Republic of India

FY2022 Ex-Post Evaluation Report of

Japanese ODA Loan "New and Renewable Energy Development Project (Phase 2)"

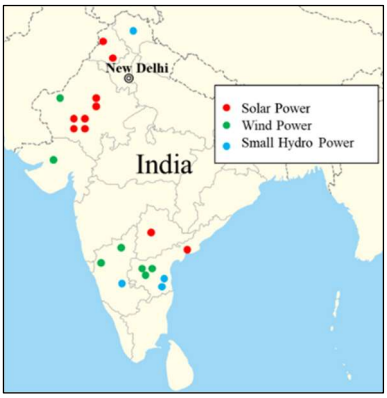
External Evaluator: Keishi Miyazaki, OPMAC Corporation

0. Summary

This project aimed to secure a stable electric supply and to diversify power supply sources to meet the increasing demand for electricity by providing two-step loans, through the Indian Renewable Energy Development Agency (IREDA), to new and renewable energy development projects in India, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change. The project was consistent with the development plan and development needs of India at the time of the appraisal and at the time of the ex-post evaluation. The consistency with Japanese's assistance policy was also confirmed. Although support for the strengthening of IREDA's appraisal system for environmental and social consideration was expected at the time of the appraisal, no directly beneficial support was provided. Besides, assistance in the area of environmental and social consideration was provided by another donor and the overlap of the assistance was avoided, while there was no official coordination between JICA and the other donor. Therefore, the relevance and coherence of the project are high. Since both the project cost and the project period were within the plan, the efficiency of the project is very high. The "installed generation capacity," "capacity factor of generation plants," "energy substitution" and "reduction of CO_2," which were set as the operation and effect indicators of the target sub-projects, were generally achieved against their respective targets. In addition, the project is estimated to have made a certain contribution to securing a stable electricity supply and diversifying the sources of electricity supply in the target states. Furthermore, it is estimated that the project has made a certain contribution to climate change mitigation through the effect of energy substitution and reduction of CO_2 of the project. No negative impacts on the natural environment caused by the project were identified. Land acquisition was carried out in accordance with Indian domestic law, and no resettlement occurred. Therefore, the effectiveness and impact of the project is high. As to the operation and maintenance of this project, no issues were observed in the policy/system, institutional/organizational, technical, financial, or environmental and social aspects; in the response to weather risks affecting the operation of the renewable energy power generation or risks such as non-performing loans; or in the status of operation and maintenance. Therefore, the sustainability of the project effects is very high.

In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Locations
(Source: Evaluator)

Solar power plant eligible for the project
(Source: Evaluator)

1.1 Background

With its recent rapid economic growth, India has seen a rapid increase in demand for electricity with peak-hour demand increasing from 109,000 MW in 2007 to 130,000 MW in 2011. However, efforts to develop electric power have not kept pace with the increase in demand; peak-hour supply in 2011 was only 116,000 MW. India suffered from chronic electricity shortages. With poor oil resources and insufficient natural gas utilization, the country depended on coal-fired power generation for 57% of its power-generating capacity in 2012. On the other hand, the proportion of new and renewable energy was 13% of the country's total power-generating capacity in 2012 and renewable energy was considered to have high development potential. In the *Twelfth Five-Year Plan* (2012-2017), the government of India set out to promote new and renewable energy sources, including the introduction of a feed-in tariff system, in order to simultaneously increase domestic power supply and reduce dependence on fossil fuels. During the period of this plan, the government aimed to develop new power sources to provide 118,536 MW of power, of which 30,000 MW was to be supplied by new and renewable energy.

1.2 Project Outline

The objective of this project is to help India secure a stable electric supply and diversify power supply sources to meet an increasing demand for electricity by providing two-step loans, through IREDA, to new and renewable energy development projects in the country, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change.

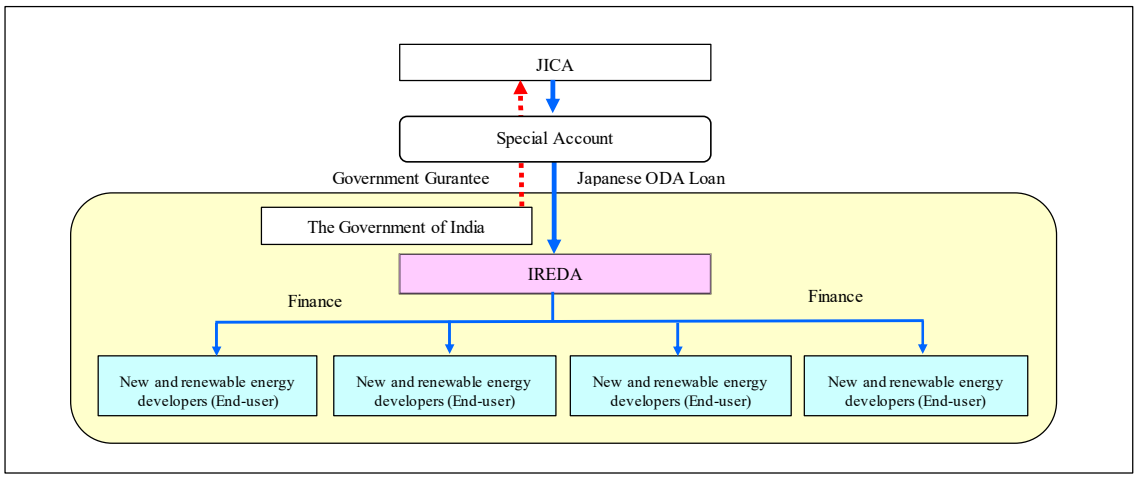
Loan Approved Amount / Disbursed Amount	30,000 million yen / 30,000 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March 2014 / September 2014	
Terms and Conditions	Interest Rate	0.25%
	Repayment Period (Grace Period	30 years 10 years)
	Conditions for Procurement	General Untied
Borrower / Executing Agency	Indian Renewable Energy Development Agency Limited (IREDA) / IREDA (Guarantor: The President of India)	
Project Completion	March 2020	
Target Area	All India	
Main Contractor (Over 1 billion yen)	N.A.	
Main Consultant (Over 100 million yen)	N.A.	
Related Studies (Feasibility Studies, etc.)	"Special Assistance for Project Implementation: New and Renewable Energy Development Project (Phase 2)" (December 2014 - February 2018)	
Related Projects	"New and Renewable Energy Development Project" (2011-2014)	

[Structure of Financial Intermediary Loan (the Two-Step Loans)]

The Financial Intermediary Loan is a scheme to provide the necessary funds for the implementation of a policy including the promotion of certain sectors, such as small and medium-scale manufacturing and agriculture and the improvement of the livelihoods of the poor, through financial institutions such as development banks under the borrower's policy finance system. It is also called a two-step loan as the process involves two or more financial institutions before the funds are provided for the final beneficiary or end-user. The Financial Intermediary Loan scheme provides finance to a large number of beneficiaries or end-users in the private sector, and supports strengthening of financial institution's skills and development of the financial sector by involving the financial institutions.

This project was designed to provide the necessary funds for new and renewable energy

developers (end-users) in the private sector through IREDA, a government-affiliated financial institution, in order to promote new and renewable energy development in India. In this ex-post evaluation, the renewable energy development projects which were financed are referred to as sub-projects and their owners, borrowers, as end-users.



Source: drawn by the evaluator referring to sources provided by JICA

Figure 1 Funds Flow of a Two-Step Loan using a Special Account

2. Outline of the Evaluation Study

2.1 External Evaluator

Keishi Miyazaki, OPMAC Corporation

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: September 2022-November 2023

Duration of the Field Study: November 27-December 20, 2022, April 10-13, 2023

2.3 Constraints during the Evaluation Study

Of the 21 sub-projects eligible for financing through IREDA under the project, one sub-project was treated as a non-performing loan because the power plant was sold to another operator following the bankruptcy of the parent company of the end-user. IREDA has not received any monitoring information, including that on the status of plant operation, from the current owner of the plant. As 12 of the sub-projects were fully repaid before the loan repayment deadline for each sub-project and their loan agreements with IREDA were terminated, IREDA did not carry out any monitoring on these 12 sub-projects after the completion of repayment, including the collection of performance data on operational and effectiveness indicators. The remaining 8 sub-projects were continuing to make repayments to IREDA while operating their power plants at the time of

ex-post evaluation. In light of the above, this ex-post evaluation made an assessment of effectiveness based on the performance data of the operational and effectiveness indicators that IREDA obtained from the end-users.

