



1. Project Data

Project ID

P117864

Project Name

PE Second Rural Electrification

Country

Peru

Practice Area(Lead)

Energy & Extractives

L/C/TF Number(s)

IBRD-80340

Closing Date (Original)

28-Feb-2016

Total Project Cost (USD)

82,705,000.00

Bank Approval Date

21-Apr-2011

Closing Date (Actual)

31-Aug-2017

IBRD/IDA (USD)

Grants (USD)

Original Commitment

50,000,000.00

0.00

Revised Commitment

43,834,175.24

0.00

Actual

43,834,175.24

0.00

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2. Project Objectives and Components

a. Objectives

The Project Development Objective (PDO) for the Second Rural Electrification Project (RE2) as stated in the Loan Agreement (Schedule 1, page 5) and in the Project Appraisal Document (PAD, page 5):

"To increase access to electricity in rural areas of Peru on an efficient and sustainable basis."

The PAD (pages 5-6) notes that this project was to build on the achievements of the prior Bank -financed First Rural Electrification Project (RE1) in more challenging conditions, providing electricity service in localities that are increasingly distant from the grid and with more dispersed populations.



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 5 -6).

One. Rural Electrification Subprojects. Appraisal estimate US\$61.60 million. Actual cost US\$ 47.31 million. This component was to provide part of the investment costs of rural electrification sub-projects to be implemented by qualified service providers, to extend services to serve 42,500 households and small enterprises. Subprojects included extension of the electricity grid (through construction of medium and low voltage transmission lines and substations) to serve new customers and providing individual solar Photovoltaic (PV) systems (including a PV module, controller, battery and fluorescent lamps). Financing mechanism included: (i) subsidies to the electricity distribution companies to partially finance the capital costs of subprojects: (ii) the companies were expected to finance part of the investment cost: and, (iii) the subsidies to companies were to meet minimum criteria, including acceptable rate of return to the distribution companies.

Two. Technical Assistance for Rural Electrification. Appraisal estimate US\$4.40 million. Actual cost US\$5.91 million. Activities included complementary technical assistance activities to the RE1 project such as: (i) promoting productive uses of electricity. According to the Live wire (A Knowledge Note Service from the Energy and Extractives Global Practice) "*Promoting Productive Uses of Electricity in Rural Electrification Programs: Experience from Peru*", "Any use of electricity that generates income for the user is a productive use of electricity." In Peru examples include, using electric motors to grind grains, processing coffee and electric pumps to irrigate the land and thereby improve growing conditions and yields. (ii) assessment of renewable energy sources: (ii) assistance to the distribution companies and other stakeholders in preparing and implementing PV projects, monitoring rural service quality and socio-economic assessment of impacts.

Three. Project Management. Appraisal estimate US\$3.68 million. Actual cost at closure US\$4.22 million. This component supported the overall management of the project in three areas: (a) evaluation and supervision of investment sub-projects. (b) Monitoring. and, (c) Fiduciary management and safeguards.

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

Project Cost. Appraisal estimate US\$69.69 million. Actual cost US\$57.45 million. Actual cost of components two and three were 34% and 14% higher and cost of component one activity was 23% lower than estimated at appraisal. The increase in cost of components was covered through reallocation of spending between components.

Project Financing. The project was financed by an IBRD loan of US\$50.00 million. Revised estimate US\$43.83 million. US\$5.42 million was cancelled following project restructuring (discussed below) and an



additional US\$0.74 million was cancelled at the end of the grace period on December 31, 2017. Amount disbursed US\$43.83 million.

Borrower Contribution. Borrower contribution was estimated at US\$32.70 million (including US\$10.60 million from the government and US\$22.10 million, including Value-Added Tax (VAT) from the service providers). Borrower contribution included US\$7.37 million from the government. Electricity Distribution Companies invested US\$6.38 million in electricity subprojects as compared to the target of US\$10.40 million, excluding VAT.

