) in order to raise their awareness and capacity to participate in the grid connected rooftop PV program.
65. **Rationale.** At present there is no funding mechanism available to support scaling up of the rooftop PV program. A US\$250 million line of CTF funding (either in the form of loan or guarantee) would have a very large impact in terms of accelerating the Government of India’s rooftop PV program in

multiple states. The DISCOM funding requirement is currently not met and therefore the CTF funding is best suited for this transformational and critical element of the project structure.

67. Support with data analysis and mapping of which transformers are suitable and thereby identifying neighborhoods where the program can initially be launched, while seeking resources to upgrade or expand capacity of the other transformers for a second phase, is a critical step to launch the program with credibility. The next category of support required by DISCOMS is the training of their staff, none of whom have experience with rooftop PV. The first category of staff is technical; the second is commercial (who need training in net metering, new billing software and management of different bills for selected customers who are pro-sumers); and the third category is the maintenance department. After information gathering and training, support is also required for financing the associated upgrades of hardware e.g. bi-directional meters, feeder strengthening or replacement, and in some locations also transformer expansion. Overall, a separate task force or team inside the DISCOMS will need to be established and empowered with resources to run the DISCOMS’s side of the grid-connected rooftop PV program.

66. **Readiness.** All participants (MNRE, FINANCIAL INSTITUTION, State Nodal Agencies, a long list of empanelled solar installers, commercial and industrial customers, and 3-4 DISCOMS that have been contacted so far) are well aware of the project structure and are eagerly waiting for the implementation to start. So far, 13 states namely Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal have notified policies that include promotion of grid connected rooftop solar systems with net metering while the State Electricity Regulatory Commission among 20 states have also notified regulation to allow net metering/feed-in-tariff. As part of project preparation, a readiness checklist will be prepared for each stakeholder group and only when all stakeholders in a given geographical meet the readiness criteria, will they be eligible for funding as a group. Upfront messaging by state nodal agencies will be undertaken only in states which have already announced a net metering policy for solar PV²⁰. Appendix 1 contains the Rooftop PV policies of all 15 states which have issued them so far, and others are in process.

Table 9: Project Indicative Financing (US\$ million)

Financing Source	Amount
CTF	250
MDBs (WB/ADB)	800
Project Sponsors/ Commercial banks/	550

²⁰ 19 states of India have so far announced their net metering policies. The Project will find an initial long-list of 10 states to explore during project preparation and finally launch in about 3-5 states.

Other Financing	
Total	1,600

Table 10: Project Preparation Timetable

Milestone	Date
CTF approval	Q4 2015
MDB Board approval	Q1 2016

Table 11: Results Indicators

Result	Indicator	Baseline ²¹	Target	Data Source & Means of verification
Avoided Annual GHG emissions ²²	tCO ₂ e reduced or avoided	0	2.30 MtCO ₂ e/y	Project monitoring reports
Increased Financing mobilized for low-carbon development	Leverage factor of CTF Funding	n/a	> 1:5	MDB co-financing agreements
Increased Supply of RE	Installed Capacity (MW)	0	1,500	MDB project Monitoring
	Design Output (GWh/y)	0	3,285 GWh/y	

Source: MDB staff estimates.

²¹ Baselines are set in 2014 unless otherwise noted. Targets are the incremental changes relative to the baseline.

²² GHG reductions are estimated using the following assumptions: 6 hours generation per day (25% Load factor), 1,500 MW, and discounted grid emissions factor of 0.70 tCO₂e/MWh. The target population (commercial and industrial customers) replaces an equivalent amount of generation from diesel gensets after installation of solar PVs.

ANNEX II: (new) Solar Park Infrastructure (WB/ADB)