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance/Coherence (Rating: ③[2])

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of India

At the time of the appraisal, the *Twelfth Five-Year Plan* (2012 to 2017) aimed to develop new power sources to provide 118,536 MW of electricity, of which 30,000 MW (25%) was planned to be supplied by new and renewable energy, in order to simultaneously increase domestic electricity supply and reduce dependence on fossil fuels. The Ministry of New and Renewable Energy aimed to develop 21,700 MW of New and Renewable Energy through the *Strategic Plan for New and Renewable Energy Sector 2011-2017*.

At the time of the ex-post evaluation, although the government of India had not formulated a Five-Year Plan, at the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) in 2021, the government had announced a target to increase its non-fossil energy generation capacity to 500 GW by 2030 and to meet 50% of its energy needs from renewable sources. The Ministry of New and Renewable Energy launched the Green Energy Corridor in 2015 to establish a mechanism for the interchange over a wide are of electricity generated in states with potential for the development of renewable energies by strengthening intra-state and inter-state transmission systems and has decided to implement the second phase of the project covering 2022-2025 for the development of the transmission network.

As mentioned above, the project was consistent with the development policy of the government of India at the time of the appraisal and ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of India

At the time of the appraisal, as stated in "1.1 Background," India was experiencing chronic power shortages because development of the power supply had not matched the rapid increase in demand for electricity as the country's economy rapidly grew. The proportion of new and renewable energy was only around 10% because India's power supply capacity depended heavily on coal-fired power generation. Meanwhile, the development potential of new and renewable energies was high and there was the necessity for the development of new and renewable energy sources in order to increase the capacity for electricity generation and

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.
[2] ④: Very High, ③: High, ②: Moderately Low, ①: Low.

promote the diversification of energy sources.

At the time of the ex-post evaluation, according to the Ministry of Power, the gap between electricity supply and demand in the whole of India had gradually been reduced from 3.6% in FY 2014/2015 to 0.4% in FY 2021/2022. However, there was still a slightly negative gap between supply and demand. Compared to FY 2014/2015, the gap between supply and demand during peak periods has improved, although in FY 2020/2021 a certain gap between supply and demand was observed (Table 1 and Table 2). This caused power outages and restrictions on electricity use in some regions and industries and by time of day.

Table 1 Energy Requirement and Availability (Amount of Power)

Year	Energy Requirement ①	Energy Availability ②	Energy Shortage (②－①)	
	MU	MU	MU	%
2014/15	1,068,923	1,030,785	-38,138	3.6
2015/16	1,114,408	1,090,850	-23,558	2.1
2016/17	1,142,929	1,135,334	-7,595	0.7
2017/18	1,213,326	1,204,697	-8,629	0.7
2018/19	1,274,595	1,267,526	-7,070	0.6
2019/20	1,291,010	1,284,444	-6,566	0.5
2020/21	1,275,534	1,270,663	-4,871	0.4
2021/22	1,379,812	1,374,024	-5,787	0.4

Table 2 Peak Demand and Peak Met (Power Output at Peak)

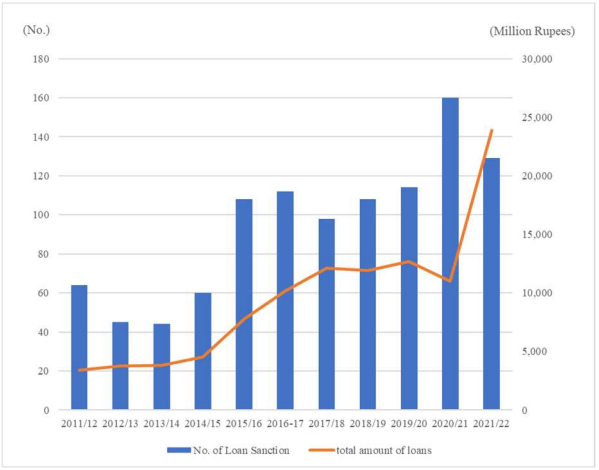
Year	Peak Demand ①	Peak Met ②	Peak Shortage (②－①)	
	MW	MW	MW	%
2014/15	148,166	141,160	-7,006	4.7
2015/16	153,366	148,463	-4,903	3.2
2016/17	159,542	156,934	-2,608	1.6
2017/18	164,066	160,752	-3,314	2.0
2018/19	177,022	175,528	-1,494	0.8
2019/20	183,804	182,533	-1,271	0.7
2020/21	190,198	189,395	-802	0.4
2021/22	203,014	200,539	-2,475	1.2

Source: made by the evaluator referring to annual reports issued by the Ministry of Power
Note 1: 1 MU (Mega Unit) = 1 GWh = 1,000 MWh

At the time of the ex-post evaluation, 57.5% of the total installed power generation capacity in India was by fossil-fuel power plants (51.3% of which were coal fired power plants) and of India's total generation capacity of 393.39 GW, 151.39 GW was from renewal power sources (Hydro 46.51 GW, Small Hydro 4.84 GW, Wind 40.08 GW, Bio-energy 10.17 GW, Waste Power 0.43 GW, Solar 49.37 GW) which was 38.5% of total installed power capacity (as of December 2021). Although the above-mentioned *Twelfth Five-Year Plan* set the target to increase the proportion of renewable energy sources in power generation capacity from 12% in 2012 to 33% in 2030, this target has been achieved earlier than planned, which indicates that the introduction of renewable energy had progressed faster than the plan. In addition, according to the Ministry of New and Renewable Energy, there is the potential to develop 750 GW of solar power, 695 GW of wind power (at 120m above ground), 42.3 GW of biomass power and 21.1 GW of small hydro power. There is still a need to strengthen efforts in renewable energy generation.

Compared to the time of appraisal, access to financial services for renewable energy projects has improved considerably. As the renewable energy market in India has matured, not only the support of the government of India, such as through loans and subsidy programs for renewable energy related projects, but also private financing services for the market have expanded. However, even under these circumstances, IREDA has continued to increase the number of

loan sanctions and the total amount of loans since 2014, set interest rates at the same level as private sector financial institutions and actively developed new financial products and services, such as financing rechargeable battery storage systems, green hydrogen and electric vehicle production (Figure 2). Therefore, it is confirmed that there was still the need for IREDA to support new and renewable energy development projects conducted by the Indian private sector at the time of ex-post evaluation.



Source: IREDA Annual Reports

Figure 2 IREDA's Number of Loan Sanctions and the Total Amount of Loans

From the above it can be seen that the development needs for renewable energy were consistently high at the time of the appraisal and at the ex-post evaluation and thus that there was consistency between the project and India's development needs.

3.1.1.3 Appropriateness of the Project Plan and Approach

At the time of the appraisal, as the renewable energy market in India was not bankable and was considered relatively risky, there was limited financing available for the market from private financial institutions. Under such circumstances, IREDA, a government-owned financial institution, was mandated to provide long-term and low interest loans to renewable energy developers with the aim of promoting new and renewable energy development projects in India. As this project aimed to provide funds necessary for renewable energy development projects to private-sector developers through IREDA, using the scheme of the two-step loan, thereby promoting the power supply development using renewable energies and securing a stable electric supply in India, the project approach was appropriate.

In addition, the Special Assistance for Project Implementation (SAPI) was conducted from December 2014 to February 2018 in collaboration with the project in order to strengthen the capacity of IREDA to operate and manage the information database for sub-project monitoring and evaluation, Non-Performing Loan (NPL) management, marketing and public relations. The support provided by the SAPI contributed to facilitating the operation of not only the sub-projects covered by the project but also that of IREDA as a whole. Therefore, the project plan and approach in conjunction with the SAPI were appropriate.

