PROJECT INFORMATION DOCUMENT (PID)
CONCEPT STAGE

Report No.: PIDC5647

Project Name	Greening the Energy Mix in DVC (P147818)
Region	SOUTH ASIA
Country	India
Sector(s)	Transmission and Distribution of Electricity (20%), Other Renewable Energy (80%)
Theme(s)	Infrastructure services for private sector development (50%), Other public sector governance (30%), Corporate governance (20%)
Lending Instrument	Investment Project Financing
Project ID	P147818
Borrower(s)	Damodar Valley Corporation
Implementing Agency	Damodar Valley Corporation (DVC)
Environmental Category	B-Partial Assessment
Date PID Prepared/ Updated	23-May-2014
Date PID Approved/ Disclosed	28-May-2014
Estimated Date of Appraisal Completion	15-Jul-2015
Estimated Date of Board Approval	15-Sep-2015
Concept Review Decision	Track I - The review did authorize the preparation to continue

I. Introduction and Context

Country Context

India has experienced average growth rates of about 8 percent during 2007-8 to 2011-12 accompanied by a reduction in poverty levels of about 1.5 percent annually between 2004-5 and 2009-10. Today, two thirds of India's population is above the poverty line. India is also increasingly urbanizing. India's dynamic economic structure and transformational demographic changes have made the role of electricity critical. With more than 243 GW of installed capacity (as of March 2014), the Indian power system is one of the largest in the world, but 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. This low consumption is amplified by the lack of access to electricity to a significant proportion of the population. The demand for power is expected to rise to support the growing manufacturing sector, meet the rising aspirations of its people, and provide electricity to meet the suppressed demand (now managed by load sheds and

unreliable supply). Currently, India relies largely on coal, both domestic and international, for its electricity requirements. India is currently the world's seventh largest emitter of global warming pollutants and fifth largest for emissions from fossil fuel combustion. Even though coal is expected to be the mainstay for the foreseeable future, it is critical that India supplements the non-renewable sources with cleaner and abundant renewable sources of energy and uses the available electricity more efficiently.

Solar power, due to its abundant and sustained availability across the globe and falling costs, has emerged as a promising long-term option for meeting growing global energy demand while addressing the adverse environmental impacts of conventional fuels. India is blessed with abundant solar insolation and energy generation potential and harnessing the same can help in addressing challenges on national and international fronts. On the national front, firstly, solar power stands to partially address the issue of shortage of power for economic growth. There is an established positive correlation between energy requirement and Gross Domestic Product (GDP) growth. With energy shortages in excess of 10 percent and with more than 300 million people without access to energy, solar power can potentially address the shortage by both grid-connected and off-grid solar power. Secondly, solar power can foster energy security for India by reducing dependence on imported fuel. Solar power can partially replace the need for imported coal and diesel requirement to power the economy. On the international front, firstly, India has already demonstrated itself as an industrial low-cost destination worldwide. Domestic manufacturing and scale of implementation in India can cause a further drastic reduction in costs to bring solar power costs to grid parity sooner than other parts of the world. Secondly, cleaner energy production through solar power also contributes to India's international commitment in Copenhagen in 2009 to reduce the emissions per unit of its GDP by 20-25 percent by 2020 over 2005 levels.

Sectoral and Institutional Context

The Prime Minister of India released the National Action Plan for Climate Change (NAPCC) in 2008. It outlines a national strategy on climate change, to enhance India's ecological sustainability and encourage sustainable energy sources. As part of NAPCC, GoI launched the Jawaharlal Nehru National Solar Mission (JNNSM or National Solar Mission) in 2010 which targets adding 20 gigawatts (GW) of grid-connected solar capacity by 2022, along with other solar targets for off-grid space.