67. This annex summarizes the major challenges and opportunities associated with India's solar program and presents concepts for the proposed operations with CTF co-financing. Solar development in India over recent years has demonstrated the commercial viability of multiple large scale projects, with generation assets developed mainly by the private sector or other commercial investors, and grid infrastructure by transmission utilities. The new challenge is to accelerate development at scale in order to deliver 100 GW of new capacity by 2022.
68. CTF co-financing will be utilized to cover additional costs and risks associated with accelerated development of GW-scale capacity in solar parks, and related grid infrastructure as well as incremental generation of 500 MW by the newly established Solar Energy Corporation of India (SECI). The overall technology risks are relatively low, but off-take risks are high due to the financial condition of many electricity distribution companies (DISCOMs). CTF will be used through a variety of financing options, products and technical assistance which may include project loans (debt), equity, new financing instruments (e.g., "green" bonds), results-based financing, and policy-based loans. A flexible programmatic approach is needed so that CTF and multilateral development bank resources achieve optimum leverage with bilateral agencies and commercial financiers. In all cases, however, CTF funding will be flexibly deployed to mitigate risks and reduce the cost of financing in support of hard investments that seek to further the goal of incremental generation and its delivery to market.
69. **Solar Park Infrastructure Overview.** This consists of setting up 'plug and play' infrastructure by the public sector, (like an industrial layout) in order to allow a state to invite utility-scale solar investment inside the Solar Park. The Solar Park will attract developers and investors who are either from the private sector, or who represent the PSUs that are prominent among the first large wave of investors expressing interest in solar parks (including NTPC, Coal India, IREDA, etc.).
70. **Detailed Concept.** Under the Solar Parks model the investor will have to focus on the commercial aspects only, i.e. PPA, financing and technical design of the project components to deliver optimum performance. Those aspects where the public sector has a comparative advantage, e.g. identifying and securing land, obtaining clearances and permits, and negotiating coordinated construction of transmission evacuation facilities, will be left to the public sector to deliver in the form of a "plug and play solar park" where space will be rented out to qualified parties who are selected through Central/State schemes to install solar PV generation capacity inside the park.
71. The shared **facilitating infrastructure** is proposed to be developed and provided by the public sector in selected states which have decided to seek MNRE assistance. It includes: suitable land availability; internal transmission system; sub-stations for pooling power generated by multiple occupants of the park; access to water for cleaning panels; access roads inside the park; telecommunication facilities; park management services, etc.

72. The Solar Park business model demonstrates the comparative advantage of a state only or a center-state collaboration that is established to remove local bottlenecks. This is the public sector's contribution to its share of the respective overall investments required for cost-effective solar PV generation. (Note: some states have decided to opt for entirely private or entirely state-funded solar parks and they would not be seeking central assistance by joining the MNRE Framework Agreement for Support to Solar Park Shared Infrastructure, with multilateral funds channeled through SECI).
73. The business model of a typical solar park is to provide publicly funded "facilitating infrastructure" on an announced schedule and for an annual user fee. Such a division of responsibilities among the public and private sectors is expected to improve efficiency, reduce time taken, and lower the overall net cost of generation for private players through economies of scale from large ground-mounted investments connected to the grid. Private developers/investors in such utility scale solar PV can then focus on their core competence which is to generate solar energy with highest efficiency and best possible terms for financial closure and reliable offtake. While the role of the investor focuses on the commercial aspects, the state-designated implementing agency for Solar Parks seeks to deliver to the market a ready-made "upgraded" site and associated transmission evacuation facilities.
74. Eligible users of the "upgraded" solar park site are investors who will be selected through a Central/State scheme to install solar PV generation capacity inside the park and use the associated evacuation facilities to sell their power through a power purchase agreement (PPA) to a suitable buyer (most often an aggregator or alternatively the state discom). The idea is to reduce the time from "allocation to connection" to less than one year.
75. Today, when an investor is awarded a solar PV generation contract, the time to connection is around 18-20 months, as the investor must first secure land for his project site, pursue the necessary permits and clearances, obtain a right of way for interconnection of his project to the nearest grid substation (either State Transmission Utility or Powergrid), and then secure financing as well as negotiate a PPA with his off-taker, which is usually the (cash-strapped) discom in the state where his project is located.
76. It is therefore clear to see how the support of Solar Parks with centralized infrastructure can simultaneously attract a large amount of solar PV investment.
77. **Proposed Transformation.** ADB and World Bank have been requested by the GOI to support at least 3-4 solar parks in the near term, with aggregate financing of up to US\$1 billion per park through a long-term programmatic engagement with MNRE and SECI. CTF co-financing will address the financing and technology challenges associated with the large scale and the associated grid infrastructure including smart grid technology inside and outside the park.
78. **Rationale.** CTF eligibility criteria align well with the 100 GW solar program which presents (i) additional upfront costs and risks associated with the scale of development and (ii) need for new

financing approaches. CTF can facilitate acceleration of solar capacity installations, buy-down additional costs of solar and smart grid technologies, and deliver risk coverage so that commercial financing can be crowded in to the maximum extent possible. Commercial development of solar energy at the GW scale will support enhancement of India's energy security, save foreign exchange, and protect against global fuel price fluctuations by using non-tradable domestic energy sources. The additional electric power capacity is critical to support equitable and sustainable economic growth in India. Achieving grid parity by the end of the decade would facilitate comparable growth in solar deployment worldwide, creating a virtuous cycle of expanded RE deployment at increasingly affordable costs.

