



1. Project Data

Project ID P148560	Project Name ESDP	
Country Micronesia, Federated States of	Practice Area(Lead) Energy & Extractives	
L/C/TF Number(s) IDA-H9570	Closing Date (Original) 31-Jul-2018	Total Project Cost (USD) 12,480,007.28
Bank Approval Date 29-May-2014	Closing Date (Actual) 30-Sep-2019	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	14,400,000.00	0.00
Revised Commitment	13,849,107.05	0.00
Actual	12,478,166.19	0.00

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2. Project Objectives and Components

a. Objectives

The Project Development Objectives (PDOs) as stated in the Financing Agreement (Schedule 1, page 5) and the Project Appraisal Document (page 6) were:

" To increase the available generation capacity and efficiency of electricity supply in the state power utilities, and to strengthen the planning and technical capacities of the recipient and the state power utilities in the energy sector "



This assessment is based on the three sub-objectives: (1) to increase the available generation capacity in the state power utilities: (2) to increase the efficiency of electricity supply in the state power utilities: and, (3) to strengthen the planning and the technical capacities of the national government and the state power utilities in the energy sector.

b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

There were three components (PAD, pages 6 -7).

1. Increasing available generation capacity and efficiency of electricity supply in the state power utilities. The estimated cost at appraisal was US\$9.2 million. The actual cost was US\$9.1 million. This component aimed at financing activities to increase the available generation capacity and improve the efficiency of electricity supply in the state power utilities. There were two subcomponents. Sub-component One activities included: (i) acquisition and installation of new fuel-efficient gensets for the Pohenpei Utilities Corporation (PUC), the Kosrae Utility Authority (KUA) and the Yap State Public Service Corporation (YSPSC): (ii) acquisition and installation of equipment (capacitor banks, temperature compensated digital fuel meters and prepaid meters) for YSPSC: (iii) acquisition and installation of grid connected photovoltaic generators and upgrading the public street lighting system for the Chuuk Public Utility Corporation (CPUC). Sub-component Two activities aimed at capacity-building activities to improve the technical performance of the state utilities.

Some new activities were added during implementation. These activities were: (i) transformer and switchgear upgrades for YSPSC: (ii) a new transformer, streetlighting, cash power meters and Supervisory Control and Data Acquisition (SCADA) for KUA: (iii) rehabilitation of a diesel genset, energy assessments, maintenance for two gensets and SCADA for PUC: and, (iv) additional street lighting, cash power meters and photovoltaic system for CPUC.

2. National and state energy planning. The estimated cost at appraisal was US\$3.4 million. The actual cost was US\$1.4 million. Activities in this component included: (i) preparing energy master plans for each state of the Federated States of Micronesia (FSM) identifying and prioritizing energy sector infrastructure investments, (ii) undertaking feasibility studies and environmental and social impact assessments; and (iii) developing a national energy sector master plan to build on the master plans developed by each state.

3. Technical assistance and project management. The estimated cost at appraisal was US\$1.5 million. The actual cost was US\$1.9 million. This component aimed at capacity building of the Energy Division of the National Department of Resources and Development (NDRD), and the Association of Micronesian Utilities for data collection, developing the Information Management System, implementing the national



energy policy, broadening dialogue on sector reforms, and capacity building of the Energy Division for project coordination, management and monitoring.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project cost. The estimated project cost at appraisal was US\$14.4 million (including a contingency allowance of US\$0.2 million). The actual cost was US\$12.5 million.

Project financing. The project was financed by an IDA grant of US\$14.4 million. The amount disbursed at closure was US\$12.5 million. The difference between the grant and the amount disbursed was partly due to exchange rate changes during implementation. US\$550,000 of the grant could not be utilized, as delivery of new equipment in few cases could not be made by the closing date. The unspent funds were reallocated for another project within the IDA portfolio. There was parallel financing for complementary sector activities from the Asian Development Bank (ADB), the European Union (EU), Japan International Cooperation Agency (JICA), the United Nations Development Program (UNDP), and the European Investment Bank (EIB).

