



Extended Annual Review Report

Project Numbers: 44932-044, 44932-054, 44932-064
Investment Numbers: 7364, 7365, 7366
Loan Numbers: 2909, 2910, 2911
September 2015

Loan 145 Megawatts Grid-Connected Solar Project (India)

This is a redacted version of the document that excludes information that is subject to exceptions to disclosure set forth in ADB's Public Communications Policy 2011.

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – Indian rupee/s (Rs)

	At Appraisal 11 July 2012	At Project Completion 12 February 2015
Rs1.00 -	\$0.018	\$0.016
\$1.00 -	Rs55.65	Rs62.39

ABBREVIATIONS

ADB	-	Asian Development Bank
BDV	-	breakdown voltage
COD	-	commercial operations date
CSP	-	country strategy and program
DCDB	-	direct current distribution box
EHS	-	environment, health, and safety
EHS&S	-	environment, health, safety, and social
EPC	-	engineering, procurement, and construction
FY	-	fiscal year
GETCO	-	Gujarat Electricity Transmission Corporation
IEE	-	initial evaluation examination
IIFCL	-	India Infrastructure Finance Company Limited
JNNSM	-	Jawaharlal Nehru National Solar Mission
LOTO	-	lock out/tag out
O&M	-	operation and maintenance
PFC	-	Power Finance Corporation
PPA	-	power purchase agreement
RBI	-	Reserve Bank of India
REC	-	Rural Electrification Corporation
SPV	-	special purpose vehicle

WEIGHTS AND MEASURES

GW	-	gigawatt
ha	-	hectare
kWh	-	kilowatt-hour
kV	-	kilovolt
MW	-	megawatt
MWh	-	megawatt-hour

NOTES

- (i) The fiscal year (FY) of the Sponsor (India) begins on 1 April and ends on 31 March. "FY" before a calendar year denotes the year in which the fiscal year starts, e.g., FY2011 begins on 1 April 2011 and ends on 31 March 2012.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

145 MW Grid-Connected Solar Project (Loan Numbers 2909, 2910, 2911 – India)

Key Dates	Expected	Actual
Concept Clearance Approval		2 August 2010
Board Approval		18 September 2012
Loan Agreement		
Responsive		21 February 2013
Sand Land		12 December 2012
Ujjawala		20 June 2013
Loan Effectiveness		
Responsive		21 February 2013
Sand Land		12 December 2012
Ujjawala		20 June 2013
First Disbursement		
Responsive		14 March 2013
Sand Land		25 January 2013
Ujjawala		6 August 2013
Commercial Operations Date		
Responsive (25 MW)	31 December 2012	29 December 2012 (17 MW)
Sand Land (25 MW)	1 April 2012	31 December 2012 (8 MW)
Ujjawala (23.06 MW)	31 December 2012	1 April 2012
Loan Closing	30 March 2013	31 March 2013
		30 September 2013

Project Administration and Monitoring	No. of Missions	No. of Person-Days
Due Diligence	7	37
Project Administration	4	63
XARR Mission	1	12

EXECUTIVE SUMMARY

India is in chronic need of additional power generation capacity. It continues to suffer from power shortages, with peak demand exceeding supply by 3% and an energy deficit of 2% for the month of March 2015. Given the diminishing availability of indigenous fuels in the country, the Government of India in 2010 launched the National Solar Mission, aiming to deploy 20 gigawatts (GW) of grid-connected solar power by 2022 and to reduce the cost of solar power generation.

In September 2012, the Board of Directors of the Asian Development Bank (ADB) approved a direct loan of up to \$100 million to six special purpose vehicles (SPVs) controlled by the Sponsor for the 145-megawatt (MW) Grid-Connected Solar Project. This was one of ADB's first solar financing ventures in the private sector in India. The project involves the construction and operation of five 25 MW and one 20 MW solar photovoltaic power generation plants (six subprojects), for a total of 145 MW across six locations in the state of Gujarat. All the solar power plants were commissioned by March 2013 and are fully operational.

Three of the six SPVs, namely Responsive, Sand Land, and Ujjawala, reached their financial close in 2013. ADB loans to these three SPVs were fully disbursed by August 2013 and repayments are being made as required. Loan facilities to three other SPVs were canceled in May 2014 on account of the lapsing of the availability period.

Evaluation of the project is based on four main criteria: (i) development results, (ii) ADB's investment profitability, (iii) ADB's work quality, and (iv) ADB's additionality. The results of this analysis were aggregated to derive an overall rating for the project.

The development results of the project are rated *satisfactory*. It was evaluated in four categories: (i) contribution to private sector development and ADB strategic development objectives; (ii) business success; (iii) contribution to economic development (economic sustainability); and (iv) environmental, social, health and safety performance. The contribution to private sector development and ADB strategic development objectives is rated *satisfactory*.

In terms of business success, the three SPVs are collectively rated *satisfactory* and the SPVs' economic contribution is rated *satisfactory*.

The SPVs' environmental, social, health, and safety performance is rated *satisfactory*.

The investment outcome as well as ADB's work quality are rated *less than satisfactory*, while ADB's additionality is rated *satisfactory*.

Overall, the project is rated *successful*.

I. THE PROJECT

A. Project Background

1. In September 2012, the Board of Directors of the Asian Development Bank (ADB) approved a direct loan of up to \$100 million to Chattel Constructions Private Limited (Chattel), Ganges Green Energy Private Limited (Ganges), Hiraco Renewable Energy Private Limited (Hiraco), Responsive Sutip Limited (Responsive), Sand Land Real Estate Private Limited (Sand Land), and Ujjawala Power Private Limited (Ujjawala), each a special purpose vehicle (SPV) controlled by the Sponsor, for the 145-megawatt (MW) Grid-Connected Solar Project. Fifty percent of the loan was to be provided in Indian rupees and 50% in US dollars.¹

2. The Sponsor was incorporated in 2008 as a wholly owned subsidiary of the Sponsor Parent. The Sponsor is a holding company for various grid-connected solar photovoltaic projects and develops solar projects in both domestic and international markets. For three such projects, the Sponsor has secured an SPV financed by ADB by way of subscription to optionally cumulative convertible debentures (OCCDs), which are redeemable or convertible into equity after five years of operation.