79. **Readiness.** A number of states have identified land and started Detailed Project Report preparation for their Solar Parks. Karnataka (Pavagada Park) and Madhya Pradesh (two districts) have already initiated such work. Rajasthan has an active Solar Park and UP is in the process of initiating studies on the land it has identified. Various other states are in different stages of progress, but all states working with WB/ADB are interested in obtaining central assistance through MNRE. Details of Solar Park Schemes of MNRE are provided in Appendix 1.
80. **Status.** The World Bank and ADB are currently each operating in four to six states, facilitated by MNRE, (with the understanding that other states are also eligible in future to be added to this list) and below is the status on the solar parks:
1. *Karnataka:* Discussions are in an advanced stage with Karnataka for the Pavagada Solar Park where 10,000 acres of land have been identified.
 2. *Madhya Pradesh:* A new approach is being prepared for MP as the discussions so far had focused on setting up/financing the solar project itself (PV panels inside the solar park). Now the World Bank is being asked to finance the intra-park infrastructure as projects will then be set up by developers; MP has established a Joint Venture with SECI and it is expected to seek funding through this JV structure. MP is fully on board on the World Bank financing the evacuation infrastructure being implemented by POWERGRID (discussed in next section). For development of Solar Parks in MP and Karnataka, MDB financing to the tune of \$200 million is being proposed. The loan will be drawn by Solar Energy Corporation of India (SECI).
 3. *Andhra Pradesh:* AP is moving ahead with a very large solar park but does not intend to seek MDB financing at this stage, as it is developing the park in collaboration with NTPC.
 4. *Telangana:* Telangana has notified its state solar policy recently.
 5. *Rajasthan:* Rajasthan has proposed two solar parks in Western Rajasthan to be developed by the state nodal agency with a joint venture partner. Land has been identified and funds from MNRE allocated for detailed design. The implementing mechanism and role for SECI in these parks is to be finalized. Additional parks in Rajasthan may also be proposed with a role for SECI in inside park infrastructure.
 6. *Uttar Pradesh:* The joint venture in Uttar Pradesh between SECI and UPNEDA will undertake solar park development activities in the identified locations in Sonbhadra, Allahabad, Jalun and Mirzapur in Uttar Pradesh. The detailed project report is to be initiated.

7. Punjab: Punjab has identified a few locations for distributed solar parks and the implementation mechanism and role of SECI are to be finalized.
 8. Tamil Nadu: Tamil Nadu intends to develop solar parks and has sought MNRE support. The implementation mechanism for these solar parks is also to be finalized.
 9. Kerala and Chhattisgarh Solar Parks are in early stage of discussion.
81. One of the Proposed Funding Mechanisms for MDB supported parks. SECI has formed 50:50 joint venture companies (JVC) with the state entities in MP and Karnataka respectively to construct the solar parks. As per the proposed funding mechanism, SECI as one of the shareholders, will contribute the MDB funds for use by these JV companies, and will be repaid through collections of user fees from private developers who are selected to occupy space in the parks. (The MDB funding may or may not be converted as SECI's equity infusion).
82. **Results.** The renewable energy power produced under the CTF-funded Solar Parks Infrastructure Project will be evacuated through the transmission infrastructure deployed under the CTF-funded Solar Parks Transmission Project. Therefore, the results indicators presented in [Table 14](#) below combine the results expected from both CTF-funded projects. There is no separate reporting for results expected from the Solar Parks Transmission Project to avoid any double-counting.