Dates. There were five Level 2 restructurings. The first on April 23, 2012 was intended for changing the definition in the loan agreement of a "Rural Electrification Provider". The second on May 20, 2012 extended the closing date by a year for completing ongoing subprojects. The third on November 6, 2015 reallocated loan proceeds between components. The fourth on February 28, 2017 extended the closing date by six months to comply with safeguards requirements. The fifth restructuring cancelled a portion of the undisbursed balance of the loan. The project closed eighteen months behind schedule on August 31, 2017.

3. Relevance of Objectives

Rationale

The objective was highly relevant to the weak electricity services in rural areas in Peru. Despite sustained economic growth for six years before appraisal in 2009, about 35% of the population was classified as poor, with the incidence of poverty disproportionately high in rural areas (particularly in the Sierra region where 60% of the population were classified as poor as compared to 1% in Lima). In the energy sector, there were wide disparities in access to electricity services, both between rural and urban areas and between regions. Rural electricity coverage was 30% as compared to 91% in urban areas and while Lima had 91% coverage, the city of Cajamarca in the Sierra region had coverage of 51%. Lack of electricity in rural areas together with lack of access to other infrastructure contributed to the low quality of life, poor medical care and education and limited opportunities for economic development.

The PDO was well-aligned with the objectives of the Ministry of Energy and Mining's National Plan for Rural Electrification (NPRE) for 2011-2020. The plan objectives included, increasing access to electricity to 65% of the rural population by 2011 and 88% by 2020 and promoting rural development with emphasis on serving isolated rural areas through renewable energy technologies (PAD, page 2). Since rural electricity coverage had increased to 78% by 2015, the NPRE for the 2013-2022 period set higher goals for increasing coverage to 92% by 2020.

At appraisal, the PDO was consistent with the Bank's Country Partnership Strategy (CPS) for the 2007-2011 period, a key pillar of which had the specific goal of increasing average access to electricity in all rural areas from 30% to 53% (page 51). The PDO was relevant to three of the four goals of the Bank's latest CPS for the 2012-2016 period namely: (i) increased access and quality of social services for the poor; (ii) connecting the poor to services and markets; and, (iii) sustainable growth and productivity.

Rating



High

4. Achievement of Objectives (Efficacy)

Objective 1

Objective

To increase access to electricity in rural areas of Peru on an efficient and sustainable basis.

Rationale

Most of the information below is drawn from the ICR, pages 10-11 and 22-28).

Outputs

- 31 rural electrification sub-projects in rural areas were approved for financing at closure. This exceeded the original target of 15. The sub-projects were subsidized up to the level required for the projects to earn the permitted rate of return by the companies. About 17 of these sub-projects were implemented in locations (in the Andean mountains, coastal deserts and the Amazon Jungle) that included indigenous people.
- Eight distribution companies made proposals to the project as per target.
- Seven renewable energy subprojects were approved at closure. This was slightly short of the original target of eight.
- Electricity Distribution Companies invested US\$6.38 million in electricity subprojects as compared to the target of US\$10.40 million.
- Three contracts were concluded with Non-Governmental Organizations (NGOs) for productive uses of electricity as per target.
- Tools were provided to the Electricity Distribution Companies (EDCs) for lower cost Operations and Maintenance (O&M) costs and tools were provided to the EDCs for billing and collection arrangements among dispersed operations.
- About, 9,600 beneficiaries were trained about the efficient use of electricity in Light-emitting diode Lamps (LEDs) and other efficient appliances, as well as the safety of internal electricity installations: 12,280 training kits were distributed to the beneficiaries of the training.
- A platform was developed to monitor the status of all household PV systems. This tool could be also used for implementing the solar household PV system program as well as off-grid sub-projects.
- The Ministry of Energy and Mines in 2012 issued a protocol (a set of guidelines for addressing Right-Of-Way and Involuntary Resettlement) that established the procedures to be followed for addressing compliance with social safeguards.
- Three activities were completed by the Non-Governmental Organizations (NGOs) for promoting productive uses of electricity.

Outcomes.