Borrower contribution. None was planned at appraisal. There was no borrower contribution during implementation.

Dates. The project was approved on May 29, 2014, and scheduled to close on July 31, 2018. After one extension, the project closed fourteen months behind schedule on September 30, 2019.

Other changes. There were two Level 2 restructurings. The following changes were made through the first restructuring on July 19, 2018.

- The closing date was extended by fourteen months from July 31, 2018 to Sept 30, 2019 to reallocate over US\$1.5 million of unspent funds from Component Two activities to revised Component One activities, in view of the slow start to implementation in two state power utilities (CPUC and KVA).

The unspent amount of US\$550,000 was reallocated to another project under the IDA portfolio at the Government's request, through the second restructuring on September 24, 2019.

3. Relevance of Objectives

Rationale

Country context. The Federated States of Micronesia (FSM) in the Pacific Islands, is a federation of four semi-autonomous states (Chuuk, Kosrae, Pohnpei and Yap), with each state having its own development strategy, and the national government providing national vision. Economic activity in FSM was constrained



due to the extreme geographic dispersion and remoteness to markets. As in other Pacific Island countries, petroleum fuels are used in FSM mainly for electricity generation, and heavy dependence on imported fuel made the country highly vulnerable to petroleum price volatility and price shocks. The key issues of the FSM's electricity sector at appraisal included the following: (i) over-dependence of the sector on imported fuel; (ii) insufficient firm generation capacity to cover peak demand; (iii) unscheduled generation shutdowns causing widespread outages and rotational load shedding; (iv) limited use of renewable energy sources and financing constraints for investments in such sources; (v) outdated power infrastructure assets; (vi) tariffs that did not fully cover costs; and (vii) weak technical capacity to manage operations and plan new investments.

Government strategy. Developing the energy sector was an important component of the government's Strategic Development Plan (SDP), that provided a road map for the country's social and economic development over twenty years (2004-2023). The National Energy Policy (NEP) adopted in 2012, had four primary components: policy and planning; conventional energy (fossil fuel); energy efficiency and conservation; and the development of renewable energy sources. The NEP aimed at increasing the share of renewable energy to 30% of energy supply by 2020. Each state had their own action plan for meeting the NEP goals.

Bank strategy. The PDOs were well-aligned with the Bank's Country Partnership Strategy (CPS) for 2014-2017. The second theme of the CPS explicitly stated the need for improving energy sector infrastructure. The PDOs were consistent with the Bank's regional engagement strategy in the Pacific Islands. This strategy highlighted the need for strengthening capacities for improving service delivery and building resilience to external shocks. The PDOs were also in line with the Bank's corporate goals to end extreme poverty and shared prosperity, by facilitating FSM's efforts to improve power generation efficiency in the short run and providing cleaner and less expensive electricity in the medium term. The PDOs remain consistent with the Bank's current Regional Partnership Framework (RPF) for 2017-2021, for nine Pacific Island countries, including FSM. The framework prioritized areas of engagement including "improving electricity supply and efficiency, and setting the stage for increasing renewable energy".

This was the first energy sector project financed by the Bank in FSM. The ICR (paragraph 28) states that although the PDOs were relevant, the PDOs could have been even more relevant, had the project activities included demand-side measures, rather than being limited to supply-side measures of increasing generation capacity. This review concludes that, given the weak implementation capacity of both the national government and the states, and given that this was the first energy sector project financed by the Bank in FSM, the overall level of ambition of the project was appropriate. The relevance of PDOs is rated as High.

Rating

High

4. Achievement of Objectives (Efficacy)



OBJECTIVE 1

Objective

To increase the available generation capacity in the state power utilities

Rationale

Theory of Change. The causal links between the project activities, their outputs and outcomes were logical, and the intended outcomes were measurable. Installing new fuel-efficient gensets in the three state utilities (KUA, PUC and YSPSC) would increase the capacity of new diesel-based generation, and this in turn can be expected to increase the reserve margin generation required for reducing the duration and frequency of power outages in the FSM states.

