conducted by Uruguay Office: September 2025

Country Name	**The Project for Introduction of Clean Energy by Solar Electricity Generation System**
Oriental Republic of Uruguay	

I. Project Outline

Background	According to The National Administration of Power Plants and Electric Transmissions (La Administración Nacional de Usinas y Trasmisiones Eléctricas ; UTE), the total power generation capacity in 2008 was 1,392 MW. The largest power generation capacity was by hydroelectric power, followed by gas-fired thermal, other non-gas thermal power, and wind power. Since the country is not a country producing fossil fuels such as crude oil, coal and natural gas, fluctuations in the international oil prices coupled with a decrease in hydroelectric power generation volume due to drought and other weather phenomena caused a tight energy supply and demand situation. In addition, the increasing operation rate of thermal power plants increased CO2 emissions and electricity costs that have restrained economic revitalization. Under these circumstances, renewable energy, including photovoltaic (PV) power generation, became a key issue in the country's energy strategy as a technology that reduces the burden of fossil fuels and promotes environmentally friendly energy use, and the promotion of their introduction was required.
Objectives of the Project	To increase power generation capacity, diversify power sources, and raise awareness of people of Uruguay for utilization of renewable energy by procurement of PV system and related equipment in the Salto Grande Hydropower Station, Salto as well as technical assistance for capacity building of technical personnel, and thereby contributing to demonstration of Japan's initiatives for promoting collaborative efforts by both developed and developing countries against climate change.
Contents of the Project	1. Project Site: Salto Grande Hydropower Station, Salto (Phase 1), Parque de Vacaciones (PdV), Minas City (Phase 2) 2. Japanese side <Phase 1> (1) 480 kW PV system (PV modules, power conditioner, circuit breaker, junction box, collecting box, transformer, cables, data management and monitoring system, display board and others) and spare parts (2) Technical assistance (soft component): Training on (i) operation & maintenance and data analysis, (ii) basic knowledge, technical characteristics, preventive inspection, operation and maintenance including emergency response of grid connected PV system, and (iii) awareness raising <Phase 2> (1) 250 kW PV system and (2) Technical assistance same as above. * As the project cost for the original scope (Phase 1) fell below the grant amount due to the drop in PV panel prices, an additional PV system (Phase 2) was constructed using the remaining funds. 3. Uruguay side: Land acquisition, construction of extension of 15 kV distribution line and switchgear to be connected to the PV system, and other expenses related to procurement of equipment and contracted agent which were not covered by grant aid

Project Period	E/N Date	December 14, 2009	Completion Date (ex-ante)	November, 2011	Completion Date (actual)	<Phase 1> March 2013 (Certificate of Completion) <Phase2> May 2019 (Certificate of Completion)
	G/A Date	December 21, 2009				
Project Cost	E/N Grant Limit / G/A Grant Limit: : 730 million yen, Actual Grant Amount: 730 million yen					
Executing Agency	National Electric Power Generation and Transmissions (UTE: La Administración Nacional de Usinas y Trasmisiones Eléctricas) (Ministry of Industry, Energy and Mining (MIEM) is a responsible organization, and Mixed Technical Commission for Salto Grande Hydropower Station (DU CTM) provides construction site for this project in the premises of Salto Grande Hydraulic Power Station.)					
Contracted Agencies	Main Contractor(s): Sojitsu Corporation, Marubeni Protechs Corporation Main Consultant(s): Nippon Koei Co., Ltd.					

II. Result of the Evaluation

1 Relevance/Coherence

[Relevance]

<Consistency with the Development Policy of Uruguay at the Time of Ex-Ante Evaluation >