Starting from a negligible base, the total installed grid-connected solar capacity base of the country had reached more than 2.6 GW by the end of March 2014. Renewable Purchase Obligations (RPOs) are the cornerstone of renewable energy capacity development in India, as envisaged under the Electricity Act, 2003 and the National Electricity Policy. They aim to provide the necessary demand-pull by mandating distribution utilities and obligated entities to mandatorily procure a proportion of their power requirements from renewable sources, including a specific percentage from solar energy. The National Tariff Policy was amended in January 2011 to prescribe solar-specific RPO be increased from a minimum of 0.25 per cent in 2012 to 3 per cent by 2022. Ministry of New and Renewable Energy (MNRE) estimates the solar capacity addition requirement to be 34 GW to achieve the 3 percent solar RPO targeted by 2022 under the National Tariff Policy.

The above stated policy initiatives have resulted in India pursuing an aggressive renewable generation program. The 12th Five Year Plan target for renewable energy (RE) generation is 36 GW which will increase the current 12% share of RE (excluding hydro) to around 20% by end of this decade. A power system of this size growing at such a pace with an increased share of renewable

energy requires automated systems (popularly known as Smart Grid systems) to manage the transmission and distribution grids more efficiently while ensuring its stability and reliability. Realizing the growing importance of smart grid technologies in the Indian power sector, to integrate renewable energy based power and also improve system efficiency, the Ministry of Power (MoP) took steps in 2010 by constituting the India Smart Grid Task Force (ISGTF), an inter-ministerial task force and the India Smart Grid Forum (ISGF), a public-private partnership initiative. ISGTF and ISGF have formulated a formulated a comprehensive smart grid vision and road map for India (August 2013) which is in alignment with Ministry of Power's overarching policy objectives of “access, availability and affordability of power for all” and also in alignment with other on-going GoI programs in power sector. The draft road map envisages the Smart Grid Vision for India as “Transform the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem that provides reliable and quality energy for all with active participation of stakeholders”.

Relationship to CAS

The proposed project is aligned with India's own vision for development outlined in the 12th Five-Year Plan (FY2013-17), which 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. The current project is a microcosm of this strategy.

The project also aligns with the India Country Partnership Strategy along its three pillars – integration, transformation, and inclusion. Under Integration, the project directly aims to reduce Greenhouse Gas (GHG) emissions, enhance investments in low-income states, and improve solar market integration. Under Transformation, the project will improve DVC’s grid reliability, add clean power generation capacity, enhance DVC’s institutional capacity, and foster innovative solar development. Under Inclusion, the project will assist DVC meet its RPO targets and possible generate employment to local people, and improve local social infrastructure.

II. Proposed Development Objective(s)

Proposed Development Objective(s) (From PCN)

The proposed project development objectives are (i) To green the energy mix of DVC through increase in grid connected solar energy generation; and (ii) To improve power system reliability and efficiency by modernizing and improving operation of DVC's grid network.

Key Results (From PCN)

The following indicators will be used to track progress in achieving the project development objectives:
(i) Generation Capacity of Renewable Energy constructed under the Project (MW);
(ii) Annual MWh of solar power generation injected into DVC's owned grid network;
(iii) Transmission lines constructed or rehabilitated under the Project (km); and
(iv) Transformation capacity added under the project (MVA).

III. Preliminary Description

Concept Description

Damodar Valley Corporation (DVC) is an organization set up under an Act of Parliament (DVC Act 1948) and is owned by 3 (three) participating Governments viz. Government of India and State Governments of West Bengal and Jharkhand. DVC was formed to construct and operate various dams, reservoirs, hydro-electric plants and irrigation canals, etc. in the Damodar river basin

primarily to control recurring devastating floods in the lower basin and also to derive other benefits e.g. providing irrigation, generating electricity and providing water supply to industries and domestic consumers along with improvement in the socio economic condition of the people residing in the DVC Command Area.