Outputs

- New gensets were installed in PUC, KUA and YSPSC.
- Conventional generation equipment was commissioned as targeted.
- Solar energy generation equipment was commissioned as targeted.
- Program to improve performance of the utilities, including capacity building and Operation and Maintenance (O&M) plans, was completed as targeted.

Outcomes

- Generation capacity from conventional sources in the four states, increased to 6.2 megawatts in 2019, relative to the baseline. This represented a 32% increase, compared to the target of 4.7 megawatts.
- Generation capacity from renewable energy (solar) sources, increased to 0.4 megawatts in 2019, relative to the baseline. This represented a 50% increase, compared to the target of 0.2 megawatts.
- 62,632 electricity consumers in the residential, commercial, service and the government sectors, directly benefited from project activities. This represented a 25% increase, relative to the target of 50,000 beneficiaries. 50% of the beneficiaries were women.

The ICR (paragraph 30) reports that the amount of additional capacity, which exceeded the original target for two utilities (PUC and CPUC), was lower than the original estimate for KUA, and was the same as the original estimate for YPSC. The lower than expected cost of solar photovoltaic (PV) installation allowed for additional capacity at the original budgeted cost. Each state met the generation N-1 criterion, with the increased reserve margin of generation, which reduces the duration and frequency of power outages. Reliability of services improved, most notably at PUC. In the PUC system, the System Average Interruption Duration Index (SAIDI) was reduced from approximately 8,600 minutes per year to approximately 4,000 minutes per year. The ICR notes that the benefits were the most evident in the case of PUC, where the new firm capacity provided by the project was essential in helping solve a power supply crisis on Pohnpei island, which resulted from a failure of all four of the previously operational gensets.

The outcomes exceeded the targets. Given that the outcomes could be directly attributable to the project, the project's efficacy in achieving this objective is rated as High.

Rating



High

OBJECTIVE 2

Objective

To increase the efficiency of electricity supply in the state power utilities.

Rationale

Theory of change. The causal links between the project activities, their outputs and outcomes were logical and the intended outcomes were measurable. Installation of new gensets in the states, together with installing capacitors, temperature compensated digital fuel meters and prepaid meters for YSPSC, and grid-connected solar photovoltaic plants and upgrading street lighting for CPUC, were likely to improve the quality and efficiency of the electric supply system and thereby aid in the long-term outcome of reducing the cost of electricity through reduced fuel consumption and more efficient operations.

Outputs

- In addition to the three new gensets for the three utilities described above, other equipment such as capacitor banks, digital fuel meters and prepaid meters were installed in YSPSC, and grid-connected photovoltaic meters were installed in CPUC.
- 2,733 energy-efficient streetlights were installed by the utilities. This represented 742% of the original target of 368 streetlights.

Outcomes

The efficiency improvements were expected to come from network efficiency benefits associated with new diesel generation, increase in capacity for solar energy, and energy savings resulting from the installation and operation of more efficient street lighting. The outputs described above were expected to generate a project lifetime savings of 124 megajoules. The projected savings substantially exceeded the original target, with an updated estimate of 915 megajoules over a ten-year time, using initial operational results.

Another criterion for measuring the efficiency of electric supply, due to the improvement in the system-level fuel intensity, is Kilowatt generated per gallon (KW/gallon). Data generated by PUC showed a 25.8% improvement (from 11.48 KW/gallon in 2014 to 14.45 KW/gallon in 2019), and data provided by YSPSC showed a 11.4% improvement (from 14.46 KW/gallon in 2014 to 16.44 KW/gallon in 2019). The ICR notes that updated operational data are still awaited from the other two utilities, as the relevant generating plans were just commissioned recently.