The project was consistent with the development policy of Uruguay at the time of ex-ante evaluation. Uruguay ratified the United Nations Framework Convention on Climate Change (UNFCCC) in July 1994 and the Kyoto Protocol in November 2000. In June 2008, it established a Cool Earth Partnership with Japan and had been actively working on climate change countermeasures. The strategic guidelines of the energy policy ("Política Energética 2005-2030") of the government of Urguay

set energy diversification as one of its strategies, aiming to reduce dependence on fossil fuels and introduce renewable energy.
<Consistency with the Development Needs of Uruguay at the Time of Ex-Ante Evaluation >
The project was consistent with the development needs of Uruguay at the time of ex-ante evaluation. As mentioned above ("Background"), Uruguay faced a tight energy supply and demand situation due to international oil price and the decrease in hydroelectric power generation volume. Besides, CO2 emissions increased due to the rising operation rate of thermal power plants. Therefore, renewal energy was expected to reduce the use of fossil fuels and promote environmentally friendly energy strategy.
<Appropriateness of Project Design/Approach>
The project design/approach was appropriate. No problem attributed to the project design/approach was confirmed. In terms of the equality of benefits (consideration for marginalized people), the project was to support the development of public policies that would provide equally positive benefits to the people through the development of Uruguay's electricity grid, which has a high share of renewable energy (over 95%).
<Evaluation Result>
In light of the above, the relevance of the project is ③[1].

[Coherence]
<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>
The project was consistent with the Japan's ODA policy to Uruguay at the time of ex-ante evaluation. Environmental protection (measures to address environmental and energy issues) is one of the priority areas for assistance to Uruguay[2]. Also, the government of Japan introduced a scheme of "Program Grant Aid for Environment and Climate Change" in 2008 aiming at support for developing countries with lack of implementation capacity and funds for balancing between reduction of CO2 emission and economic growth in order to effectively promote global efforts against climate change. The project was implemented under this scheme as a mitigation measure through the introduction of clean energy.
<Collaboration/Coordination with JICA's Other Interventions>
Although the collaboration/coordination with JICA's other interventions was not planned at the time of ex-ante evaluation, continued support by JICA for the implementation and expansion of renewable energy to Uruguay is underway. In particular, a country-specific training program on "Promotion of Hydrogen Energy Utilization" was conducted in FY2023 for 10 Uruguayan participants (MIEM and UTE staff and technicians). This country-specific training program carries on the collaboration between MIEM and UTE that was formed during the photovoltaic power generation project and complements the strengthening of the implementation system in Uruguay.
<Cooperation with Other Institutions/ Coordination with International Framework>
No cooperation/coordination with other development partners was clearly planned at the time of ex-ante evaluation or during the project period.
<Evaluation Result>
In light of the above, the coherence of the project is ②.

[Evaluation Result of Relevance/Coherence]
In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Effectiveness>
The project objectives were mostly achieved as planned, as the indicators such as "Power generation volume at transmission end" (Indicator 1), "Estimated reduction of CO2 emission" (Indicator 2), and "Reduced electricity cost" (Indicator 3) achieved the targets.
As for the Phase 1 plant, the annual target figures have been almost achieved until 2023. However, since the beginning of 2024, the plant has been out of service due to power conditioner problems and malfunctioning of data logging device and operating display panel. As for the power conditioner, the Uruguayan authorities considered resolving the problem from a technical aspect. As a result, it has been indicated that power conditioner system replacement is necessary to solve this problem.
In terms of awareness-raising through the project, the Phase 2 plant of the project is located in a tourist area visited by more than 40,000 people a year, including school students, and contributes to their understanding of the country's energy policy which aims at creating awareness and educating people about sustainable development, including photovoltaic power generation. There have also been other communication activities developed by the project's facilitating agencies (MIEM and UTE).
The project strengthened the technical capacity of UTE. UTE has been responsible for the operation and maintenance of the photovoltaic plants under the project and UTE has been carrying out its responsibilities As the first PV system introduced in the country, the technology under the project was innovative in Uruguay's electricity system at the time the proposal was approved, and the technical assistance (soft-component) greatly contributed to the development of the capacity of engineers and other stakeholders in Uruguay to implement this system. The successful technical assistance rapidly increased UTE's confidence in this technology and enabled the subsequent large-scale implementation of photovoltaic projects[3].

[1] ④ : very high, ③ : high, ② : moderately low, ① : low
[2] Source: ODA Country Data Collection (2010)
[3] The PV system, which began operating in 2013 with Japanese cooperation, was the first PV project in Uruguay. Since then, the number of photovoltaic projects has steadily increased, and the capacity building and human resource development of Uruguayan institutions with Japanese cooperation has contributed to the expansion of PV in Uruguay, according to this report by the Ministry of Industry, Energy and Mining (MIEM) (https://www.energiasolar. gub.uy/index.php/institucional/energia-solar-fotovoltaica).