During the project period, the loans of 12 out of 21 eligible sub-projects were fully paid

before the repayment due date. This could be attributed to cases where end-users refinanced their loans from IREDA to private financial institutions after the construction of the power generation facilities was completed and their operation started, fully repaying the loans from IREDA. According to IREDA, the reason for early repayment by end-users has been that they consider the period from project formulation to construction to be of high business risk. Therefore, end-users prefer loans from IREDA. However, once the construction of a facility is completed and stable operation has started, the business risk is lowered. Therefore, end-users refinance with private financial institutions that offer lower interest rates than IREDA, allowing early full repayment to IREDA. Considering the provision of the finance necessary for the early stage of the project and the risk sharing and mitigation with end-users, it is worthwhile for IREDA, as a government owned financial institution with a public duty to support the private sector, to provide the financial support for renewable energy development projects. According to the end-users interviewed in this ex-post evaluation, good communication has been maintained between IREDA and end-users through opportunities for project monitoring by IREDA, including visits to power generation facilities, and through regular end-user project progress reports to IREDA. Moreover, IREDA's technical advice to end-users is highly valued.

The ex-post evaluation of the "New and Renewable Energy Development Project (2011-2014)" which preceded this project, showed lessons learned on the need for the implementing agency to establish a system for directly monitoring sub-projects. Based on this, the SAPI was implemented in conjunction with the project to strengthen IREDA's monitoring capacity. It can be concluded that in this sense the project reflected and utilized the lessons learned from the preceding project, which contributed to the smooth implementation of the project and the achievement of the project objective.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

At the time of the appraisal, "Improvement of the Poverty and Environment issues" was a high-priority goal of the *Country Assistance Program for India* (2006) which stated that assistance for new and renewable energy would be provided. The *JICA Country Analysis Paper for India* (March 2012) assigned high importance to "support for measures related to the environment and climate change." This was very important for India, which is increasingly dependent on foreign energy resources, to promote the introduction of renewable energy as an energy policy and for Japanese companies to utilize their knowledge and technology. As illustrated, this project is consistent with these polices. In addition, in response to the growing global interest in environmental issues, the government of Japan has actively supported India's environmental and energy policies though the India-Japan Energy Forum, the Japan-India Energy Dialogue and the Joint Statement of Japan-India Summit

Meeting. Therefore, this project is consistent with Japan's ODA policy.

3.1.2.2 Internal Coherence

The implementation of assistance to strengthen IREDA's capacity to monitor environmental and social consideration was expected at the time of the appraisal. However, at the time of the ex-post evaluation, it was confirmed that this assistance had not been implemented. However, as assistance for the area of environmental and social consideration was provided by other doners, duplication of assistance was avoided. In addition, no synergies or interlinkages between this assistance and JICA's electricity transmission and distribution development project were verified in the project states.

3.1.2.3 External Coherence

Although collaboration between JICA and other donors was not expected at the time of the appraisal and it did not take place during the project implementation period, it was confirmed that each doner provided assistance based on its objective and priority areas taking into account the position of IREDA. As a result, there was no overlap between doners.

Consistency with the development plan and development needs was recognized at the time of the appraisal and at the time of the ex-post evaluation. The project was also consistent with Japan's development cooperation policy at the time of the appraisal. Meanwhile, the assistance to strengthen IREDA's capacity to monitor environmental and social consideration which was envisaged at the time of the appraisal was not conducted and although there was no overlap in cooperation or areas of assistance between doners, there was no formal form of collaboration between JICA and other doners; therefore, no internal or external coherence was recognized.

Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ④)

3.2.1 Project Outputs

The financial scheme of this project, as shown in Figure 1, is in the form of a two-step loan, comprised of a loan by JICA to IREDA and IREDA's lending for eligible sub-projects according to JICA requirements. The sectors eligible for financing set at the time of the appraisal were photovoltaic and solar thermal power generation projects, wind power projects, small-scale hydropower projects (less than 30 MW), cogeneration (using bagasse) projects (less than 30 MW) and biomass power projects (less than 30 MW).

Under the project, 21 sub-projects were eligible for IREDA's financing, as shown in Table 3. Of these, 10 projects were photovoltaic power generation projects, 7 projects were wind power projects and 4 projects were small-scale hydropower projects. As for the loan terms and

conditions for the sub-projects, throughout the project period, IREDA reduced interest rates and extended the repayment period in accordance with market trends. However, the basic loan terms and conditions have not changed since the time of appraisal. According to IREDA, the reduction in interest rates and extensions of repayment period were made through the managerial efforts of IREDA.

When a loan application is submitted to IREDA by an end-user, the group in charge of each sub-sector (solar, wind, small hydro, or the like) of the technical-service department starts appraisal based on the eligibility criteria for financing loans. In addition, the finance department confirms the credit risk rating of the end-user and other financial aspects. Finally, after the technical service department conducts a technical review, including market and business risk analysis, and checks the status of environmental clearance, IREDA decides whether or not to approve the loan.

At the time of the ex-post evaluation, it was confirmed that IREDA had properly implemented appraisals for each sub-project in accordance with the screening procedure, had confirmed the acquisition of various government permits and approvals, including environmental clearances, and had monitored the utilization status of facilities and financial status during the construction and project implementation period.

Table 3 Number of Eligible Sub-Projects and Loan Condition

Project Type	No.	Loan Condition					
		(Appraisal and Actual) June 2012		(Actual) December 2015		(Actual) May 2017	
		Interest Rate	Repayment Period	Interest Rate	Repayment Period	Interest Rate	Repayment Period
Solar Power	10	12.25% -13.00%	5-10 years	10.20% -11.40%	Maximum 10-15 years	9.80% -11.00%	Maximum 10-15 years (Hydro power 20 years)
Wind Power	7	11.90% -12.50%		10.20% -11.40%		9.80% -11.00%	
Small Hydro Power	4	11.90% -12.25%		10.20% -11.70%		10.35% -11.50%	

Source: IREDA

As the project is a sovereign loan[3], the guarantee fee is charged by the government of India in the process of funding IREDA. On the other hand, some other doners provided non-sovereign loans[4] directly to IREDA, which has reduced the financing cost for IREDA and end-users. IREDA therefore indicated that it expects JICA to consider providing non-sovereign loans if JICA loans are available in the future. In addition, under the yen loan project, the borrower pays 0.02% of the loan amount to JICA as a Front-End Fee[5] after signing of the Loan Agreement. However, IREDA requested that JICA consider allowing the Front-End Fee to be paid in

[3] Loan guaranteed by the government of the borrowing country; in principle Japanese ODA loans are sovereign loans.
[4] Loan not guaranteed by the government of the borrowing country.
[5] Font-End Fee is a fee to be paid by the Borrower to JICA, when the provision of Japanese ODA loans starts.

instalments during the disbursement period due to the temporary large burden on the borrower. Furthermore, currently yen loans are denominated in either JPY or USD, but as the borrowing countries bear a heavy burden of foreign exchange risk, IREDA has requested that JICA consider loan agreements in local currency.[6]

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned total project cost was 33,060 million yen (of which the yen loan was 30,000 million yen), and the actual total cost was 33,060 million yen (of which the yen loan was 30,000 million yen), which was within the plan (within 100% of the plan).

Table 4 Project Cost (Plan/Actual)

Unit: million yen

Item	Plan (2014)		Actual (2020)	
	Total	Of which ODA Loan	Total	Of which ODA Loan
Provision of Finance	30,000	30,000	30,000	30,000
Front-End Fee	60	0	60	0
Administration Cost	3,000	0	3,000	0
Total	33,060	30,000	33,060	30,000

Source : JICA and IREDA

Note: As for Administration cost, since it was difficult to obtain the exact amount from IREDA, approximately 10% (3,000 million yen) of the loan amount was deemed to have been financed from the IREDA budget.

3.2.2.2 Project Period

The timing of project completion was defined as the last disbursement by JICA to IREDA. At the time of the appraisal, the project was expected to last from April 2014 to March 2020 (72 months) but the actual period was from September 2014 to March 2020 (66 months), so the project was completed six months earlier than the plan (91% of the planned period). Although the effectuation of the Loan Agreement was delayed by eight months, from April 2014 to December 2012, due to the time needed for the approval process between the two governments, the project was still completed within the plan. The reason why the project period was shortened and the project was completed within the planned period was that the need for funds in the Indian renewable energy sector rapidly increased from FY 2014/2015 to FY 2017/2018 and IREDA's raising funds alone from private financial markets could not keep up with the financial needs. Appraisal and sanction of the sub-project loans that were eligible for ODA loans were conducted earlier than had been expected. As a result, the project had lent up to the maximum loan limitation of 30,000 million yen by March 2020.

In light of the above, it is clear that both the project cost and project period were within the plan. Therefore, efficiency of the project is very high.