The outcomes far exceeded the targets and given the likely attribution of outcomes to the project's activities, the project's efficacy in achieving this objective is rated as High.

Rating

High

OBJECTIVE 3



Objective

To strengthen the planning and the technical capacities of the national government and the state power utilities in the energy sector.

Rationale

Theory of Change. The links between the project activities, their outputs, and their outcomes were logical and the causal chain was clear. Capacity building of the national government and each state for preparing master plans, of the Energy Division of the National Department of Resources and Development and the Association of Micronesian Utilities (AMU) for data collection, utility bench-marking, and the program to improve technical performance, were all aimed at strengthening the planning capability of the national government and the state utilities. The combination of the investment activities described above, and the capacity building activities were likely to contribute to the long-term development objective, of improving the delivery of electricity services that is reliable, affordable and less vulnerable to the volatility in fossil fuel prices.

Outputs.

The following outputs were completed as targeted.

- Energy sector master plans were approved in each state, and the national sector master plan that would build on the state energy plans was developed.
- The energy sector information system was completed. The master plans are now being used by the utilities, the National Department of Resources and Development (NDRD), and the various donors for planning future investments. The models, inputs and calculations that have been provided to the FSM counterparts are designed to be regularly updated. The modelling exercise showed that the needed transformation would be achieved mainly by adding a large amount of solar PV capacity (plus storage) to reduce reliance on diesel and providing increased access (including mini-grids on outlying islands).
- Technical assistance was provided for capacity building of the Energy Division of the National Department of Resources and Development and the Association of Micronesian Utilities for data collection, utility bench-marking and conducting policy dialogue, as targeted.

Outcomes.

- The sustainability program was agreed with each power utility as targeted.

The key outcome indicator was reported as realized, but there was no beneficiary survey or other measurement instrument when the project closed in September 30, 2019, that could provide tangible and credible evidence on the extent to which the technical assistance provided by the project, did contribute to strengthening the planning and technical capacities of the national government and the state power utilities.

According to the information provided subsequently by the team, the Bank conducted an interview-style survey at the end of June 2020, with the leaders of the four state utilities, to evaluate the planning and technical capacities of the national government and the power utilities. The main conclusions of the survey were: (i) The planning capacities of the national government and utilities were strengthened and the government and utilities were promoting the implementation of the Master Plan, prepared under the project in a coordinated and effective manner: (ii) The facilities constructed under the project are now being operated and maintained by the strengthened technical capacities of the utilities: and (iii) The government and the



utilities had made the necessary effort to maintain and improve capacity through providing continuous opportunities for training staff.

In light of the additional evidence provided by the team through the survey with utility leaders, the project's efficacy in achieving this objective is rated as High.

Rating
High

OVERALL EFFICACY

Rationale

Efficacy of the three sub objectives were rated as High. The overall efficacy is rated as High.

Overall Efficacy Rating

High

5. Efficiency

Economic analysis. A cost-benefit analysis was conducted for activities associated with Component One activities, which accounted for 76% and 49% of the costs at appraisal and at closure respectively. The economic benefits were assumed to come from better and more economic delivery of electricity services, reducing petroleum fuel imports, and reducing FSM's vulnerability to volatile fuel price and supply risks. The methodology used at closure used updated operational data reflective of the utility system as a whole. The updated Net Present Value (NPV) at 12% percent discount rate was US\$5.93 million at closure, as compared to the NPV of US\$5.03 million at appraisal. The ex post Economic Internal Rate of Return (EIRR) was 28.8%, compared to the ex ante EIRR of 25.5%.

Financial analysis. A financial analysis was conducted to determine the financial viability of the investments. The investments were expected to have a significant positive impact on the financial position of the four utilities through reducing operating costs. The financial NPV at closure was US\$5.34 million, as compared to the NPV of US\$5.16 million at appraisal, and the ex post Financial Internal Rate of Return (FIRR) was 27.5%, as compared to the ex ante FIRR of 25.8%.