The report's solar power generation trends are shown below.

<Impact>

The project was expected to contribute to demonstration of Japan's initiatives for promoting collaborative efforts. The installation of these pilot plants, especially the Phase 1 plant, had a significant positive impact on the subsequent development of public policies that encouraged the installation of large-scale photovoltaic systems. This has not only contributed to the decarbonization of the Uruguayan electricity supply matrix but has also strengthened the energy security of supply system and strengthened the country of Uruguay.

In terms of social equity and inclusiveness, the national electricity tariff system employs a "solidarity" mechanism, whereby contributions from users with relatively low costs will partially finance the energy supply of users in areas with higher costs (isolated areas or areas with low population density)[4].

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ③.

Quantitative Effects

Phase 1

	Baseline (2010) Baseline Year	Target (2013)*1 3 years after Completion	Actual (2013) Year of Completion	Actual (2014) 1 year after Completion	Actual (2015) 2 years after Completion	Actual (2016) 3 years after Completion	Actual (2023) Year of ex-post evaluation
Indicator 1: Power generation volume at transmission end (MWh/year)	0	648	652	727	707	628	653
Indicator 2 Estimated reduction of CO2 emission (ton/year)	0	168	169	188	183	162	169
Indicator 3 Reduced electricity cost (US$/year)	0	32,400	32,600	36,350	35,350	31,400	32,650

Source: UTE

Note 1: Calculation Methodology is as follows:

Annual CO2 emission reduction = emission reduction unit× annual power output

= 0.259 (kg-CO2/kWh) × 647,534 (kWh/year) = 167,712 (kg-CO2/year) ≒ 168 (ton/year)

(CO2 Emission Reduction Unit＝0.259 kg-CO2/kWh)

Note 2: Electricity tariff is US$50 per MWh (unchanged from 2010 to 2023)

Phase 2

	Baseline (2019) Baseline Year	Target	Actual (2020) 1 year after Completion	Actual (2021) 2 years after Completion	Actual (2022) 3 years after Completion	Actual (2023) Year of ex-post evaluation
Power generation volume at transmission end (MWh/year)	0	-	354	381	388	363

Source: UTE

3.Efficiency

Although the project cost was as planned (the ratio against the plan: 100%), the project period considerably exceeded the plan (the ratio against the plan for phase 1: 200%). The project period exceeded the plan due to procedural reasons as follows: (1) Delivery of Site was delayed 5 months. There were technical problems in securing the normal frequency for connection to the grid, which took time to identify and resolve, thus delaying the delivery of the system by 11 months. (2) The Phase 1 project was scheduled to be completed in November 2011, but the completion was delayed due to delays in site preparation issues that were to belong to the Uruguayan side. Construction was completed in May 2013 including soft component.

	Project Cost (Japanese side only, yen)	Project Period (months)
Plan (ex-ante)	730 million	20
Actual	730 million	40 (Phase 1 only)
Ratio (%)	100	200

Outputs were produced as planned.

In the light above, the efficiency of the project is ②.

Year (production; ktep): 2014(0.3)/2015(4.2)/2016(13.1)/2017(23.1)/2018(38.7)/2019(38.1)/2020(39.8)/2021(41.9)/2022(44.1)/2023(44.1)

[4] In order to address the problem of different electricity costs between urban and rural areas, especially in remote areas, UTE has introduced a rate equalization system in its rate setting. This system ensures that residents in rural and remote areas do not have to pay higher rates than those in urban areas. In rural and remote areas, the cost of supplying electricity may be higher due to the lack of electricity supply infrastructure and long transmission distances. As a result, the cost of supplying electricity in rural areas tends to be relatively higher than in urban areas.

4 Sustainability

< Institutional/Organizational Aspect>

The organizational structure for Operation and Maintenance (O&M) of the facilities have been appropriate.

MIEM signed an agreement with UTE that both parties had obligations, responsibilities, and rights regarding the power plant. This agreement facilitated coordination and cooperative efforts between MIEM and UTE engineers. Since the work between MIEM and UTE technicians was flexible, cooperative, and open to sharing acquired knowledge, the evaluation has been very positive.