Table 12: Project Indicative Financing (US\$ million)

Financing Source	Amount
CTF	100
MDBs (WB/ADB)	200
Project Sponsors/ Commercial banks/ Other Financing	1,000
Total	1,300

Table 13: Project Preparation Timetable

Milestone	Date
CTF approval	Q4 2015
MDB Board approval	Q1 2016

Table 14: Results Indicators

Result	Indicator	Baseline ²³	Target	Data Source & Means of verification
Avoided Annual GHG emissions ²⁴	tCO ₂ e reduced or avoided	0	3.07 MtCO ₂ e/y	Project monitoring reports
Increased Financing mobilized for low-carbon development	Leverage factor of CTF Funding	n/a	> 1:12	MDB co-financing agreements
Increased supply of RE	Installed capacity (MW)	2700	2,000	MDB project Monitoring
	Design Output (GWh/y)	n/a	4,380	

Source: MDB staff estimates.

²³ Baselines are set in 2014 unless otherwise noted. Targets are the incremental changes relative to the baseline.

²⁴ GHG reductions are estimated using the following assumptions: a mix of PV and CSP with aggregate capacity factor of 25%; 2,000 MW installed capacity; grid emissions factor of 0.7 tCO₂e per MWh (the current grid mix discounted more than 20% to account for future RE penetration).

Annex III: (new) Solar Park Transmission Evacuation Infrastructure (WB/ADB)

83. **Solar Park Evacuation Infrastructure Overview.** Multilateral support for smart grid infrastructure to evacuate variable renewable energy power from solar parks to the national market is proposed to finance only the inter-state transmission system for which POWERGRID has been selected on a nomination basis. Timing of the availability of transmission evacuation facilities from the project site to the state grid or to the national grid is critical for the investor's revenue assumptions, and therefore is also a major determinant of financial close from private lenders.
84. **Detailed Concept.** Based on investor consultations, it has been determined that the presence of an Inter-State Transmission System (ISTS), built and owned by POWERGRID, connecting the solar park pooling station to the national grid injection point. Such access to the ISTS is needed also to transmit renewable energy throughout the country particularly to states which are not in a position to construct their own solar parks either due to shortage of land or due to shortage of adequate solar resources. Therefore, POWERGRID, the Central Transmission Utility of India, will be the focal point for this component of solar parks. Discussions are in an advanced stage with POWERGRID which will borrow from the World Bank and ADB to provide the transmission facilities out of the solar parks in the respectively assigned states.
85. **Solar Parks to be supported by MDBs with Transmission Evacuation.** The size of the POWERGRID loan required for transmission evacuation from both MP (Rewa) and Karnataka (Pavagada) solar parks along with a provision for rest of the future solar parks in the selected states, or other future states to be assigned to the MDBs is estimated to be US\$700 million. Progress in Karnataka and MP solar parks is advanced, whereas the other two states (AP and Telangana) will be ready later. AP is proceeding without MDB funding for its first solar park but may come back for future parks, and Telangana is further behind but expected to approach MDBs when it is ready. POWERGRID has already made visits to the sites in Karnataka and MP and plans to initiate its investments as soon as the relevant Joint Venture companies (JV between State Nodal Agency and SECI) register their applications for a long term access (LTA) license. POWERGRID has also discussed the possibility of retro-active financing with MDBs, i.e. the fact that it may start construction of the required transmission evacuation lines in Karnataka and MP once the license application is received, as the lead time is 24-30 months. It would then seek reimbursement when the MDB loan is approved provided that all procurement has been done in keeping with required guidelines.
86. POWERGRID is an experienced multilateral borrower and is a sophisticated company with many international and domestic funding sources, including from private investors through the capital markets. The evacuation infrastructure will be coordinated with the progress of solar parks as well as upcoming generation in these and future solar parks as appropriate.

87. Out of the total US\$700 million funding to be sought for POWERGRID from CTF and MDBs, the size of the proposed POWERGRID loan for inter-state transmission evacuation from Rajasthan and Uttar Pradesh is estimated to be US\$400 million. Inter-state high voltage transmission investment plans have been prepared by PGCIL based on site visits and ongoing discussions with the states to provide long term access. PGCIL has an option to initiate advance procurement.
88. **Proposed Funding Mechanism.** For this solar park evacuation project, POWERGRID will be the direct borrower as well as the implementing agency for the project.
89. **Readiness for Implementation.** Please refer to Appendix 1 for further information on green energy corridor Phase II and respective parks evacuation details by POWERGRID as mentioned above.
90. **Results.** The proposed transmission infrastructure project will contribute to achieving the results already captured under the CTF-funded Solar Parks Infrastructure Project. Since the transmission infrastructure funded under this project will help evacuate the renewable energy power generated under the CTF-funded Solar Parks Infrastructure Project, the results for this project are not reported separately to avoid any double counting.