The network of investments along the basin has successfully controlled and moderated large floods since the 1950s. Over the years, leveraging its locational advantage, DVC has progressed towards becoming a leading power producer in Eastern India. DVC has around 3,710 MW of thermal capacity and 144 MW of hydel capacity under operation and another 4,200 MW of thermal plants under construction scheduled to be commissioned in the 12th Plan period by FY2014. Another 1,320 MW is planned to come up by the year 2018 with overall capacity reaching 9,230 MW, almost a three-fold increase on the current operational capacity. In addition, DVC also distributes power to about 290 High Voltage consumers (voltages above and including 33 kV) in the Damodar Valley Command area. Its current consumers include the Indian Railways, steel plants, and collieries. DVC has recently also agreed to supply 120 MW in 2016 and scale-up to 360 MW in the next 4 to 5 years, to the Dedicated Freight Corridor Corporation of India Limited (DFCCIL), to meet the requirements of the electrified Eastern Dedicated Freight Corridor, which is under construction at present. This freight corridor is expected to be a growth pole for regional development in the coming years.

In the past, DVC's focus has been only on development of thermal projects but now DVC is keen to green its energy generation mix and also improve the quality of power supplied to its consumers. On the solar side, DVC's initial plan is to scale up its solar capacity to around 235 MW by FY 2017 and upto 1,000 MW by 2022. To improve the power quality, DVC plans to implement a system strengthening and modernizing project on a pilot area and also extend the Automated Meter Reading system implemented recently on all consumers, to power injection and interchange points, in order to build an efficient energy accounting system. Whether this will cover only the pilot area or the entire DVC network, will be decided during project preparation.

The proposed project is planned to have three components:

(a) Investment in Greenfield Solar Generation (Estimated cost - US$ 386 million): DVC's assets include almost 25000 acres of land, a significant percentage of which is presently not utilized and a network of irrigation canals maintained by the respective state government. DVC's primary objective in diversifying into solar energy investments is to diversify its energy mix to offset the challenges faced in thermal generation capacity addition while utilizing its vast holdings of unused land and spaces. Addition of solar capacity will also enable DVC towards meeting its RPO targets as a deemed licensee, and replace a part of its thermal generation in future. The initial plan is to scale up its solar capacity to around 200 MW by 2017, as the first phase of its proposed program to invest in 1,000 MW of grid-connected solar PV by 2022. This would complement its 5,000+ MW of thermal power generation assets. Since there is no prior in-house experience with solar power, DVC is already piloting with its own funds a 15MW canal-top grid-connected solar PV investment to better understand solar procurement (in this case, on a supply and install basis with operation and maintenance for three years), and to establish and train an in-house solar PV team to complement its vast expertise in conventional generation. This 15 MW solar pilot project, the largest of its kind in India (so far, only a 1 MW pilot project of grid-connected irrigation canal-top solar PV has been undertaken near Ahmedabad in Gujarat),will be mounted over a stretch of irrigation canals (in Burdwan district of West Bengal), that are part of a vast irrigation network owned by DVC and

maintained by the Irrigation Department of West Bengal.

DVC proposes to undertake a program to invest in 1,000 MW of grid-connected solar PV on its available vast holdings of un-utilized land. DVC's available land holdings can be classified in various categories: (i) wastelands owned by DVC, (ii) stretches inside the protected boundaries of thermal power plants; (iii) land under its transmission infrastructure; (iv) flat hydel catchment area; (v) sloping embankments of its dams; (vi) outside the perimeter fence of power plants, for example, on the shores of reservoirs or other un-utilized flat land; (vii) the irrigation canal network in owned by DVC and maintained by West Bengal; (viii) partial use of space above existing productive water bodies located on DVC land such as cooling ponds. Considering a minimum requirement of 5 acres per megawatt for ground-mounted solar panels, DVC's proposed overall investment targets will therefore require at least 5,000 acres. This translates to a little over 20 sq km, if it were assumed to be entirely ground-mounted solar installations. Judicious use of available spaces for installing solar generation capacity is therefore a hallmark of this proposed investment program if DVC succeeds in greening its energy mix to 1,000 MW which is far above its minimum regulatory requirements, as it proposes to do.