- By project closure, infrastructure with the capacity to connect 42,669 households (equivalent to about 169,000 people) was constructed by sub-projects financed through electricity companies. This exceeded the target of 42,500 by 0.4%.
- 36,518 households (equivalent to about 142,895 people) were provided with new connections. This exceeded the target of 34,000 people by 7.4%. The ICR (page 23) notes that there is one grid-connected sub-project that is still under construction that should be finished by March 2018 and that once this is



finished, it is expected to add 818 connections to the actual 36,518 connections already completed. With this total connection is expected to reach a total of 37,336 connections (about 10% over the original target). 17 sub-projects were implemented in locations with indigenous population. 15% of the project beneficiaries (equivalent to about 21,000 people) were indigenous population. With this Peru's rural electricity coverage increased by 2.1% at project closure. The project exceeded its targets for capacity to connect and number of people connected by project close by 0.4% and 7.4% respectively (ICR, page 10).

- 11,915 Photovoltaic systems were provided at closure (ICR, page 10). There were no targets for this indicator, as during the implementation of the RE1 project, this component was subject to delays due to exogenous factors. However, although there was no quantitative target for this indicator, the number of connections exceeded the connections under the RE1 project by 68%.
- 4376 rural producers (including 36% women) adopted electricity equipment. This was slightly short of the target of 5,000. The ICR notes that a socio-economic impact of the first Rural Electrification Project (RE1) productive uses activities conducted as part of this project showed that incomes of participating producers were estimated to have increased by 6% annually and their average consumption increased from 56 to 240 Kilo Watt /hour at project closure. As the Second Rural Electrification Project (RE2) continued those of RE1, participating producers in RE2 could be expected to have similar benefits.

Summary: The key goal of increasing access to electricity in rural areas on an efficient and sustainable basis was substantially achieved. The targets were either realized or exceeded and it is reasonable to assume that the project activities by increasing access to electricity in rural areas with dispersed population can be expected to contribute to the long-term development objectives of promoting social development and sustaining economic growth.

Rating
Substantial

Rationale

There is only one objective, thus the overall Efficacy rating is Substantial.

Overall Efficacy Rating
Substantial

5. Efficiency

Economic analysis. An economic analysis was conducted for activities associated with component one activities (investment in rural electrification subprojects that encompassed grid extension systems and off-grid Photo Voltaic (PV) systems), based on a willingness to pay approach. These activities accounted for 88% of the appraisal estimate and 84% of actual cost. The costs of grid extension systems included the annual investment cost of residential connections to the grid, including capital investment and connection



cost, operation and maintenance (O&M) cost. The benefits of grid extension were assumed to come from increased electricity consumption by new users due to the lower price of the new service. The costs of off-grid PV systems included the annual investment cost for the PV Home Systems, O&M costs and the annualized cost of the replacement of batteries every five years.

The Net Present Value at 10% discount rate was US\$24.3 million and the aggregate ex post Economic Internal Rate of Return (EIRR) was 18.3%, as compared to the ex ante EIRR of 22%. The ex post EIRRs for the grid extension and off-grid PV sub-components were 20% and 11% (as compared to the ex-ante EIRR of 20% and 16%). The lower ex post EIRRs for the different types of generation and distribution systems were due to conservative assumptions, as the potential benefits from the productive uses of the components/systems were only minimally incorporated. Had additional consumption of electricity with productive uses been more fully considered, the aggregate economic return would have been somewhat higher, making it comparable to the EIRR of 22% that was estimated at appraisal.

Cost effectiveness. The average costs per connection for grid extension and Photo Voltaic (PV) subprojects at US\$1,268 and US\$1,011 were lower than the appraisal estimates of US\$1,628 and US\$1,000 respectively. The total project cost was US\$65.60 million as compared to the estimate of US\$82.70 million due to a combination of factors including depreciation of the local currency that reduced the US\$ cost of local components and efficient execution. As a result, at closure US\$6.17 million of the IBRD loan remained unused.