Administrative and operational issues. There was a slow start to project implementation, with regard installing new generating capacities at KUA and the CPUC. There were implementation delays, due to inadequate staffing of the implementing agency during much of the implementation period, due partly to the extreme remoteness of the locations and challenges associated with recruiting qualified personnel. These



delays contributed to the 14-month extension of the closing date (while noting positively the additional time was also used to apply the cost savings from Component Two activities to provide additional equipment for the utilities).

Efficiency is rated as substantial given the achieved rates of return, while noting the administrative and operational shortcomings during implementation.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	25.50	76.00 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	28.80	49.00 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The relevance of the PDOs to the government and Bank strategy is rated as High. With efficacy ratings for the three sub objectives rated as High, overall efficacy is High. Efficiency is rated as substantial. In line with the Bank's ICR preparation guidelines, these sub-ratings lead to an overall project outcome rating of Highly Satisfactory.

a. Outcome Rating

Highly Satisfactory

7. Risk to Development Outcome

Financial risk. There is financial risk to the long-term viability of the power sector, given that the electricity tariffs do not fully cover costs in the four state utilities.



Technical risk. The ICR (paragraph 63) notes that high-speed mobile gensets provided under the project are not designed for long-duration prime mover demands, and would need to be replaced quickly. The ICR notes that a follow-on project aims to address this issue by providing 7.5 megawatts of medium speed gensets for PUC, that would help ensure reliable long-term operation.

8. Assessment of Bank Performance

a. Quality-at-Entry

As the first energy sector project financed by the Bank in FSM, the project was based on the Bank's experience of designing energy sector projects in other Pacific Island countries. Lessons incorporated at design included responding to the national and state priorities of improving the performance of power utilities in the short term and diversifying the energy mix in the medium run to reduce reliance on petroleum imports, deliberately keeping the design simple in view of the weak implementation capacity, and funding key operational and technical positions for supporting the implementing agency. The implementation arrangements were appropriate, with the Energy Division of the National Department of Resources and Development (NDRD) responsible for project implementation, and a Centralized Implementation Unit in NDRD responsible for addressing fiduciary and safeguards issues. Several risks were identified at appraisal, including a high risk associated with lack of technical capacity. Mitigation measures included a technical assistance component. With mitigation measures, the project risk was rated as substantial at appraisal. (PAD, paragraph 35). The arrangements made at appraisal for safeguards and fiduciary compliance were appropriate (discussed in section 10). There were shortcomings in M&E (discussed in section 9).

Quality-at-Entry Rating

Satisfactory

b. Quality of supervision

Twelve Implementation Status and Results Reports were archived during the project lifetime, implying twice a year supervision missions. Given the cost savings realized during implementation, the supervision team aided by adding additional components for Component One, and allocated the unspent amount of this loan at closure to another project in the IDA portfolio at the Government's request. The support provided by the team aided in safeguards compliance (discussed in section 10).

The ICR provides no details on the continuity of leadership during implementation. According to the Borrower's ICR provided in the Annex, there were deficiencies in the Bank performance with respect to procurement of several goods and consulting services, which contributed to delays during implementation.



Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The Energy Division of the National Department of Resources and Development (NDRD) was in charge of monitoring project performance. The results framework was clear and the key outcome indicators (increase in generation capacity with increased reserve margin of generation, project lifetime savings, and the number of electricity consumers benefiting from the project activities) were appropriate for monitoring performance Component One activities. The targets were clearly specified.