3. The subprojects were originally financed by the sponsor mainly through subordinated loans. Debt financing was composed of funding by ADB and domestic nonbanking financial institutions in India, namely, Power Finance Corporation Limited (PFC), India Infrastructure Finance Company Limited (IIFCL), and Rural Electrification Corporation (REC). Owing to prolonged delays in closing the domestic financing and the advanced stage of completion of the solar plants, the Sponsor asked ADB to close the financing in two groups: first Responsive, Sand Land, and Ujjawala, then Chattel, Ganges, and Hiraco.

4. Responsive, Sand Land, and Ujjawala reached their financial close in 2013. ADB loans to these three SPVs totaling \$42.1 million were fully disbursed in the same year.² Loan facilities to Chattel, Ganges, and Hiraco were canceled effective May 2014.³ Responsive, Sand Land, and Ujjawala are collectively referred to as “the project” in this report.

5. The project was consistent with ADB’s Strategy 2020,⁴ its country strategy and program (CSP) for India,⁵ and ADB’s Energy Policy and Asia Solar Energy Initiative.⁶ The project supported inclusive and environmentally sustainable growth through infrastructure development and an enhanced focus on energy. Despite the cancellation of ADB financing to three of the

¹ Disbursements to Sand Land, with an aggregate amount of \$16.7 million were made in US dollars, given the regulatory constraints of the Reserve Bank of India. After the issue was settled, succeeding disbursements for Responsive and Ujjawala were made in both US dollars and Indian rupees.

² ADB loans to Sand Land (\$16.72 million), Responsive (\$13.66 million), and Ujjawala (\$11.71 million) were fully disbursed in February 2013, March 2013, and August 2013, respectively.

³ On 19 May 2014, loans to Chattel, Ganges, and Hiraco amounting to \$57.90 million were cancelled due to the lapse of the loan availability period in September 2013 (which was extended once from 31 March 2013).

⁴ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

⁵ ADB. 2009. *Country Partnership Strategy: India, 2009–2012*. Manila. ADB. 2013. *Country Partnership Strategy: India, 2013–2017*. Manila.

⁶ ADB. 2011. *Asia Solar Energy Initiative: A Primer*. Manila.

subprojects,⁷ the remaining subprojects (Responsive, Sand Land, and Ujjawala) met the CSP's minimum target for addition of 70 MW of solar power generation.

6. From 12 to 14 November 2014, ADB fielded an extended annual review mission to strengthen the loan review and gathered information from the key management of Sponsor.

B. Key Project Features

7. The project used a mixture of solar technologies of multi-crystalline, thin-film technology and crystalline silicone photovoltaic panels across the three subproject sites on fixed-tilt mounting structures. Panels were supplied by major international and domestic manufacturers.

8. The Sponsor entered into a fixed-price turnkey engineering, procurement, and construction (EPC) contract for the procurement and supply of foreign and domestic equipment, as well as erection and construction services for the project. To prevent potential conflicts of interest among the group companies of the sponsor, CRISIL⁸ was engaged as a third party and administered an international competitive bidding process to select EPC contractors for the subprojects.

9. All the subprojects are located in Gujarat State. The 25 MW Responsive solar power plant, located in Kamalpur Village, Surendranagar District, was commissioned in December 2012. Its power is transmitted through the 66-kilovolt (kV) substation of the Gujarat Energy Transmission Corporation Limited Transmission Circle Office (GETCO) in Kamalpur. The 25 MW Sand Land solar power plant located in Alwada/Khimat Village, Banaskantha District, was commissioned in April 2012. Last, the 23.06 MW Ujjawala solar power plant, also located in Kamalpur Village, Surendranagar District, was commissioned in March 2013. Power evacuation for both Responsive and Ujjawala is through the 66 kV GETCO substation in Kamalpur.

10. Each of the solar power plants has its own operation and maintenance (O&M) team, working in three shifts of 15 staff members each day. The modules are cleaned at least once every 10 days to prevent buildup of dust, soil, and other small debris. A sprinkler system has been installed at the Sand Land to allow automatic cleaning of the modules. The modules have warranty periods of five years. Service-level agreements with the suppliers require their technicians to be on site within 24 hours of an emergency.

11. Each of the SPVs entered into power purchase agreements (PPAs) with the Gujarat State Electricity Board, Gujarat Urja Vikas Nigam Limited, to sell 100% of the output of each plant for a period of 25 years from the commercial operations date (COD).

C. Progress Highlights

12. The three solar plants were completed within the original cost estimate for those plants. The performance of the three ADB-financed facilities has exceeded the P-90 level base case projections, with plant availability above 90% of projections and for most of the year, 100%.

13. Under the EPC contract, the original target date for COD for all SPVs was in December 2011. Unlike Sand Land and Responsive, Ujjawala missed the regulatory deadline of 31

⁷ Three SPVs, Chattel (25 MW), Ganges (25 MW), and Hiraco (20 MW) were commissioned in December 2012, March 2012, and April 2012, respectively, and are operating satisfactorily.

⁸ CRISIL (Credit Rating Information Services of India Limited) is a global analytical company providing ratings, research, and risk and policy advisory services.

December 2012; instead, it achieved its COD on 31 March 2013. As a result of the delayed COD, (i) the tariff regime for Ujjawala was reduced to the tariff applicable for projects commissioned after 31 December 2012; and (ii) the installed capacity fell short of the design capacity, as the Sponsor was able to commission only 23.06 MW by 31 March 2013.