Operational and administrative issues. There were significant delays associated with implementing component one activities in the initial years (between May 2013 and November 2014) due to a combination of factors including, uneven political support following the change of government which contributed to delays in appointing management staff in the Electricity Distribution Companies (EDCs) and the Directorate of Projects, resistance on the part of EDCs to a rural activity that they perceived as adverse to their financial interest, late completion of the prior RE1 project (which meant that the Project Unit remained engaged in implementing the RE1 Project) and compliance with safeguards during implementation. According to the information provided by the team, these factors were rectified following the Mid-Term Review in 2014 and at project closure most project activities had been completed and there was safeguards compliance, although in terms of OP/BP 4.12 not all identified people were able to claim their compensation and the funds were put in an escrow account at their names at Banco de la Nacion (discussed in section 10).

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	✓	22.00	88.00 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	18.00	84.00 <input type="checkbox"/> Not Applicable



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

6. Outcome

Relevance of the PDO to the Government and Bank strategy is rated as High. Efficacy of the single objective - to increase access to electricity in rural areas of Peru on an efficient and sustainable basis - is rated as Substantial. Outcomes exceeded targets and the outcomes can be expected to increase access to electricity services in rural areas and thereby contribute to the long-term objective of promoting social development and economic growth. Efficiency is rated as Substantial. The project's performance had only minor shortcomings and its outcomes was therefore rated as satisfactory.

a. Outcome Rating

Satisfactory

7. Risk to Development Outcome

Technical risk. The technologies used in the grid extension subprojects have already been proven and this in conjunction with the experience of the Electrical Distribution Companies (EDCs) in the technical and commercial operation of power grids, indicate limited technical risk in grid extension subprojects. Further, the better regulatory conditions of the past years in Peru could aid in maintaining the financial viability of the electrical companies. The risks associated with effective operation of the electricity grid is low. There are however risks associated with operating and maintaining Photo Voltaic (PV) systems in isolated areas in the long term as the model used still needs validation.

8. Assessment of Bank Performance

a. Quality-at-Entry

This project was prepared based on the lessons from the prior Bank financed project (Rural Electrification Project (RE 1) which had an outcome rating of satisfactory by the Project Performance Report (PPAR) prepared by the Bank's Independent Evaluation Group (IEG). The project activities were similar to RE1, with one difference -activities aimed at providing electricity services to localities that were distant from the grid and with more dispersed populations. Lessons incorporated included, making the distribution companies responsible for implementing subprojects to ensure financial viability and technical assistance activities aimed at increasing rural electricity users. Average costs for grid extension subprojects were estimated to be 50% higher than under the prior project because of the greater distance from the grid. The project activities included an investment component aimed at increasing electricity access to a fairly large number of rural consumers (making use of both grid and off-grid energy sources) and technical assistance activities that were tailored to the needs of the country (such as aimed at providing support to the Government and the Electricity Distribution Companies, assessment of renewable energy sources and promoting productive uses of



electricity). The results framework adequately captured the linkage between project activities and outcomes, with the intermediate outcomes constituting the requisite building blocks in the causal chain. Risks were identified at appraisal including moderate risks associated with sustainability of investments in solar Photovoltaic Systems (PVs) and inadequate indigenous capacity to address fiduciary and safeguards issues. Mitigation measures incorporated included provision of PV system by distribution companies under regulated systems with cost effective tariffs and entrusting fiduciary management to the unit that had implemented the prior project. Appropriate arrangements were made at appraisal for fiduciary and safeguards compliance (discussed in section 10 a and b).

The project timelines were optimistic given that the project was implemented in the context of the political uncertainty associated with a government transition. This contributed to delays in implementing component one activities in the initial years.

Quality-at-Entry Rating

Satisfactory

b. Quality of supervision

Thirteen Implementation Status and Results Reports (ISRs) were filed over a seven-year period (implying supervision missions of twice a year). The active engagement of the supervision team and dialogue with the new authorities (following the change in government) and the Electricity Distribution Companies (EDCs) aided in countering the delays that were experienced in the early years of the year. The support provided by the team aided in fiduciary and safeguard compliance (although the right of way payments was not fully made at closure). Project restructurings were appropriate in response to changing conditions (especially during the last months of implementation) and this helped in realizing the PDOs.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