DVC is in the process of engaging a consultant, under its own funding, to prepare the Detailed Project Report for Phase 1 of its Solar PV Investment Program, proposed to be funded under the project. Further, as some of the investments in solar component are likely to be on unconventional surfaces (e.g. water bodies or sloping land etc.), technical and environmental issues associated with these investments will be carefully assessed during project preparation. DVC will prepare an Environment and Social Management Framework (ESMF) and undertake social and environmental screenings for sub-projects to identify and categorize adverse impacts, and accordingly prepare and implement Environment and Social Mitigation Plans (ESMPs) to minimize and mitigate the adverse impacts and enhance positive impacts.

(b) Investments in DVC's Grid Network to Improve Reliability and Efficiency (Estimated Cost - US $ 90 million): DVC's existing electricity distribution operation has shown a demand growth of 9% per annum and this is expected to continue over the 12th (2012-17) and 13th (2017-22) five year plan periods, aided by rapid industrialization in the Damodar River Valley. Over these two plan periods, DVC plans to undertake significant capital investments to build the backbone transmission and sub-transmission infrastructure to address the demand growth and ensure reliability of supply.

DVC has divided its grid network into six operational divisions and has identified a pilot zone consisting of parts of three divisions. The pilot zone covers about 14 sub-stations, 4 switch yards of thermal and hydro power generation stations and feeder points for 50 critical consumers. DVC plans to strengthen and modernize the grid network in the pilot zone and invest in improving its efficiency in the first phase of the project. DVC has identified the pilot zone based on availability of communication infrastructure and critical consumer coverage. This zone is proposed to be strengthened, augmented and modernized to improve reliability and operational efficiency by augmenting existing sub-stations and lines and building new assets. A SCADA cum EMS is also proposed to be installed along with a suitable Management Information System. The upgradation and modernization of the switchyards included in the pilot zone is critical to attaining the end-objective of improving the quality of power supply to consumers but there are no investments envisaged in the power stations themselves. DVC has already prepared a concept note about the proposed investment and is currently preparing the Detailed Project Report, which will help the Bank team in preparing a phased plan and also in identifying the suitable investments under this

component.

(c) Technical Assistance Component (Estimated Cost - US$ 10 million): DVC's organization and institutional practices have not evolved as required, over time and the organization is presently not fully equipped to take on the challenges of business expanding by three times in 7 years and several new critical initiatives being planned. DVC's Corporate Plan has been prepared recently for the period 2012-22 with a perspective plan up to 2027. The Corporate Plan of DVC identifies several critical areas of institutional strengthening, which need to be implemented in order to improve the effectiveness and efficiency of such large investments and to make the organization deliver sustainably on its intended objectives in the Valley and beyond. DVC is keen on using the association with the Bank in improving its technical and organizational capacity, learning from the experiences of other key CPSUs like NTPC and POWERGRID in the power sector, who have had long association with the Bank and which today are recognized as flagships, being listed on the Indian stock market and operating according to international best practices. The Technical Assistance component will aim to assist DVC to conduct institutional assessments across all key functions of DVC, developing a comprehensive business process reorganization plan to enhance core capacities of the organization across functions such as human resources, project management and monitoring, operation and maintenance, financial management and implementation of enterprise wide IT and assistance in project management support in implementation of the two investment components indicated above. In addition, DVC is also keen on getting exposure to the latest tools and technologies in the area of solar investment and smart grid investments. The specific interventions will be designed and agreed with DVC during project preparation.

IV. Safeguard Policies that might apply

Safeguard Policies Triggered by the Project	Yes	No	TBD
Environmental Assessment OP/BP 4.01	×		
Natural Habitats OP/BP 4.04			×
Forests OP/BP 4.36	×		
Pest Management OP 4.09			×
Physical Cultural Resources OP/BP 4.11	×		
Indigenous Peoples OP/BP 4.10			×
Involuntary Resettlement OP/BP 4.12	×		
Safety of Dams OP/BP 4.37			×
Projects on International Waterways OP/BP 7.50		×	
Projects in Disputed Areas OP/BP 7.60		×	

V. Financing (in USD Million)

Total Project Cost:	486.00	Total Bank Financing:	243.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	243.00
International Bank for Reconstruction and Development	243.00
Total	486.00

VI. Contact point

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