14. The debt financing for the three ADB-financed projects was to be provided together with three domestic nonbanking financial institutions. Financial closing with local lenders was substantially delayed, mainly due to their prolonged internal approval processes for the alignment of terms with ADB financing. In 2014, disbursement of domestic financing took place from PFC and IIFCL for Sand Land and from PFC for Responsive; disbursement of domestic financing for Ujjawala had not taken place as of May 2015.

II. EVALUATION

A. Project Rationale and Objectives

15. As set out in the report and recommendations of the President, the project's objectives were (i) to promote sustainable growth by diversifying India's energy mix through the addition of renewable energy capacity; (ii) to prove the feasibility of utility-scale solar power projects in India and their operational performance in a location (Gujarat) where substantial development in solar power was planned for 2012–2017; and (iii) to demonstrate the profitability and sustainability of a variety of solar photovoltaic technologies at utility scale by private generators in India by generating about 105,000 MWh⁹ of clean energy per year while delivering adequate returns for the private sector. These objectives were relevant and were achieved by the project.

B. Development Impact

1. Private Sector Development

16. ADB provided long-term, limited-recourse financing, which was not readily available for large solar power generation projects in India, where the majority of finance comes from local commercial banks and has shorter tenures. The transaction, one of ADB's first solar financing projects in the private sector in India, sent a message to the market that ADB is committed to supplementing the financing needs of India's renewable energy projects. It attracted new entrants to the market, which led to active competition in bidding on new projects. The number of solar power installations increased significantly in Gujarat.¹⁰

17. The Sponsor continuously provides trainings to employees both at the central office and at the plant sites, which enables them to acquire needed skills and experience that can be utilized in their current responsibilities. The trainings also open opportunities for employees to advance their careers.

18. The Sponsor's business operations continue to improve, as manifested in the stable provision and growing generation of energy from the solar power plants. The company has been adopting improvement initiatives such as cable fault locator machines, which minimize cable fault breakdown and a breakdown voltage (BDV) testing machine which improves the

⁹ Average generation per Financial Model (P-90) for the three ADB-financed SPVs, taking into account two full operational years (2013–2014).

¹⁰ With more than 300 days of sunshine and a solar radiation rate of 5.6 to 6.0 kWh/m²/day, Gujarat has the potential to generate 750 GW from solar energy.

efficiency of the transformer. The company has also introduced an automatic sprinkler system¹¹ at the Sand Land plant, which will improve the performance ratios by lessening losses due to soiled panels. Last, a direct current distribution box (DCDB) was installed at the Responsive plant in order to prevent so-called potential induced degradation,¹² and to achieve optimal load sharing.

19. In employing unskilled, semiskilled, and skilled workers for the plants, the Sponsor gave preference to people from the local villages and from nearby SPV plant sites in Gujarat.

20. The impact on private sector development of the Sponsor and the SPVs is rated *satisfactory*. Private sector development indicators and ratings appear in Appendix 2.

2. Business Success

21. The project is rated *satisfactory* for business success.

3. Economic Sustainability

22. The project is rated *satisfactory* for economic sustainability.

4. Environment, Social, Health, and Safety Performance

23. **Environment.** The project is classified as category B on environment, and initial evaluation examinations (IEEs) were prepared for each of the SPVs. Each SPV also prepared an environmental management and monitoring plan that is implemented on site and periodically audited internally. A corporate environment, health, safety, and social (EHS&S) policy has been adopted and operationalized at the sites through the use of a manual that contains standard operating procedures. An environment, health, and safety (EHS) committee has been institutionalized at the corporate and SPV levels. EHS trainings are continually provided to the workers. This was verified through document review, evaluation of available safeguard documents, observations from the site visits, and interviews with corporate and site personnel.

24. **Social Safeguards.** The project is classified as Category C for both indigenous peoples and involuntary resettlement. No indigenous peoples were living within or close to the project sites, and no physical relocation or economic displacement issues were expected during project preparation. A total of 85.83 hectares (ha) was acquired for Sand Land. 57.17 ha for Responsive. and 59.70 ha for Ujjawala. Land was procured on a willing buyer-willing seller basis following the requirements of ADB's Safeguard Policy Statement (2009). Compensation was paid to all land owners and the land registration process was completed. No outstanding issues on land compensation remain.

25. **Other social dimensions.** During construction, each solar power plant provided jobs for 350 workers, 150 of whom were from local communities. During operation, on average, each subproject employs 1 plant manager, 6 operation and management staff, 26 technicians, 1 plant security and administrative head, 23 security crew members, and 20 module-cleaning crew members. A grievance redress mechanism is in place, and corporate social responsibility

¹¹ The Automatic sprinkler system is expected to replace manual cleaning of modules.

¹² Potential induced degradation (PID) is a phenomenon that leads to the gradual deterioration of photovoltaic modules' performance; it is caused by exposure to a voltage potential relative to ground. Degradation could reach up to 30% or more after a few years.

activities are being implemented. The plants have complied with national and ADB safeguard requirements and submit annual monitoring reports to ADB.

26. The project's environmental, social, health, and safety performance is rated *satisfactory*.

C. ADB Investment Profitability

27. ADB's investment profitability is rated *less than satisfactory*.

D. ADB Work Quality

28. Overall ADB work quality is rated *less than satisfactory*.

E. ADB's Additionality

29. ADB's additionality is rated *satisfactory*. ADB financing came in at a time when all six projects were in advanced stages of completion. The loan tenure required for solar power generation projects is longer than that available in the local market. The local currency portion of ADB's loan has given the borrowers a natural hedge, as their revenues are denominated in rupees. In addition, ADB's participation in the debt financing of the sector triggered local and international bank participation. This is one of ADB's first solar financing projects in the private sector in support of a national solar program, which is important for catalyzing similar investments in other states in India.

F. Overall Evaluation

30. The project's overall rating is *successful*, with the development outcome and ADB's additionality rated as *satisfactory*.