[6] The provision of non-sovereign loan, the payment of Front-End Fee and loan agreement in currencies other than yen and US dollar are matters that require institutional changes to the Japanese ODA loans.

3.3 Effectiveness and Impacts[7] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, the operation and effect indicators were "maximum power output," "capacity factor of generation plants," "energy substitution," and "reduction of CO_2." Target values were set at the time of the sanctioning of each sub-project, because the sub-projects to be targeted had not been identified at the time of the appraisal. IREDA conducted monitoring on a quarterly basis by means of collecting and reviewing a monitoring report from end-users, which included the actual values of the four operation and effect indicators. However, as IREDA did not sufficiently instruct the end-users in the method of calculating "energy substitution" and "reduction of CO_2," it became clear that the actual values for these in the monitoring reports had not been calculated properly in terms of consistency and reliability. Therefore, in this ex-post evaluation, the actual values were estimated by the evaluator based on the formulas used in the SAPI, and the achievement of effectiveness was analysed.

(1) Maximum power output (MW)

At the time of the appraisal "maximum power output (MW)" was set as one of the operation and effect indicators; however "installed generation capacity" was stated in the financing appraisal document and in the monitoring reports of each sub-project, instead of "maximum power output;" moreover, in the ex-post evaluation of the preceding project (Phase 1) "maximum power output" was synonymous with "installed generation capacity." Therefore, also in the ex-post evaluation, "maximum power output" was regarded as synonymous with "installed generation capacity," based on confirmation with IREDA; and achievement was analysed by comparing the target value of installed generation capacity set at the time of the financing appraisal for each sub-project and the actual value at the time of the ex-post evaluation. For the 12 sub-projects, repayment was completed before the scheduled repayment date, and therefore, the actual values at the time of the completion of repayment were compared with the target values (Table 5).

As shown in Table 6, as for maximum power output (synonymous with installed generation capacity), 19 of 21 eligible sub-projects were mostly achieved as planned, while 2 remained unverified. The reasons for this were that one sub-project was under a Non-Performing Loan (NPL), and that the other one completed repayment by December 2014, prior to the repayment due date, which made it difficult for IREDA to obtain the actual value of "installed generation capacity."

[7] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 5 Installed Generation Capacity of Each Sub-Project

Name of State	Name of End-User	Project Type	Installed Generation Capacity (MW)	
			Target	Actual
			At the time of Appraisal of Each Sub-project	At the time of Ex-post evaluation or Repayment Completion
Punjab	Allianz Ecopower	Solar	2.0	2.0
	Abundant Energy	Solar	2.0	2.0
Himachal Pradesh	Cosmos Hydropower	Small Hydro	19.8	19.8
Rajasthan	Tanot Wind Power Venture	Wind	120.0	120.0
	Azur Green Tech	Solar	40.0	40.0
	Azur Sun Shine	Solar	20.0	20.0
	Heramba Renewable	Solar	20.0	20.0
	Aalok Solar Farms	Solar	10.0	10.0
	Abha Solar Farms	Solar	10.0	10.0
	Shreyas Solar Farms	Solar	20.0	20.0
Karnataka	Greenenergy Wind	Wind	16.0	16.0
	Renew Wind Energy	Wind	50.4	un-verified
	Sri Maruthi Powergen	Small Hydro	18.9	18.9
Gujarat and Karnataka	Mahidad Wind Energy	Wind	63.2	un-verified (Uncompleted)
Andhra Pradesh	Photon Solar Power	Solar	5.0	5.0
	Balaji Energy	Small Hydro	3.0	3.0
	Balaji Energy	Small Hydro	8.0	8.0
	Ostro Andra Wind	Wind	98.7	98.7
	Ostro Wind	Wind	98.7	98.7
	Vayu Urja Bharat	Wind	120.0	120.0
Telangana	Maheswari Mining and Energy	Solar	10.0	10.0

Source: IREDA
Note 1: the target values were set at the time of the appraisal of each sub-project. The actual values are the installed capacity at the time of the ex-post evaluation or repayment completion. Although the Loan Agreement was signed in September 2014, Renew Wind Energy Corporation completed repayment in December 2014, and therefore IREDA did not keep any monitoring record of actual values.
Note 2: Although Mahidad Wind Energy Corporation had installed a part of the wind power plant by December 2019, at the time of the ex-post evaluation all facilities were still incomplete, and the corporation was under NPL.

Table 6 Operation Indicator (Maximum Capacity (= Installed Generation Capacity) of Each Sub-Project)

Achievement Status of Installed Generation Capacity	No. of Sub-Projects
Target was achieved beyond plan (criteria: over 100%)	0
Target was achieved mostly as planned (criteria: between 70% and 100%)	19
Target was achieved to some extent (criteria: 50% or more and less than 70%)	0
Target was poorly achieved (criteria: below 50%)	0
Un-verified	2
(breakdown) It is difficult to obtain actual values because the end-user was under NPL.	1
It is difficult to obtain actual values because the end-user completed repayment in December 2014.	1

Source: IREDA

(2) Capacity factor of generation plants (%)

The achievement was analysed by comparing the target value of the capacity factor of generation plants set at the time of the appraisal for each sub-project and the actual values for the most recent

year that was available at the time of the ex-post evaluation (Table 7).

Table 7 Operation Indicator (Capacity Factor of Generation Plants)

Name of State	Name of End-User	Type of Project	Time of Commencement	Time of Repayment	Target	Actual					
					At the Time of the Appraisal of Each Sub-project	Period of Operation of Power Generation Plant					At the Time of the Ex-post Evaluation
						Dec. 2016	Dec. 2017	Dec. 2018	Dec. 2019	Mar. 2020	Dec. 2022
Punjab	Allianz Ecopower	Solar	2015.03	2021.04	18.21	16.44	16.98	16.23	13.03	15.57	Re-payment
	Abundant Energy	Solar	2015.03	2021.09	18.86	15.05	15.98	Not submitted	13.11	13.38	Re-payment
Himachal Pradesh	Cosmos Hydropower	Small Hydro	2022.09		56.67						46.00
Rajasthan	Tanot Wind Power Venture	Wind	2015.12	2016.09	23.60	Un-verified	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Azur Green Tech	Solar	2015.5	2017.08	19.50	18.82	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Azur Sun Shine	Solar	2015.5	2017.08	19.50	18.60	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Heramba Renewable	Solar	2017.10	2020.12	23.91		Un-verified	26.42	17.53	26.42	Re-payment
	Aalok Solar Farms	Solar	2017.11	2021.12	23.86		Un-verified	26.71	17.90	26.69	Re-payment
	Abha Solar Farms	Solar	2017.10	2022.12	23.86		Un-verified	26.68	17.85	26.69	Re-payment
	Shreyas Solar Farms	Solar	2017.11	2023.12	24.04		Un-verified	26.57	17.05	26.60	Re-payment
Karnataka	Greenenergy Wind Corporation	Wind	2014.12		23.44	Un-verified	Not submitted	21.84	26.75	10.80	19.89
	Renew Wind Energy	Wind	2013.05	2014.12	23.56	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Sri Maruthi Powergen	Small Hydro	2019.05		36.70		Un-verified	Under construction	9.00	—	16.93
Gujarat and Karnataka	Mahidad Wind Energy	Wind	2017.03		26.13		Un-verified	Un-verified	19.02	Un-completed	NPL
Andhra Pradesh	Photon Solar Power	Solar	2015.11		20.78		20.60	Not submitted	18.50	18.72	15.06
	Balaji Energy	Small Hydro	2017.11	2018.8	31.13		Un-verified	Re-payment	Re-payment	37.00	Re-payment
	Balaji Energy	Small Hydro	2017.12		32.36		Un-verified	Not submitted	20.00	27.72	Re-payment
	Ostro Andra Wind	Wind	2017.03		29.70		Not submitted	15.80	19.60	9.00	26.13
	Ostro Wind	Wind	2017.03		32.20		Not submitted	16.00	21.69	10.00	27.37
	Vayu Urja Bharat	Wind	2017.12		34.00				25.17	10.90	25.90
Telangana	Maheswari Mining and Energy	Solar	2016.03		19.50		19.81	18.04	16.40	22.00	Not submitted

Source: IREDA

Note 1: Monitoring reports for the project were prepared by IREDA every six months. However, the actual values of the reports submitted in December are described in the table above. The actual values of the reports submitted in June were also taken into account for the evaluation of the effectiveness of the project.