Given that technical assistance was an important component of the project, the M&E framework could have included a beneficiary survey, to assess the extent and the specific ways in which the institutional strengthening and capacity building benefited the project stakeholders.

b. M&E Implementation

The ICR notes that the required data for monitoring performance was simple to collect and generally coincided with milestones (such as the installation of key equipment).

c. M&E Utilization

The M&E data was utilized for monitoring project performance. The first restructuring was based on M&E data. This provided stakeholders with a timely picture of the progress of the project on the ground.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

The project was classified as a Category B project under the World Bank's safeguard policies. Six safeguard policies were triggered at appraisal: Environmental Assessment (OP/BP 4.01), Natural



Habitats (OP/BP 4.04), Physical Cultural Resources (OP/BP 4.11), Forests (OP/BP 4.36), Involuntary Resettlement (OP/BP 4.12), and Safety of Dams (OP/BP 4.37).

The PAD (page 28) notes that the expected environmental impacts of investments that were known at appraisal, were expected to be minor. An Environment Management Plan (EMP) was prepared and publicly disclosed at appraisal for these activities. Although Component Two activities of preparing the national plan did not entail infrastructure investments, an Environmental and Social Impact Framework (ESIF), an EMP and a Resettlement Plan were to be prepared during implementation. The ICR (paragraph 56) notes that an ESIF and a Resettlement Policy Framework (RPF) were prepared during implementation.

The ICR (paragraph 56) notes that there was overall safeguards compliance, and that there were no issues associated with environmental safeguards and safeguards on natural habitats, physical cultural resources, forests, involuntary resettlement and safety of dams during implementation.

b. Fiduciary Compliance

Financial management. Financial management arrangements were centralized in the National Department of Resources and Development (NDRD). A financial assessment conducted at appraisal concluded that the arrangements were satisfactory. Financial management risk was rated as substantial at appraisal, in view of the weak implementation capacity (PAD, paragraph 25). The ICR (paragraph 57) notes that there was overall compliance with financial management. However, the ICR provides no details on the quality of audits.

Procurement. A procurement assessment was conducted at appraisal. The procurement risks identified at appraisal included, lack of procurement and technical capacity, possibility of low participation by bidders, and lack of proper cost estimates. The mitigation measures adopted at design included hiring a qualified procurement advisor and technical consultants, and developing a packaging strategy to attract participation from international bidders. A procurement plan was prepared at appraisal to address procurement issues (PAD, page 25).

The ICR does not report any cases of mis-procurement. However, there were procurement issues (such as delays in the hiring of advisors) during implementation and a full-time procurement manager was never hired as envisioned at appraisal.

c. Unintended impacts (Positive or Negative)

d. Other



11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Highly Satisfactory	Highly Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

The ICR draws the following main lessons from the experience of implementing this project, with some adaptation of language:

1. A targeted holistic package of support can be beneficial in small island contexts.

The concept note of this project identified issues in the power sector in FSM, which seemed to be common to small island states such as high cost of imported fuel, tariffs not reflective of costs, and inadequate technical and managerial capacity. The lesson is that providing support for purchase of critical equipment linked to improving efficiency of electric supply and capacity building for key institutions, can be useful in small island states.

2. A centralized implementation unit for addressing fiduciary and safeguards issues, can be useful in countries with limited capacity for implementing Bank-financed projects.

A centralized unit set up during implementation of this project aided in working effectively to address such issues.

3. Demand-side issues need to be included for an effective sustainable energy strategy.

The activities in this project addressed supply side and institutional strengthening issues, given the weak implementation capacity. As the first energy sector project in FSM, a lesson is that future projects should also consider incorporating demand-side issues in the energy sector.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is well-written and provides a convincing account of the implementation challenges. It candidly discusses the issues associated with staffing key positions. The ICR gives adequate evidence for efficacy and draws reasonably good lessons from the experience of implementing this project.



The ICR's original evidence was inadequate to support a High rating for PDO3. For both accountability and lesson-learning purposes, it would have useful to include in the ICR all the necessary supporting evidence, instead of providing it separately after the ICR had already been widely reviewed. The information provided in the ICR on Bank supervision is sparse. It is not clear whether there was continuity of team leadership on the part of the Bank. The ICR also does not provide enough information on the quality of audits.

a. Quality of ICR Rating
Substantial