III. ISSUES, LESSONS, AND RECOMMENDED FOLLOW-UP ACTIONS

A. Issues and Lessons

31. **Need to arrange domestic cofinancing in a timely fashion.** Sponsor decided to engage with ADB first for these ADB-funded subprojects, under the assumption that the financial close with the domestic lenders would follow. The financing with the domestic lenders took substantially longer to close than expected, which led to cancellation of ADB financing for the Chattel, Ganges, and Hiraco SPVs. It is recommended that cofinancing with domestic lenders be secured by sponsors in a timely fashion, so that the security package can be shared between ADB and such lenders without the need for an additional documentation process that causes delay in financial closing.

B. Recommended Follow-up Actions

32. ADB will continue to engage with the sponsor, so that the project's unperfected security will be secured pending the receipt of RBI approvals. ADB will also closely monitor the developments of financial closing with IIFCL, PFC, and REC for the three SPVs as they will have an impact on the documents for sharing security with ADB.

PROJECT-RELATED DATA
Investment Summary

A. Investment Identification

1.	Country	India
2.	Investment Numbers / Loan Numbers	7364 / 2909 7365 / 2910 7366 / 2911
3.	Project Title	145 Megawatts Grid-Connected Solar Project
4.	Borrower	Responsive Sutip Limited ("Responsive") Sand Land Real Estate Private Limited ("Sand Land") Ujjawala Power Private Limited ("Ujjawala")
5.	Amount of Approved ADB Assistance - Direct Loan	\$100 million
6.	Signed Amount	\$13.66 million (Responsive) \$16.72 million (Sand Land) \$11.71 million (Ujjawala) Total \$42.10 million
7.	Canceled Amount	\$57.90 million
8.	Environment Category	B

**INDICATORS AND RATINGS FOR PROJECT CONTRIBUTIONS TO PRIVATE SECTOR
DEVELOPMENT AND ADB STRATEGIC DEVELOPMENT OBJECTIVES:
Responsive, Sand Land, and Ujjawala SPVs**