Note 2: Target values of each sub-project were set at the time of the appraisal of each sub-project.

Note 3: Boxes marked with a "diagonal line" are those where there was no record prior to the installation of the power plant. "Not submitted" are those where no submission was made to IREDA by the end-user. "Un-verified" are those that were left blank in the monitoring report.

Note 4: The capacity factor of Mahidad Wind Energy Corporation as of December 2019 indicated the capacity factor generated from the partially completed power plant and not the capacity factor generated from maximum installed capacity as set at the time of the appraisal of the sub-project. At the time of the ex-post evaluation, the plant was under NPL management.

Regarding the capacity factor of generation plants, as shown in Table 8, 6 of 21 eligible sub-projects were achieved, 11 sub-projects were almost achieved as planned, 2 sub-projects were not achieved, and 2 sub-projects were not verified. The reasons for non-achievement were that the one sub-project did not generate power after completion of the construction of the facility and made repayment before the repayment date in September 2016; and that the other sub-project reduced the volume of power generation due to a fault in the transmission line between the power plant and the substation where the distribution company was responsible for maintenance and operation. The reasons for the un-verified sub-projects were that one sub-project was under a Non-Performing Loan (NPL) and the other one completed repayment by December 2014 prior to the repayment due date, which made it difficult for IREDA to obtain the actual value of the "installed generation capacity."

Table 8 Operation Indicator (Capacity Factor of Generation Plants)

Achievement Status of Capacity Factor of Generation Plants	No. of Sub-Projects
Target was achieved beyond plan (criteria: over 100%)	6
Target was achieved mostly as planned (criteria: between 70% and 100%)	11
Target was achieved to some extent (criteria: 50% or more and less than 70%)	0
Target was poorly achieved (criteria: below 50%)	2
(breakdown) No power was generated after the commissioning (made repayment in September 2016)	1
Fault in the transmission line between the power plant and substation	1
Un-verified	2
(breakdown) It was difficult to obtain actual values because the end-user was under NPL.	1
It was difficult to obtain actual values because the end-user completed repayment in December 2014.	1

Source: IREDA

Note: For sub-projects currently under repayment, the achievement status was checked based on actual values at the time of the ex-post evaluation, and for sub-projects that had been repaid before the scheduled repayment date, the achievement status was checked based on actual values for the most recent year available.

(3) Energy substitution (tons of oil equivalent/year) and reduction of CO_2 (t-CO_2 equivalent/year)

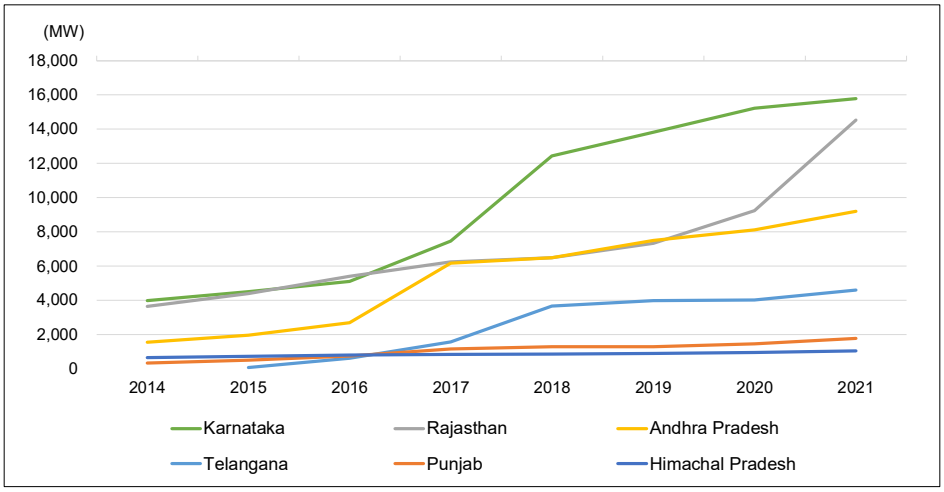
In this ex-post evaluation, the achievement was analysed by calculating and comparing the target and actual values for the "capacity factor of generation plant" set at the time of the appraisal of each sub-project, based on the formulae[8] used in the SAPI for "energy substitution" and "reduction of CO_2." Therefore, for "energy substitution" and "reduction of CO_2," as shown in Table 8, which indicates the achievement of the capacity factor of generation plants, 6 of 21 eligible sub-projects were achieved, 11 sub-projects were almost achieved as planned, 2 sub-projects were not achieved, and 2 sub-projects were not verified. The reasons for non-achievement are the same as those for the non-achievement of the "capacity factor of generation plants."

[8] Energy substitution = 85.98 (toe/year) × Installed Capacity × Capacity Factor × 24 (hrs) × 365 (days)/1000
Reduction of CO_2 = 2.26 ×85.98 (toe/year) × Installed Capacity × Capacity Factor × 24 (hrs) × 365 (days)/1000
In both formulae, 85.98 is the conversion factor for energy substitution and 2.26 is for the reduction of CO_2.

3.3.1.2 Qualitative Effects (Other Effects)

(1) Ensuring a stable electricity supply to meet increasing electricity demand

Reviewing the renewable energy power-generation capacity in the project states from the time of the appraisal to the time of the ex-post evaluation, it was found that it had increased in all states, as shown in Figure 3. In addition, the supply- demand gap for electricity narrowed significantly between FY 2016 and 2017 in all states except Himachal Pradesh, as shown in table 9. It is considered that the increase in the renewable energy generation capacity has contributed to narrowing the supply – demand gap in the project states. Around the same time, the sub-projects financed by the project started generation (Table 10). Therefore, it is assumed that the project had a certain effect on improving the supply – demand gap and ensuring a stable electricity supply in the project states.



Source: Ministry of Statistics and Programme Implementation (MOSPI) and Central Electricity Authority (CEA).

Figure 3 Renewable Energy Generation Capacity in the Project States (MW)

Table 9 Power Supply-Demand Gap in the Project States

Unit: Net Core Units = 10 MU

Name of State	2014	2015	2016	2017	2018	2019	2020	2021
Punjab	△155	△155	△342	0	3	△1	△7	△44
Himachal Pradesh	7	△9	△7	△5	△23	△7	△6	△3
Rajasthan	△768	△211	△63	△59	△20	△6	△10	△50
Karnataka	△459	△437	△593	△17	△6	0	△2	△2
Andhra Pradesh	2984	587	△393	△9	6	△4	0	△19
Telangana		△961	△308	△8	△27	△1	△1	△2

Source: Reserve Bank of India

Note 1: 1 MU= 1MW × 24(hrs) × 365(days) × Capacity factor/1,000.

Note 2: Data was not available for Telangana state in 2014, because Telangana state split from Andhra Pradesh state in June of that year.

Note 3: Numbers in the table show the power supply capacity against power demand and △ indicates an electricity shortage.

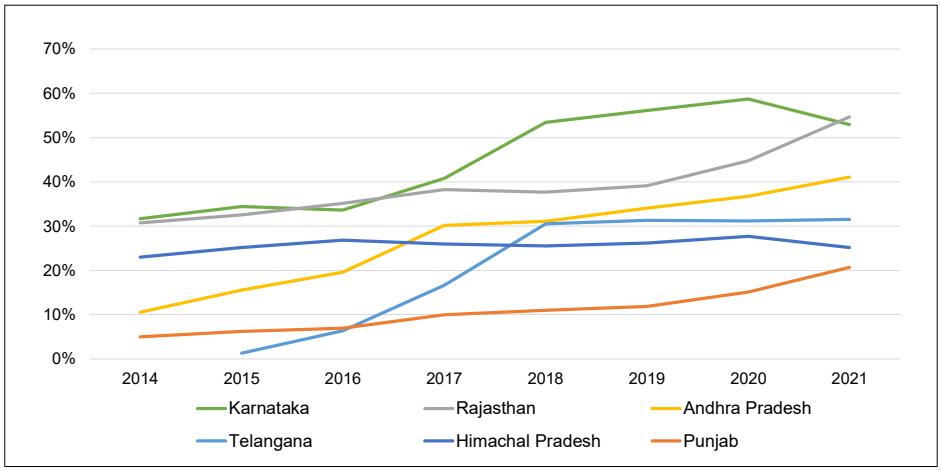
Table 10 Timing of Commencement of Sub-Projects in Target States