UTE has been responsible for the operation, maintenance, and management of the facility. It also has provided information on the performance of the facilities. MIEM has managed to maintain open communication with UTE regarding plant operations and supervises actions for the proper management of various resources to ensure the proper functioning of the facilities.

The number of UTE staff who are responsible for operation, maintenance, and general monitoring is two. The number of technical personnel has been sufficient to carry out proper operation and maintenance, as well as to monitor the overall operating conditions of the facilities.

<Technical Aspect>

As mentioned above (2. Effectiveness/Impact), the staff at UTE has had technical quality. Various technical courses and professional update offerings have been generated, both at the level of technical universities and professional institutions.

<Financial Aspect>

While the budget for personnel and operating expenses at UTE has been generally covered, systematic planning the budget for medium-term facility renewal needs seems inadequate.

<Environmental and Social Aspect>

No issue on environmental and social aspects has been observed, and it has not been necessary to take any countermeasures.

<Current Status of Operation and Maintenance>

There has been no problem with the condition of the PV modules, however, the replacement of power conditioners for the Phase 1 project and other equipment that must be replaced or updated after a certain number of years have not been implemented. This is because the Uruguayan agencies were waiting for the completion of the defect inspection of the Phase 2 (the inspection was completed in August 2022), as they considered it necessary to coordinate with the Japanese side since it would be a quite large-scale replacement. The Uruguayan authorities would try to bear some of the burden if they are replaced. Due to security reasons of UTE's internal communication network caused by a malfunction of the data logging device and operating display panel for Phase 1 plant (The data of the communication and control system was not displayed correctly, which did not meet the cyber security requirements set by UTE. In addition, the PC that controls the operation was operated by the old operating system, which had been malfunctioning), which caused the need to disconnect the facility from the electric power network in early 2024. As for the Phase 2 plant, 64 sulfated connection points have been found[5]. It is not possible to operate and control certain parameters remotely, which complicates operations.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the financial aspect and the current status of operation and maintenance. Therefore, the sustainability of the project effects is ②.

5 Summary of the Evaluation

The project mostly achieved the project objectives, as the "Power generation volume at transmission end" "Estimated reduction of CO2 emission," and "Reduced electricity cost" achieved the targets. The project raised the awareness of people for renewable energy and strengthened the operation and maintenance capacity. As for impacts, the project encouraged the installation of large-scale photovoltaic system. As for sustainability, some problems have been observed in terms of the financial aspect and the current status of operation and maintenance, however, there have been no problems in terms of institutional/organizational, and technical aspects. As for efficiency, although the project period significantly exceeded the plan, the project cost was as planned.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations to Executing Agency:

- Up to 2023, the year for the ex-post evaluation by JICA, the target figures (indicators) were achieved, and the objectives of the project were almost achieved as planned. However, since the beginning of 2024, the Phase 1 project has been stopped due to a malfunction of the power conditioner. Eleven years have passed from the start of operation in 2013 to the present, and each equipment of the PV facility is nearing the end of its lifetime, it is necessary to replace not only the power conditioner but also other equipment at appropriate times while keeping the facility in operation, it is recommended that MIEM and UTE take the budget consider measures such as setting aside a reserve fund for this purpose in accordance with the timeline for policy and budget formulation on the Uruguayan side.
- The capability of remote data collection and remote control is an important factor in efficient management of photovoltaic power plants. It is recommended that when replacing equipment in photovoltaic facilities, remote monitoring and control functions be included.

Lessons Learned for JICA:

- Under the project, there was appropriate coordination, demarcation of roles, and allocation of human resources between the supervising ministry and the executing agency. MIEM, the supervising ministry signed an agreement with UTE, the

[5] In some of the PV power plant's wiring connections, metal parts were found to have a whitish discoloration and are corroding. This is due to a phenomenon called "sulfation" caused by sulfur components in the air and humidity. As sulfation progresses, the flow of electricity at the connection points becomes impaired, which may lead to a decrease in power generation efficiency and equipment failure.

executing agency through which both sides assume obligations, responsibilities, and rights related to the solar power plant. The implementation of the project thus proceeded smoothly. In the planning stage, this kind of arrangement for the stakeholders is effective for other similar projects.

Phase 1 (Salto) project

Phase 2 (Minas) project