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
1. Within company PSD effects					
1.1 Improved skills: New or strengthened strategic, managerial, operational, technical, or financial skills	<p>Rewards and recognition policies motivate the staff through appreciation mailers, end-of-the-month award, and on-the-spot award.</p> <p>Internal training related to EHS, as well as operation and maintenance of the solar plants, is given regularly.</p> <p>Each staff member has an individual development plan.</p>	Satisfactory	Upgraded skills of staff and motivation to perform in assigned work is sustained	Company adopts various employee engagement schemes along with performance management system to motivate employees.	Low. Employee welfare and satisfaction is always ensured through work-life balance schemes and creation of opportunities for professional development.
1.2 Improved business operations: Improved ways to operate the business and compete, as seen in investee operational performance against relevant best industry benchmarks or standards	<p>Generation has increased for Responsive, Sand Land, and Ujjawala for FY2014 as compared with previous fiscal year.</p> <p>In place are (i) a cable fault locator machine which minimizes cable fault breakdown; (ii) a BDV testing machine, which improves the efficiency of the transformer; and (iii) audit systems, which help improve plant performance.</p>	Excellent	Sustained and increasing generation supply to the grid	<p>Generation capacity will further increase with ongoing improvement initiatives (i.e., liaison with grid to reduce losses).</p> <p>A cross-functional audit system is being adopted across the sites to improve performance.</p>	Low. Delayed response from government authorities and third parties will lead to delay in implementation of improvements.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
1.3 Improved governance: As evident in set standards related to corporate governance, stakeholder relations, ESHS fields and/or energy conservation, and their implementation	<p>The Sponsor's strong corporate social responsibility program covers its staff and villages near the plants.</p> <p>A revised EHS policy was signed on 27 January 2014. The company adopted the ESHS policy and standard operating procedures at the corporate and SPV levels. Coordinators facilitate trainings, implementation of environmental management plans, and recording of EHS observations at the plants to allow reporting and mitigation of any EHS concerns at the sites.</p>	Satisfactory	Solid undertaking of governance at both corporate and SPV levels	Zero-risk working conditions and improved perception among local stakeholders	Low. Management is focused on and committed to stakeholder engagement, corporate governance, sustainability, and safety protocol adherence.
1.4 Innovation: New or improved infrastructure design, technology, service delivery, ways to cover or contain cost, manage demand or optimize utilization, improved risk allocation between private company and government, financial structure, etc.	An automatic sprinkler system has been installed at the Sand Land project site.	Satisfactory	Sprinkler system installed has been operating satisfactorily	Automatic sprinkler system prevents the process of manual cleaning of modules.	Low.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
1.5 Catalytic element: Mobilizing or inducing more local or foreign market financing or foreign direct investment in the company	Following ADB's approval of the loans to the SPVs in 2012, the Sponsor continued to exert efforts in closing with the local lenders (REC, PFC, and IIFCL), who are first timers in working with an international financial institution such as ADB.	Satisfactory	These local lenders are accumulating experience in sharing the security package with ADB.	The Sponsor will be able to secure a large amount of financing from these domestic lenders in future expansions of solar projects.	Persistent high lending rates and any escalation in cost will impact the sector.
2. Beyond company PSD effects					
2.1 Private sector expansion: Contribution by a pioneering or high-profile project that facilitates in its own right, or paves the way, for more private participation in the sector and economy at large	<p>State solar policy paved the way for explosive growth in the solar power sector with about 900 MW installed in one year starting in mid-2012.</p> <p>Solar power installations increases are mostly coming from the private sector.</p>	Satisfactory	Investment participation of ADB in the sector boosted private sector involvement in improvement.	<p>Private sector expansion in this sector in India is increasing.</p> <p>The government set a target of 100 GW by 2020, an increase of 97 GW in 5 years or about 20 GW a year.</p>	<p>Medium. Risks pertaining to growth of solar plants:</p> <ol style="list-style-type: none"> 1. Financing at competitive rates and longer-tenure loans 2. Availability of timely transmission infrastructure 3. Timely land acquisition
2.2 Competition: Contribution of new competition pressure on public and/ or other sector players to raise efficiency and improve access and service levels in the industry.	More private sector companies are participating in the bidding for solar projects in India.	Excellent	The regulatory framework promoting solar power generation in India is attractive.	With significant capacity addition proposed every year and a successful track record of projects, new players, including large corporations, are planning to enter	Low. Might encounter unviable bids from inexperienced players, which might lead to significant delay in the rollout of the proposed expansion plan.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
				the sector. This will lead to further reductions in tariffs and improvements in efficiency.	
2.3 Demonstration effects: Adoption of new skills, improved infrastructure assets and services, more efficient processes, maintenance regimes, improved standards, risk allocation, and mitigation beyond the project company	A DCDB was installed before the invertors to minimize the PID effect with negative grounding concept.	Satisfactory	A DCDB has been installed at the Responsive site only.	A DCDB will be needed only for the type of solar panel at Responsive.	Medium. Demonstration effects are dependent on government direction to adopt specific technologies.
2.4 Linkages: Relative to investments, the project contributes notable upstream or downstream linkage effects to business clients, consumers, suppliers, key industries, etc. in support of growth	Increasing supply to 40 GW per year of energy generation in support of the country's target to JNN SM goals.	Satisfactory	The deficit in the country's power supply in FY2014 was 3.6%, a slight improvement from power supply deficit in FY2013 which was 4.2%	With infrastructure development in the country, the opportunity exists for more people to benefit from the supply of power generation.	Low. The Increased supply of power provides a positive effect on the industry.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
2.5 Catalytic element: Mobilizing or inducing more local or foreign market financing or foreign direct investment in the sector (beyond the company) through pioneering or catalytic finance	The stable generation profile and timely revenue realization from solar plants create an environment conducive to successful local or foreign direct investment.	Satisfactory	Local lenders are accumulating experience to provide competitive lending to solar investors.	Government will focus and incentives will further improve growth opportunities in the solar energy sector.	Medium. The poor health of distribution companies, constraints on land availability, and delayed clearances will impact investment in the solar energy sector.
2.6. Affected laws, frameworks, regulation: Contributes to improved laws and sector regulation for public private partnerships, concessions, joint ventures, and build-operate-transfer projects; and liberalizing markets as applicable for improved sector efficiency	PPAs are executed with state governments for 25 years. Each state has an electricity regulator that determines solar tariffs for a control period.	Satisfactory	Long-term PPA provide reasonable projections of revenue streams.	PPAs with state and central distribution companies will be key drivers of solar power growth in India. Electricity generation could play an important part by executing PPAs based on Feed in tariff (FiT).	Medium. The financial strength of a few distribution companies deters investors and financial institutions from investing in such projects.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
3. Contribution to other ADB strategic objectives					
3.1 Sector development (outputs): Contribution to other sector development outputs and outcomes not captured under point 2., such as capacity or network expansion, etc.	Of the 255 GW of installed power capacity, renewables contribute 32 GW or 12.5%, of which solar has an installed capacity of 2.7 GW. The growth is making an impact on ancillary component industries such as those providing modules, balance of system (BoS), and equipment supplies.	Satisfactory	Local lenders are accumulating experience in lending that is applicable to other type of renewable projects.	Over the next five to six years, the scale of solar installations is expected to increase to 100 GW, or 20 GW a year. The annual addition will support local economies.	Medium. Risks are financing, transmission network infrastructure, and land acquisition.
3.2 Sector development (outcomes): Contribution to other sector development outputs and outcomes not captured under point 2., such as increased infrastructure utilization or consumption, improved in-country connectivity, improved energy security, etc.	1. Finance Sector – Foreign investments and domestic institutional funding have been used to fund the project, leading to capacity building in the domestic financial sector with respect to solar power. 2. Domestic Manufacturing – Most of the equipment in the project other than panels and inverters has been sourced from domestic vendors. This has promoted local manufacturing and has also led to capacity building in the sector.	Satisfactory	Competitive provision of services and products by domestic lenders and manufacturing companies.	Due to the explosive growth in solar power in the country, further expected benefits include 1. Finance - increased long-term foreign funding in the form of private equity as well as debt 2. Agriculture – increased acceptability of solar, has created a movement toward solar pumps for agriculture,	Low. The trend to expand solar power generation in India is irreversible.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
				leading to multiple benefits across the sector 3. Manufacturing - Increased investment in solar manufacturing in the country	
3.3 Inclusion: Improved access to, availability of, or affordability of infrastructure services for the poor and other disadvantaged groups	Solar power development has led to the acquisition of vast areas of barren or unwanted land. Solar power has led to an increase in land pricing, which has helped the poor financially through both purchases and employment. Solar power development has led to greater access to electricity for people	Satisfactory	Purchase of land by the sponsor provided economic opportunities for the landowners.	Annual addition of solar capacity would result in the purchase of significant areas of barren or non-agricultural land. Employment of semiskilled and unskilled labor would also increase exponentially.	Risks include the high cost of land, which might increase the price of solar generation, and the limited transmission networks, which will force developers to construct plants in developed areas.
3.4 Job creation: Creation of additional sustainable jobs or self-employment. Distinguish between jobs created within and beyond the company.	The company created job opportunities within the company as well as with the contractor for approximately 187 Security staff and 218 technicians.	Satisfactory	Long-term operation warrants stable and long-term employment.	More jobs will be created once the company embarks on construction and operation of additional generation plants.	Low. The company is robustly pursuing additional solar projects.