Year	No. of Commencements	Project States
FY 2013	1	Karnataka (1)
FY 2014	3	Karnataka (1), Punjab (2)
FY 2015	5	Rajasthan (3), Telangana (1), Andhra Pradesh (1)
FY 2016	4	Andhra Pradesh (2), Gujarat and Karnataka (2)
FY 2017	7	Rajasthan (4), Andhra Pradesh (3)
FY 2018	0	
FY 2019	1	Karnataka (1)
FY 2022	1	Himachal Pradesh (1)

Source: Evaluator

(2) Diversification of electricity supply sources

The proportion of renewal energy generation capacity to the total installed power generation capacity increased in all project states, as shown in Figure 4. It can be considered that there has been a shift from a power supply dominated by thermal power generation to a power supply incorporating renewable energy, which indicates that diversification of electricity supply sources has progressed. As shown in Table 11, in FY 2020, in Andhra Pradesh, the electricity capacity generated by sub-projects accounted for 7.76% and 6.76% of the total installed capacity of Wind and Small hydropower respectively. In Rajasthan, the sub-projects financed by the project also accounted for 2.34% and 2.79% of the total installed capacity of solar and wind, respectively. In light of the above, it can be assumed that sub-projects in project states financed by the project had a certain impact on the diversification of electricity supply sources.



Source: MOSPI and CEA

Figure 4 Percentage of Electricity Generation Capacity from Renewable Energy Sources out of Total Electricity Generation Capacity in the Target States

Table 11 Degree of Contribution to Power Source Diversification by the Project in the Target States (FY 2020)

State	Type of Power	Entire State (MW)	By Sub-Projects (MW)	Degree of Contribution
Punjab	Solar	947.1	4.0	0.42%
Himachal Pradesh	Small Hydro	911.5	19.8	2.17%
Rajasthan	Solar	5137.1	120.0	2.34%
	Wind	4299.7	120.0	2.79%
Karnataka	Wind	4790.6	16.0	0.33%
	Small Hydro	1280.7	18.9	1.48%
Andhra Pradesh	Solar	3610.0	5.0	0.14%
	Wind	4092.4	317.4	7.76%
	Small Hydro	162.1	11.0	6.79%
Telangana	Solar	3620.7	10.0	0.28%

Source: Calculated by the evaluator based on documents from MOSPI and the monitoring reports from IREDA
Note: Contribution degree = Installed generation capacity of sub-projects in each of the target states (by type of generation) / Installed generation capacity in each state (by type of generation)

3.3.2 Impacts

3.3.2.1 Intended Impacts

(1) Qualitative effect

At the time of the appraisal, environmental improvement, sustainable economic development and climate change mitigation were assumed as impacts. At the time of the ex-post evaluation, for the 19 sub-projects for which "capacity factor of generation plants" was verified, the cumulative total of energy substitution and the reduction of CO_2 were calculated from the month following the date of commissioning until FY 2022. For some sub-projects that had made prepayment prior to the repayment date, it was assumed that the capacity factor of the generation plants had remained unchanged between the final year for which actual value was obtained and the time of the ex-post evaluation. As a result, it is estimated that the sub-projects under the project have generated an energy substitution of about 410,000 oil equivalent tonnes and a reduction of CO_2 of about 119.6 million CO_2 equivalent tonnes. Therefore, the project has made a certain contribution to environmental improvement and climate change mitigation.

Table 12 Effect Indicator (Energy Substitution and Reduction of CO_2)

Indicator	Estimated Value
Energy substitution	410,000 oil equivalent tonnes
Reduction of CO_2	119.6 million CO_2 equivalent tonnes

Source: calculated by the evaluator based on actual values of capacity factor of each sub-project provided by IREDA

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Environment

The Project was classified as Category FI under the JICA Guidelines for Environmental and Social Considerations (April 2010), as sub-projects could not be identified before approval for JICA loans and such sub-projects are estimated to have an environmental impact.

According to IREDA, when a loan application is submitted by a renewable energy developer, IREDA officials visit the proposed project site to check the necessary permits and approvals, the environmental and social situation of the project site, and the status of end-user's actions for necessary consideration and environmental monitoring plans, based on the environmental screening check list. In addition, IREDA officials also visit project sites to check whether there has been any negative environmental and social impact during appraisal, construction, commissioning, and completion of the loan agreement. A total of 21 sub-projects under the project were not classified as Category A under the JICA Guidelines for Environmental and Social Considerations and were not expected to have negative environmental or social impacts. Moreover, the results of regular monitoring by IREDA were submitted properly to JICA and it was confirmed that no negative environmental or social impacts had occurred during the loan period of each sub-project.

(2) Resettlement and Land Acquisition

The results of the evaluation of the environmental screening checklist and interviews with IREDA officials during the ex-post evaluation showed that none of the 21 sub-projects under the project included resettlement. It was also confirmed that each end-user had properly acquired land for project sites in accordance with the relevant national laws of India, and that there were no particular problems regarding land acquisitions.

(3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights

As for Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights, it was confirmed that there was no negative impact from the project. The sub-projects visited by the evaluator during the ex-post evaluation actively employed local people as labourers during the construction of the power plant facilities, as well as facility maintenance staff, security guards and drivers. As part of their CSR activities[9] they provided support to the surrounding communities for medical, educational and water supply services.

In light of the above, it can be seen that the Operation and Effect Indicators of the 21 sub-projects under the project were mostly achieved. It was confirmed that there have been certain effects in securing a stable electricity supply and a diversification of electricity supply sources as well as impacts of a certain contribution to environmental improvement and climate change mitigation. No negative impacts on the environment or society were observed. Land acquisitions were carried out appropriately in accordance with the laws and regulations and no resettlement

[9] Social Contribution Activities that are carried out to fulfill the social responsibility of the company (CSR).

occurred under the project.

In conclusion, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

Column: Six Sub-Projects where a Site Visit was conducted in the Ex-Post Evaluation

	[End-user] Maheswari Mining & Energy Pvt. Ltd. [State] Telangana [Type of generation] Solar [Installed capacity] 10 MW [Commencement] 2016 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 3 of the end-user's technical staff and 5 technical staff dispatched from a foreign power generation company. In addition, local residents are employed as security guards and cleaning staff.
	[End-user] Photon Solar Power Pvt. Ltd. [State] Andhra Pradesh [Type of generation] Solar [Installed capacity] 5 MW [Commencement] 2015 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 11 of the end-user's technical staff. In addition, 6 local residents are employed as security guards and cleaning staff.
	[End-user] Greenenergy Wind Corporation Pvt. Ltd. [State] Karnataka [Type of generation] Wind [Installed capacity] 16 MW (800kW × 20 Turbines) [Commencement] 2014 [Operation and Maintenance System] The operation and maintenance of the facility is outsourced to a wind turbine manufacturer, with 20 technical staff stationed there and some local residents employed.
	[End-user] Vayu Urja Bharat Pvt. Ltd. [State] Andhra Pradesh [Type of generation] Wind [Installed capacity] 120 MW (2,000kW × 60 Turbines) [Commencement] 2017 [Operation and Maintenance System] The operation and maintenance of the facility is outsourced to a wind turbine manufacturer, with 45 technical staff stationed there. In addition, 40 local residents are employed as security guards and service staff.
	[End-user] Sri Maruthi Powergen Pvt. Ltd. [State] Karnataka [Type of generation] Hydro [Installed capacity] 24 MW [Commencement] 2019 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 25 end-user technical staff. In addition, 3 local residents are employed as security guards.
	[End-user] Cosmos Hydro Power Pvt. Ltd. [State] Himachal Pradesh [Type of generation] Hydro [Installed capacity] 19.8 MW [Commencement] 2021 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 40 end-user staff (20 technical and 20 non-technical staff).