Table 15: Project Indicative Financing (US\$ million)

Financing Source	Amount
CTF	80
MDBs (WB/ADB)	620
Total	700

Table 16: Project Preparation Timetable

Milestone	Date
CTF approval	Q4 2015
MDB Board approval	Q1 2016

ANNEX IV: (new) Generation of 500 MW of Solar Energy by SECI (World Bank)

91. SECI, a central government entity that is currently in the process of being converted to Renewable Energy Corporation of India (RECI), is mandated by the Government of India to develop/support at least 1,000 MW of renewable energy for which it is seeking World Bank financing for a large portion of the activities. Further, the GOI has also decided and Cabinet has approved the conversion of SECI from a Section 25 (or Section 8 as per the new Companies Act) company (not-for-profit) to Section 3 company (commercial entity). Furthermore SECI's remit has been expanded to cover all renewable energy sectors including wind, biomass and other frontier clean energy sources. Cabinet has also approved renaming of SECI to Renewable Energy Corporation of India (RECI).
92. SECI is the leading public sector agency in the Indian Solar Power Sector. SECI is also a power generator and aggregator, and is mandated to generate 1,000 MW of solar power to catalyze the market and to assist with price discovery, and to broaden the market which can currently only sell to state DISCOMS where the power is generated.
93. The CTF financing of US\$20 million will leverage an additional US\$480 million of World Bank funds to support SECI to meet a portion of its generation mandate. This is a leveraging ratio of 1:24 and shows a major impact of the CTF resources.
94. **Readiness.** SECI has identified land in Karnataka for 250MW of its 500MW to be assisted by the World Bank and is in discussion with other JV partners at State Nodal Agencies in order to find the optimum location for generating the remaining 250MW.

Table 17: Project Indicative Financing (US\$ million)

Financing Source	Amount
CTF	20
MDBs (WB)	480
Others	480
Total	980

Table 18: Project Preparation Timetable

Milestone	Date
CTF approval	Q4 2015
MDB Board approval	Q1 2016

Table 19: Results Indicators

Result	Indicator	Baseline ⁵⁶	Target ⁵⁶	Data Source & Means of verification
Avoided Annual GHG emissions ⁵⁷	tCO ₂ e reduced or avoided	0	0.77 MtCO ₂ e/y	Project monitoring reports
Increased Financing mobilized for low-carbon development	Leverage factor of CTF Funding	n/a	> 1:24	MDB co-financing agreements
Increased supply of RE	Installed capacity (MW)	2700	1,500	MDB project Monitoring
	Design Output (GWh/y)	n/a	1,095	

Source: MDB staff estimates.

Appendix 1: Supporting Documents for New Projects Proposed under CTF Investment Plan to Indicate Readiness to Implement the CTF-funded Projects

Sequence	Name of the New Project
	<i>Solar Rooftop PV Project (World Bank, ADB)</i>
	Preparedness of Various States with regard to implementation of Solar Rooftop PV Projects in their Respective States – A Brief
1.	Solar Rooftop policy of Andhra Pradesh
2.	Solar Rooftop policy of Chhattisgarh
3.	Solar Rooftop policy of Gujarat
4.	Solar Rooftop policy of Haryana
5.	Solar Rooftop policy of Himachal Pradesh
6.	Solar Rooftop policy of Karnataka
7.	Solar Rooftop policy of Kerala
8.	Solar Rooftop policy of Manipur
9.	Solar Rooftop policy of Punjab
10.	Solar Rooftop policy of Rajasthan
11.	Solar Rooftop policy of Tamil Nadu
12.	Solar Rooftop policy of Uttarakhand
13.	Solar Rooftop policy of Uttar Pradesh
14.	Solar Rooftop policy of West Bengal
	<i>Solar Parks Infrastructure (World Bank, ADB)</i>
15.	Solar Parks Scheme of MNRE
	<i>Solar Parks Transmission Evacuation (World Bank, ADB)</i>
16.	Extracts from Green Energy Corridor Phase II
17.	Solar Parks Summary for ADB
18.	Solar Parks Summary for the World Bank
	<i>Financing Solar Power Projects of SECI (World Bank)</i>
19.	SECI Annual Report 2011-12
20.	SECI Annual Report 2012-13
21.	SECI Annual Report 2013-14