Results Area	Actual Achievements ^a	Rating ^b	Justification	Potential Future Achievements ^c	Risk ^d
3.5 Environmental sustainability: Project net impact on GHG emissions. Any other contributions to environmental improvements	As a clean energy project, solar photovoltaic does not lead to any GHG emissions. A total of 120 GWh has been generated as of FY2015.	Satisfactory	The project caused no emission of GHG.	The company's solar projects will be reducing 40,000 units of GHG emissions per year.	Low. The project is already commissioned and generating power without GHG emissions.
3.6 Regional integration: Project contributions to regional cooperation and integration by facilitating trade, cross-border mobility, cross-border power supplies, etc.	Nearly all states are developing solar power for their own consumption. There have been cases under central solar policy in which solar power has been exported to other states. The capacity addition in solar is spread across various states in India, mainly in Gujarat, Rajasthan, Madhya Pradesh, Orissa, and Karnataka.	Satisfactory	There is no cross-border power supply by the project.	In general, there would be greater cross-border power supply in the near future with large solar parks being built in Rajasthan and Madhya Pradesh.	Key risks include the transmission network and its capacity.
4. Overall Rating^e		Satisfactory			

ESHS = environmental, social, health, and safety; GHG = greenhouse gas; JNNSM = Jawaharlal Nehru National Solar Mission, PID = potential induced degradation, PSD = private sector development, PV = photovoltaic.

^a**Achievements to be assessed for all result areas.** Highlight (in bold font) achievements in areas that have been specifically referred to as project outputs, outcomes, and impacts in the report and recommendation of the President and the Design and Monitoring Framework for the project.

^b**The rating scale for is each results area is Unsatisfactory, Less than Satisfactory, Satisfactory, Excellent, Not applicable.** Consider already manifest actual outputs, outcomes and impacts (positive or negative).). "Excellent" reflects a high level of achievement, usually exceeding targets. "Satisfactory" denotes a good level achievement in line with expectations and set targets. "Less than satisfactory" reflects a low level of achievement below expectations. "Unsatisfactory" reflects no achievement or significant negative effects. "Not applicable" should only be used, if the project report and recommendation of the President does not mention this aspect in its presentation of envisaged project development results, project justification, ADB's additionality, or the Design and Monitoring Framework itself, and if negative effects are not apparent.

^c Consider potential for further achievements considering relevant developments in the medium-term or external to the project.

^d**Assess risk to the realization of further potential achievements on a scale of high, medium, low.** Add further explanations in the box, particularly if risks are assessed to be low.

^e**The overall rating scale is Unsatisfactory, Less than Satisfactory, Satisfactory, Excellent.** The overall rating is not an arithmetic mean of the individual indicator ratings, and does not have fixed weights. It will be primarily based on the level of achievement of envisaged project outcomes as stated in the DMF, provided these and associated indicators are meaningful for contributing to envisaged development impacts in the Design and Monitoring Framework. See para. 10 in Appendix 1 for further guidance.

INDUSTRY AND OPERATIONS REVIEW

1. The total installed power generation capacity in India is 268 gigawatts (GW) as of 31 March 2015. India remains in need of additional power generation capacity. The country continues to suffer from power outages, with peak demand exceeding supply by 3% and an energy deficit of 2% for the month of March 2015.

2. Of the total installed capacity in FY2014, 69% comes from thermal sources (coal, gas, and diesel), 15% from hydropower, 13% from renewable energy, and 2% from nuclear energy. Solar accounts for 10% of the total installed renewable energy capacity in the country. Tables A3.1 and A3.2 present the distribution of power capacity in all India by sector and capacity of renewable energy sources.

Table A3.1: Energy Capacity, by Sector
(MW, %)

Fiscal Year	Thermal		Nuclear		Hydro (Renewable)		RES (MNRE)		TOTAL	
	MW	%	MW	%	MW	%	MW	%	MW	%
2014	189,497.78	69.5	5,780.00	2.1	41,632.43	15.3	35,776.96	13.1	272,687.17	100.00
2013	168,254.99	68.6	4,780.00	2	40,531.41	16.5	31,692.14	12.9	245,258.54	100.00
2012	153,847.99	68.1	4,780.00	2.1	39,623.40	17.6	27,541.71	12.2	225,793.10	100.00
2011	131,603.18	65.8	4,780.00	2.4	38,990.40	19.5	24,503.45	12.3	199,877.03	100.00

MNRE = Ministry of New and Renewable Energy, MW = megawatt, RES = renewable energy sources.

Sources: Government of India, Ministry of Power, Central Electricity Authority; and Ministry of New and Renewable Energy

Table A3.2: Installed Capacity, Renewable Energy Sources
(MW, %)

Fiscal Year	Small Hydro		Wind		BM/BC		Bio Waste to Power		Total		Solar		Total	
	MW	%	MW	%	MW	%	MW	%	MW	%	MW	%	MW	%
2014	4,055.36	11.34	23,444.00	65.53	4,418.55		115.08		4,533.63	12.67	3,743.97	10.46	35,776.96	100.00
2013	3,803.68	12.00	21,136.40	66.69	4,013.55		106.58		4,120.13	13.00	2,631.93	8.3	31,692.14	100.00
2012	3,587.56	13.03	18,807.78	68.29	3,564.53		96.08		3,694.47	13.41	1,451.90	5.27	27,541.71	100.00
2011	3,496.04	14.27	17,139.95	69.95	3,095.13		73.66		3,357.00	13.70	510.05	2.08	24,503.04	100.00

BM = biomass power and gasification, BC = bagasse cogeneration, RES = renewable energy sources.

Sources: Government of India, Ministry of Power, Central Electricity Authority, and Ministry of New and Renewable Energy

3. The Jawaharlal Nehru National Solar Mission (JNNSM), launched in January 2010 by the Government of India, is a major initiative of the national and state governments to promote ecologically sustainable growth while addressing India's energy problems. The number of solar power plant licenses to be awarded in 2015 is projected to increase by 30%—a move that adds 1 GW of capacity to the government's 2015 target. The goal of the JNNSM is to install 10 GW of solar power capacity by 2017 and 20 GW by 2022.

4. Gujarat State has been a leader in solar power generation, with two-thirds of the 900 MW of photovoltaic systems in the country. The state has commissioned Asia's biggest solar park at Charanka Village. The park is already generating solar power, with a capacity of 2 MW and a planned capacity of 500 MW. The park has been functioning with multiple developers and multiple beneficiaries. It has been named the most innovative and environmentally friendly

project by the Confederation of Indian Industry. As of May 2015, the state government has approved 17 solar parks and plans to auction 15.9 GW of solar generating capacity in 2015.