(Source of photographs: Evaluator)

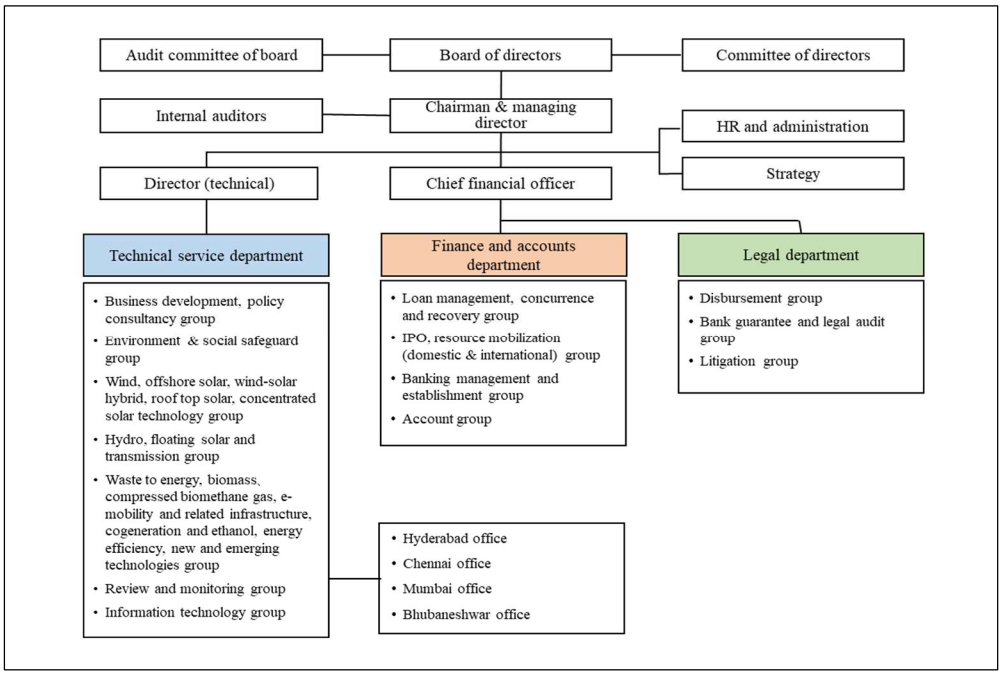
3.4 Sustainability (Rating: ④)

3.4.1 Policy and System

As stated in "3.1.1.1 Consistency with development plan of India," at COP 26 in 2021, the government of India announced the target to meet 50% of its energy needs from renewable energy sources by 2030 and to reduce carbon emissions by 1 billion tonnes. The introduction of renewable energy has also been identified as a priority in the development policies of the target states, and various policies to promote development in the renewable energy sector have been implemented at the national and state levels. Thus, the policies and systems necessary to sustain effectiveness have been ensured.

3.4.2 Institutional/Organizational Aspect

IREDA is a government-owned financial institution which was established in 1987 to promote new and renewable energy development projects in India through long-term and low-interest loans under the administrative control of Ministry of New and Renewable Energy. IREDA's organization chart is shown in Figure 5. Under the Board of Directors, the Chairman and Managing Director is placed as well as the technical service department, finance and accounts department, etc. In the technical service department, the groups responsible for solar, wind and hydro power, etc., are located as well as the review and monitoring, and information systems groups. The total number of staff is 159 (as of April 2023), including 70 staff in the technical service department and 25 staff in the finance and accounts department.



Source: Prepared by the evaluator quoting from the IREDA document (As of December 2022)

Figure 5 IREDA Organization Chart

IREDA's New Delhi head office is mainly responsible for loan appraisal, monitoring, fund raising, and loan disbursement and credit supervision. The branch offices in Hyderabad, Chennai, Mumbai and Bhubaneswar frequently visit project sites at the time of the appraisal, the first disbursement and the completion of the loan agreement, to confirm the project plans, check the status of construction and completion, and confirm the operational status of the facilities. At the same time, IREDA has hired external experts, called Lender's Independent Engineers (LIE),[10] for better monitoring. They conduct site inspections for each sub-project every quarter during the construction period of the power generation facilities and once in half a year or once a year after commissioning and provide end-users with technical and financial guidance and advice. According to IREDA, the number of staff is sufficient for IREDA's current operations, but IREDA plans to expand the number of loans and finance new areas such as green hydrogen and storage batteries. Therefore, IREDA is actively hiring new staff to strengthen its organizational structure.

As one initiative for further improvement, IREDA established Separate Monitoring Groups in its technical department consisting of technical service teams and monitoring teams for different sectors, such as solar, small hydro and wind power. Each group is responsible for the supervision of projects during the loan implementation process. Under this system, each group meets every Monday to review the quarterly monitoring reports submitted by end-users, check the operational status of sub-projects with problems and the financial status of end-users, and consider necessary measures. Since the establishment of this system, there has been an improvement in supervision, so that IREDA can now receive monitoring reports from 99% of end-users.

Therefore, no problems are found in the institutional/organizational aspect.

3.4.3 Technical Aspect

IREDA's technical department is made up of technical experts in various renewable energy sectors, who are comprehensively engaged on supervision of the sub-projects from loan appraisal, through monitoring, to the completion of repayment, and who have accumulated greater knowledge of financing in this sector than the staff of general financial institutions. The finance and accounts department sets the terms and conditions of IREDA's loans and offers appraisals for each sub-project provided by the technical service department. The two departments meet regularly for the purpose of credit protection. IREDA has established various training schemes to maintain knowledge of financing renewable energy power projects. IREDA staff attend an annual training course at the National Power Training Institute on renewable energy related technologies, finance, risk management, regulations, etc., and external experts are

[10] The Lender's Independent Engineer (LIE) is an external expert employed by a financial institution to monitor the operational, technical and financial aspects of a financed project and to advise the end-user.

invited as lecturers on new technologies to improve knowledge and service quality. At the time of the ex-post evaluation, IREDA was receiving technical transfer from two environmental and social experts hired with funds from the World Bank's Clean Technology Fund. It was confirmed that manuals for loan appraisal, loan disbursement and credit management were in place and updated on a regular basis.

IREDA is also working on further improvements and is developing a system that will allow end-users to input monitoring data (such as the operation status of a facility and financial information) directly through the IREDA portal website, instead of by email. IREDA plans to introduce the system from 2024.

Therefore, no technical problems have been identified.

3.4.4 Financial Aspect

There have been no major issues with IREDA's financial situation over the last five years. Table 13 shows IREDA's major financial data for the last five years. Regarding profit, although profit after tax decreased in FY 2018/19 and FY 2019/2020 compared to FY 2017/18, it improved to 3,464 million INR in FY 2020/21, which was similar to profit before FY 2017/18, going on to significantly increase to 6,335 million INR in FY 2021/22. The Capital Adequacy Ratio, an indicator of the company's capital strength and soundness in management, had been on a downward trend since 2012/13. However, it improved to 21.22% in FY 2020/21. The statutory minimum capital adequacy ratio for financial institutions set by the Reserve Bank of India, the country's central bank, is 12%, and IREDA has fully met this standard. The NPL ratio increased to 7.18% and 5.61% in FY 2019/20 and FY 2020/21 respectively, but it decreased to 3.12% in FY 2021/22, which was a significant improvement even during the COVID-19 pandemic and the subsequent economic downturn. This may be attributed to the fact that IREDA was able to increase the number and amount of loans, while at the same time reducing the conversion of sub-projects into non-performing loans by establishing a mechanism to identify and resolve various problems occurring in sub-projects at an early stage through a strengthening of the monitoring system.

Therefore, no financial problems have been observed.

Table 13 Major Financial Indicators of IREDA

Unit: million Rupees

	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22
Revenue	17,800	20,222	23,723	26,577	29,841
Interest Revenue	17,791	20,195	23,673	25,643	27,132
Profit before tax	5,607	3,109	2,411	5,695	8,338
Profit after tax	3,931	2,499	2,145	3,464	6,335
Dividend	1,355	1,281	exempted	exempted	exempted
Asset	202,772	245,179	276,519	302,929	367,084
Capital Adequacy Ratio	18.05%	16.32%	14.34%	17.12%	21.22%
Non-Performing Asset Ratio	3.84%	3.74%	7.18%	5.61%	3.12%

Source: IREDA documents
Note: The Department of Investment and Public Asset Management of the Ministry of Finance waived the payment of dividends for FY 2019/20, 2020/21 and 2021/22.