Preparedness of Various States with regard to implementation of Solar Rooftop PV Projects in their Respective States – A Brief

Sl. No.	States	State Policy for Grid Connected Solar Rooftop	SERC Regulatory/ Tariff Order
1.	Andhra Pradesh	Andhra Pradesh Solar Policy 2015	<ul style="list-style-type: none"> • APERC Order 2010 • APERC Amendment 2010 • Andhra Pradesh Amendment Net Metering
2.	Chhattisgarh	Chhattisgarh Solar Energy Policy 2012-2017	<ul style="list-style-type: none"> • Chhattisgarh Tariff Order for procurement of power from Rooftop PV Solar Power Projects by distribution licensees of State Regulations, 2013 • Order for Connectivity and Distribution Charges for Solar Rooftop PV Projects - Issued on 29/10/2014
3.	Delhi	----	<ul style="list-style-type: none"> • Delhi Electricity Regulatory Commission (Net Metering for Renewable Energy) Regulations, 2014 • Guidelines under DERC (Net Metering for Renewable Energy) Regulations, 2014 • Brief Note on Guidelines under DERC (Net Metering for Renewable Energy) Regulations, 2014
4.	Gujarat	Gujarat Solar Power Policy 2009	<ul style="list-style-type: none"> • Gujarat Solar Tariff Order 2012
5.	Haryana	Haryana Solar Policy 2014	<ul style="list-style-type: none"> • Order for SPV Power Plants for Building/Areas of Haryana Government • Regulations for the Grid Connected Solar Rooftop Photovoltaic System
6.	Himachal Pradesh	Himachal Pradesh Solar Power Policy	
7.	Karnataka	Karnataka Solar Policy 2014-2021	<ul style="list-style-type: none"> • Karnataka Tariff Final Order 09.10.2013
8.	Kerala	Kerala Solar Policy 2013	<ul style="list-style-type: none"> • Kerala KERC Order 10.06.2014
9.	Manipur	Manipur Solar Policy 2014	
10.	Orissa		<ul style="list-style-type: none"> • Net Metering/Bi-Directional Metering & their Connectivity for Rooftop Solar PV Projects Dated 26.11.2014
11.	Punjab	Punjab Solar Rooftop Policy 2014	
12.	Rajasthan	Rajasthan Solar Energy Policy, 2014	<ul style="list-style-type: none"> • Connectivity and Net Metering for Grid Interactive Rooftop and Solar Systems, Regulations, 2015

Sl. No.	States	State Policy for Grid Connected Solar Rooftop	SERC Regulatory/ Tariff Order
13.	Tamil Nadu	Tamil Nadu Solar Energy Policy 2012	<ul style="list-style-type: none"> Tamil Nadu TNERC Order 7.3.2013 Tamil Nadu TNERC Amendment Order 31.07.2013
14.	Uttar Pradesh	Uttar Pradesh Rooftop Solar Photovoltaic Power Plant Policy, 2014	<ul style="list-style-type: none"> Uttar Pradesh Electricity Regulatory Commission (Rooftop Solar PV Grid Interactive Systems Gross / Net Metering) Regulations, 2015
15.	Uttarakhand	Uttarakhand Solar Policy 2013	<ul style="list-style-type: none"> Uttarakhand Tariff Order 2013
16.	West Bengal	West Bengal Solar Policy 2012	<ul style="list-style-type: none"> West Bengal WBERC Notification 2013
17.	Andaman and Nicobar		<ul style="list-style-type: none"> Joint Electricity Regulatory Commission for the state of Goa and Union Territories (Solar Power - Grid Connected Ground Mounted and Solar Rooftop and Metering Regulations – 2014) and Solar Power Tariff
18.	Chandigarh		
19.	Dadar and Nagar Haveli		
20.	Daman and Diu		
21.	Lakshadweep		
22.	Pondicherry		
23.	Goa		

Note: the policies for grid-connected solar rooftop issued by the states as indicated above is attached below. For further information, please refer the link <http://mnre.gov.in/file-manager/UserFiles/solar-rooftop-states-policy-tariff.htm>