5. India's push for solar power has not come without a few other bumps. Under Phase I of the JNNSM, half of the crystalline silicon modules purchased to meet the target were required to be sourced from Indian domestic suppliers. More recently, Phase II of the JNNSM expanded that requirement to the purchase of thin-film solar panels, which the United States often exports to India. US representatives claim that the requirement violates trade agreements of the two countries under World Trade Organization rules.

ENVIRONMENTAL IMPACT

A. Overview

1. The project was classified as category B for environment under ADB's Safeguard Policy Statement (2009). This required each of the special purpose vehicles (SPVs) to prepare an initial environment examination (IEE) for each of the sites. During processing, the potential environmental and social impacts and risks of the project were identified, and effective measures to avoid, minimize, mitigate, and compensate for the adverse impacts were incorporated in the environmental and social management plans. Information disclosure and consultations with affected people were conducted in accordance with ADB requirements, and a grievance redress mechanism was put in place.

B. Review Findings

2. **Environmental management system.** Each of the SPVs adopted the corporate environment, health, safety, and social (EHS&S) policy of the sponsor which commits to develop and operate a safe, healthy, and clean environment by protecting humans, machinery, and the environment from hazards and risks. It has a policy of complying with applicable environmental and occupational health and safety requirements of its stakeholders as well as a policy of continually improving processes and practices for the prevention of pollution, ill health, and injury; conservation of resources; and minimization of risks.

3. The EHS&S policy is operationalized by each of the SPVs. A corporate head for EHS&S oversees the company-wide implementation of its policy and procedures, while a dedicated manager administers the EHS&S concerns. Environment, health, and safety (EHS)-related processes are being executed, and trainings are being facilitated by an EHS&S coordinator who handles safeguard-related issues on site. An EHS core committee, made up of the heads of all departments and chaired by the vice president for operation, holds a monthly EHS Apex meeting, where EHS issues are discussed and actions to improve EHS performance are taken.

4. **Environmental management and monitoring.** Each of the SPVs prepared an environmental management and monitoring plan as part of the IEE for each project. During construction, the site clearing and leveling had minimal impact in terms of soil erosion because the land area is generally flat. Dust generation due to excavation and vehicle traffic were minimized through phased grading and the use of water sprinklers. Sanitation facilities (e.g., septic tanks and soak pits) and garbage bins were also provided at the camp site. Adequate personal protective equipment such as face masks, safety shoes, helmets, and goggles were provided to workers. Safety-related trainings and toolbox talks were also provided on a regular basis.

5. During operation, regular safety trainings and measures on electrical safety are provided. A waste management plan is in place for handling and disposal of broken solar cells as well as handling and storage of oils and chemicals. Damaged solar panels are stored in a designated area to be returned to the suppliers. To avoid land contamination, color-coded waste collection bins for separating domestic waste, recyclable waste, and hazardous waste are provided. In each of the SPVs, water consumption is monitored and efforts to maximize use of water resources are pursued. In Sand Land, an automated sprinkler has been implemented to clean solar panels. Rainwater harvesting and stormwater collection systems are also in place. Greenbelt planting within the site boundaries is also pursued.

6. Weekly EHS reporting covers these elements: trainings provided; work permits and Lock Out/Tag Out (LOTO) systems¹ implemented; accidents, incidents, near misses reported; EHS observations and status; plantation and hazardous waste management details; and compliance with use of personal protective equipment. To encourage performance improvement among EHS coordinators on site, a “Best EHS Coordinator” award² is given each month.

7. **Health and safety performance.** The SPVs have a safety work permit system and an accident/incident reporting and investigation system. They also have protocols for control of hazardous activities such as the LOTO procedure. Six monthly mock drills and live firefighting training are conducted on site. EHS trainings (e.g., modules on general safety, fire safety and electrical safety, precautions against snakebite) and awareness activities are also implemented on site. Safety rules are communicated to contractors, and EHS provisions are included in the contracts. First-aid boxes and personal protective equipment are available at the sites, and associates are trained in first-aid procedures. The corporate EHS team conducts EHS audits regularly.

8. Employees undergo regular medical health checkups, and health awareness and medical bulletins are posted on site. Plant personnel participate in global and national EHS celebrations. The potential for snakebite is considered an occupational hazard on site; measures in place include planting of snake-repellent herbs and regular spraying of anti-snake formulations (e.g., carbolic acid) are in place.

9. **Compliance with national and ADB requirements.** Each of the SPVs ensures its statutory compliance with EHS regulations. Although solar photovoltaic power projects are exempted from obtaining environmental clearance under the Environment Impact Assessment Notification (2006) of the Ministry of Environment and Forests, the SPVs obtained consents and authorizations from the Gujarat Pollution Control Board and the Directorate for Industrial Safety and Health. To comply with ADB requirements, each SPV prepared an IEE with corresponding environmental plan and management and monitoring plans to mitigate potential impacts and/or risks. A grievance register is also being maintained. The SPVs have developed an internal monitoring and reporting system to address EHS concerns at the sites, and they submit annual environmental monitoring reports to ADB.

C. Conclusion

10. The review and evaluation of available safeguard documents, observations from the site visits, and interviews of corporate and site personnel show that the SPVs satisfactorily comply with national and ADB environmental, health, and safety requirements. The SPVs have sufficient systems, procedures, and manpower to implement them and are committed to the continual improvement of their environmental management, monitoring, and reporting system.

¹ LOTO refers to the safety procedure used in industry to ensure that dangerous machines have been properly shut down and are incapable of being started up again prior to the completion of maintenance or servicing work.

² The EHS coordinators of the three SPVs are rated together with the other 12 solar photovoltaic plants of the company throughout India.