3.4.5 Environmental and Social Aspect

The project was required to consider environmental and social aspects, such as land acquisition and the damming of rivers for the construction of dams during the construction of the power generation facilities. Once the loan application has been submitted by the prospective borrower, IREDA conducts an environmental and social impact assessment (desk-based assessment) using an environmental screening checklist, visits a project site, checks the status of required environmental government permits and approvals, and conducts environmental monitoring during the construction and operation of the facilities until repayment. In addition, as mentioned above, the capacity of IREDA's Environmental and Social Safeguards and Safety Management Group, supported by the World Bank, has been strengthened, and a system to mitigate the risks of environmental and social considerations has been systematically put into place. These initiatives of IREDA surpass those of private sector financial institutions. Therefore, it is considered that there will be no problems in dealing with future environmental and social risks.

3.4.6 Preventative Measures to Risks

Although there is a risk that the operating conditions and power generation of renewable energy, such as solar, wind and small-hydro power, can be affected by changes in weather conditions, a certain degree of risk prediction is possible through proper analysis of the location of the project site and past weather conditions at the time of the appraisal of each sub-project. In addition, it is possible to reduce the risk of NPLs during the loan period with regular monitoring and financial analysis of the sub-project.

3.4.7 Status of Operation and Maintenance

At the time of the ex-post evaluation, one sub-project had become a non-performing loan and IREDA was not obliged to monitor 12 sub-projects that had been repaid before the repayment date. Therefore, it was not possible to directly verify the operation and maintenance of the 13 sub-projects. On the other hand, the 8 sub-projects that are still being financed have experienced no major problems in terms of the status of operation of the power generation facilities and the end-user's financial status. In the ex-post evaluation, the evaluator visited the sites of 6 sub-projects (two solar power plants, two wind power plants, and two small-hydro power plants) and confirmed that all the power generation facilities were properly maintained and managed by engineers stationed there and that there were no particular problems (See the Column).

No issues have been observed in the policy/system, institutional/organizational, technical,

financial, and environmental and social aspects, including the current status of the operation and maintenance. Future risks have been well mitigated. Therefore, sustainability of the project effects is very high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This Project aimed to secure a stable electric supply and to diversify power supply sources to meet the increasing demand for electricity by providing two-step loans, through the Indian Renewable Energy Development Agency (IREDA), to new and renewable energy development projects in India, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change. The project was consistent with the development plan and development needs of India at the time of the appraisal and at the time of the ex-post evaluation. The consistency with Japanese's assistance policy was also confirmed. Although support for the strengthening of IREDA's appraisal system for environmental and social consideration was expected at the time of the appraisal, no directly beneficial support was provided. Besides, assistance in the area of environmental and social consideration was provided by another donor and the overlap of the assistance was avoided, while there was no official coordination between JICA and the other donor. Therefore, the relevance and coherence of the project are high. Since both the project cost and the project period were within the plan, the efficiency of the project is very high. The "installed generation capacity," "capacity factor of generation plants," "energy substitution" and "reduction of CO_2," which were set as the operation and effect indicators of the target sub-projects, were generally achieved against their respective targets. In addition, the project is estimated to have made a certain contribution to securing a stable electricity supply and diversifying the sources of electricity supply in the target states. Furthermore, it is estimated that the project has made a certain contribution to climate change mitigation through the effect of energy substitution and reduction of CO_2 of the project. No negative impacts on the natural environment caused by the project were identified. Land acquisition was carried out in accordance with Indian domestic law, and no resettlement occurred. Therefore, the effectiveness and impact of the project is high. As to the operation and maintenance of this project, no issues were observed in the policy/system, institutional/organizational, technical, financial, or environmental and social aspects; in the response to weather risks affecting the operation of the renewable energy power generation or risks such as non-performing loans; or in the status of operation and maintenance. Therefore, the sustainability of the project effects is very high.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Although the executing agency is obliged to collect monitoring data on the operation of power generation facilities and the effects of environmental improvement from end-users on a quarterly basis, there were some cases where information was missing from progress reports submitted to JICA due to failures of submission by end-users. It is important that the implementing agency continuously monitor the status of sub-projects' operation from the perspective not only of increasing the effectiveness of the project, but also of protecting the implementing agency's credit. Therefore, in addition to strengthening the supervision system of each sub-project by the sectoral monitoring groups, it is necessary to continuously work on the establishment of a more efficient monitoring system, such as the system of reporting monitoring data thorough the portal site, which is planned to be introduced from FY 2024.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) Importance of project formulation based on lessons learned from similar and previous projects

Using lessons learned from similar and preceding projects, a Special Assistance for Project Implementation (SAPI) was conducted in parallel with the project to strengthen IREDA's capacity, including the maintenance of an information database for the monitoring and evaluation of the sub-projects. The ex-post evaluation confirmed that, as a result, IREDA's database had had some impact on the facilitation of project management. In addition, it is important for the implementing agency to conduct monitoring of the sub-projects in order to enhance the effectiveness of the project in two-step loans. For JICA, it is necessary to check the monitoring capacity of the implementing agency at the project formation stage and, if necessary, consider providing support for capacity building through the dispatch of experts or the carrying out of technical cooperation projects in combination with the project.

(2) The need to develop two-step loans attractive to borrowers

As financing services from financial institutions for private renewable energy projects in India were not as sufficient at the time of the planning of the project as they are today, the need for the finance of renewable energy development projects through IREDA was high. At that time, the loan terms of IREDA were competitive in the market. However, since then, with the maturing of the renewable energy market, financing options for renewable energy development projects have improved compared to the time of appraisal and IREDA has been placed in a more competitive market environment. This is due to the expansion of financial services to the sector by private financial institutions as well as loan and subsidy schemes by the government of India. The market

environment has also become more competitive. In this context, the Credit Institute for Reconstruction (KfW) which is the state-owned German development bank has started to offer non-sovereign loans to IREDA, and IREDA has also made use of non-sovereign loans and borrowing from private commercial banks to offer interest rates comparable to those of private financial institutions. In the case of yen loans, which are in principle sovereign loans, the funds are provided to the implementing agency with a certain interest rate added as a government guarantee, which increases the actual interest burden on the implementing agency and reduces the incentive of the implementing agency (borrower). In order for yen loans of the two-step loan scheme to become more attractive to borrowers, it is necessary to consider providing charge-free soft components such as the technical assistance and consulting services needed by borrowers, like the SAPI in this project, as a higher value-added service package with the loan.

5. Non-Score Criteria

5.1. Performance

5.1.1 Objective Perspective

Although IREDA did have a technical department for project appraisal, monitoring and evaluation, based on the preceding project, New and Renewable Energy Development Project (Phase 1), it was required to adapt to the significant technological innovation and diversification in the field of renewable energy and conduct smooth operation of the information system for monitoring existing projects. Therefore, JICA implemented the SAPI from December 2014 to February 2018 in parallel with the project. The aim of this was to strengthen the capacity of IREDA, in a flexible way taking into consideration IREDA's actual situation and challenges, such as strengthening the capacity for managing the information database for the monitoring and evaluation of sub-projects, and supporting the establishment of a management system for the purpose of credit protection. Meanwhile, IREDA has been able to significantly increase the number of loan approvals in response to the growing financing needs for renewable energy projects since 2014. Since the SAPI collaboration with the project also coincided with the period of expanding lending, the support to IREDA made through the SAPI made a certain contribution to IREDA's business expansion.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs (1) Number of Sub-Projects	Two-step loans from IREDA as borrower to end-users Number of sub-projects was not set	As Planned 21 sub-projects
(2) Terms and Conditions		
Eligible Sub-Projects	Power industry (Private and public companies registered in India that are investing in new and renewable energy development)	As Planned
Eligible End-Users	・Photovoltaic and Solar thermal power generation ・Wind power generation ・Small hydro power generation (less than 30 MW) ・Cogeneration power generation (using bagasse) (less than 30 MW) ・Biomass power generation (less than 30 MW)	・Solar photovoltaic power generation ・Wind power generation ・Small hydro power generation
Financing Norms and Schemes	・Set based on each end-user's credit risk. ・Interest rate: 11.90-13.25% ・Repayment period: 5-10 years (as of June 2012)	As planned or equivalent to the plan
2. Project Period	April 2014-March 2020 (72 months)	September 2014-March 2020 (66 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	 60 million yen 33,000 million yen (21,154 million Rupees) 33,060 million yen 30,000 million yen 1 Rupee = 1.56 yen (as of October 2013)	 60 million yen 33,000 million yen (20,000 million Rupees) 33,060 million yen 30,000 million yen 1 Rupee = 1.65 yen (average between 2014 and 2020)
4. Final Disbursement	March 2020	