SOCIAL IMPACT

I. Project Overview

1. The project was classified as category C for both indigenous peoples and involuntary resettlement. At the time of processing, a social safeguards audit was conducted by an independent external advisor¹ to check the project's compliance with ADB's Safeguards Policy Statement on Involuntary Resettlement and Indigenous Peoples. The audit confirmed that no indigenous peoples were living within or close to the project site, and no physical relocation or economic displacement issues were expected during preparation. The audit also reported that land was procured on a "willing buyer/willing seller" basis following the requirements set forth in ADB's Safeguard Policy Statement. Furthermore, the project was expected to generate jobs for unskilled workers from communities surrounding the project area during construction. Following completion, a review was undertaken of the project's actual social impacts from the three ADB-funded solar plants.

II. Review Findings

A. Involuntary Resettlement Impact

2. **Sand Land.** Sand Land is a 25 MW solar photovoltaic generation power plant with an area of 85.83 hectares (ha) comprising 56 parcels of agricultural land acquired from 153 landowners² in the villages of Alwada and Khimat. Compensation was paid to all landowners, and the land registration process was completed between May 2011 and January 2012. No outstanding land compensation issues remain. Of the area acquired, 62.98 ha was allocated for the module, 12.95 ha for the balance of the plant, 8.1 ha for water reservoirs, and 1.8 ha as open area. The conversion order changing the land classification from agricultural to non-agricultural was obtained in May 2013. No additional land was acquired, allocated, or procured during project implementation.

3. **Responsive.** Responsive is a 25 MW solar PV generation power plant with an area of 57.17 ha, acquired from 23 landowners in Kamalpur and Rajpar. Compensation was paid to all landowners, and the land registration process was completed between September 2011 and March 2012. No outstanding land compensation issues remain. Of the area acquired, 46.86 ha was allocated for the module, 5.85 ha for the balance of the plant, 2.3 ha for water reservoirs, and 2.17 ha for open area. No additional land was acquired, allocated, or procured during project implementation.

4. **Ujjawala.** Ujjawala is a 23.06 MW solar PV generation power plant. A total of 59.70 ha was acquired from 25 landowners³ in Kamalpur. Compensation was paid to all landowners and land registration was completed in August 2012. Of the area acquired, 45.56 ha was allocated for the module, 4.80 ha for the balance of plant, 2.42 ha for the water reservoirs, and 6.92 ha for the open area. No additional land was acquired, allocated, or procured during project implementation.

¹ Ernst & Young assisted in the preparation of the audit report.

² Some parcels were owned by more than one landowner. One parcel was owned by as many as 20 landowners who inherited the land. Registration is done in front of the land registry, where each of the landowners confirms to the land register his or her receipt of payment for the land.

³ Eleven owners sold their land to Responsive Sutip Limited; Responsive and Ujjawala subsequently entered into an agreement to sell for these parcels of land.

5. The issuance of conversion orders for the non-agricultural land classification for both Responsive and Ujjawala was still pending at the time of writing, owing to the number of approvals and no-objection certificates required from the local government department and authorities, and other supervening events (e.g., preoccupation with elections, staff changes) beyond the control of the sponsor. Extensions of time for securing the land classification orders have been granted by ADB multiple times already, and regular follow-up is done to ensure the issuance of said orders. Field visits and interviews with landowners who sold parcels of land to Responsive and Ujjawala confirmed the audit findings at the time of processing—namely, that although the land acquired for the three subprojects was classified as agricultural land, it was not productive because of the high concentration of salt in the soil.

B. Indigenous Peoples Impact

6. **Sand Land.** The project is situated 5–6 kilometers (km) from the nearest community. The villagers belong to the Hindu community; predominant castes include Kshatriya, Vaishya, Krushak, and Brahmin. The parcels of land were procured from landowners belonging to the Hindu community and were not used, occupied, or claimed as ancestral domain or property of any tribal groups.

7. **Responsive and Ujjawala.** The two solar plants are on adjoining sites 7–8 km from the nearest community. Almost 70% of the villagers belong to the Hindu community; predominant castes include Darbari and Brahmin. The parcels of land were procured from landowners belonging to the Hindu community and were not used, occupied, or claimed as ancestral domain or property of any tribal groups.

C. Other Social Dimensions

8. **Employment opportunities.** The Sponsor's human resource policy prohibiting child or forced labor is adopted by each SPV. To implement the policy, each SPV has established a system of physical and document verification for each worker entering the premises. During construction, each solar plant was able to provide employment for 350 workers, 150 of whom were from local communities. During operation, each subproject employs an average of 1 plant manager, 6 operation and management staff, 26 technicians, 1 plant security and administrative head, 23 security crew members, and 20 module-cleaning crew members. The security and module-cleaning crew and technicians are local workers. The company has installed automatic sprinkler systems in Sand Land, which will reduce the amount of labor required to clean the solar panels and will decrease the SPV's demand for local labor. Female workers at the site are limited to the grass-cutting crew.

9. **Corporate Social Responsibility Activities.** To date, the Sponsor has implemented two kinds of corporate social responsibility activities at the three sites: upgrades of community infrastructure (drainage system and street lights) and educational support (supplies of teaching aids, books, and uniforms to schools and organization of field visits by students).

10. **Grievance Procedure, Consultations, and Community Relations.** Each SPV has established a grievance handling mechanism to manage complaints arising from the operations of the plant. A grievance redress committee was created at each site comprising the project head, the liaison officer, and a representative of the community. The operations and management manager of each SPV serves as a liaison officer for community concerns and manages grievances arising from the construction and operation of the solar plant. Some of the

complaints reported with respect to the operations of the power plant include improper disposal of waste, including panel modules, which the SPVs have addressed promptly.⁴

III. Conclusion

11. The review and evaluation of safeguards documents, inspection of project facilities, and interviews with staff at the corporate office and with local community members indicated that the Sponsor and its SPVs have complied with ADB's social safeguard requirements.

⁴ Complaints were reported at the Ujjawala solar power plant.