Monitoring indicators and targets were for the most part adequate to measure the achievement of the project's developmental objectives. The number of outcome and output indicators was limited and the latter constituted reasonable building blocks to determination of the former. The four key outcome indicators - infrastructure established with the capacity to provide service to rural households in the long term, actual number of rural households and small enterprises connected during the lifetime of the project, the number of households and small enterprises connected using individual solar photovoltaic systems, and the number of rural family productive units adopting electricity using equipment under the productive uses activities were appropriate. Based on the experience of the prior RE1 project, the results framework incorporated an indicator to explicitly



measure the project's capacity to provide an electricity service to rural households (that is, the number of potential connections) in addition to the actual connections during implementation.
Data on electricity connections was to be provided directly by the electricity service providers (PAD, page 8).

b. M&E Implementation

The Directorate of Competitive Funding (DCF) provided a monitoring team that maintained accurate measures of project indicators. As stipulated in the Loan Agreement, the Directorate of Competitive Funding (DCF) supplied to the Bank semester progress reports, including an update of the results indicators. The project also conducted two socio-economic impact assessments of the rural electrification and productive uses components that could be useful for national and international evaluations of rural electrification.

c. M&E Utilization

Utilization of data was satisfactory. The data was utilized for informing management and monitoring project performance. The DCF also conducted a survey of 511 beneficiaries of the rural electrification sub-projects, based on a representative sample of 12 grid and PV subprojects for investigating connection rates, use of electricity, quality of service and perceived benefits.

M&E Quality Rating

High

10. Other Issues

a. Safeguards

The project was classified as a Category B project: Other than Environmental Assessment (OP/BP 4.01), two environmental safeguards were triggered: Natural Habitats (OP/BP 4.04): Physical Cultural Resources (OP/BP 4.11): Two social safeguard policies were triggered: Indigenous Peoples (OP/BP 4.10): and, Involuntary Resettlement (OP/BP 4.12). (PAD, 12-13).

Environmental Safeguards. An Environmental Management Framework (EMF) prepared for the prior Rural Electrification (RE1) project was updated and publicly-disclosed at appraisal, given that this project supported similar kind of investments. The framework included measures to mitigate adverse impacts on natural habitats and physical cultural resources (PAD, page 13). An Environmental Management Plan (EMP) was to be prepared for each subproject during implementation. The compliance with environmental safeguards was deemed to be satisfactory during implementation (ICR, page 18).

Social Safeguards. The Indigenous Peoples Planning Framework and Involuntary Resettlement Framework of the RE1 Project were updated at appraisal. The frameworks required that each subproject has an approved Resettlement Plan and if indigenous people were present in the area, an Indigenous Peoples Development Plan. The frameworks were publicly disclosed (PAD, page 12). The project's compliance with regard to social safeguards was deemed to be satisfactory during implementation. The ICR



(page 17) notes that there were considerable delays in the Right-Of-Way (ROW) payments in the last year, which led to the second extension of the project closing date. Although many Electricity Distribution Companies (EDCs) complied with the required payments, two companies lagged behind. According to the information provided by the Bank project team, these factors were rectified following the Mid-Term Review in 2014 and at project closure most project activities had been completed and compliance with safeguards was met (although in terms of OP/BP 4.12 not all identified people were able to claim their compensation, and the funds were put in an escrow account at their names at Banco de la Nacion).

b. Fiduciary Compliance

Financial Management. A Financial Management Assessment was conducted at appraisal. The Project Unit (PU) had implemented the prior RE1 project and had the required expertise and its financial management arrangements were deemed to be satisfactory and the financial management risk was rated as Moderate at appraisal (PAD, pages 11-12 and page 23). The ICR (page 18) notes that in addition to its regular supervision missions, the Bank launched two missions to address specifically financial management issues during implementation. Financial information and monitoring reports were delivered in a timely fashion and external audits were unqualified (ICR, page 18)..

Procurement. An assessment at project appraisal of the PU's capacity to implement procurement concluded that the procurement risk was Moderate. A procurement plan was prepared to address procurement risks (PAD, page 12). The ICR (page 18) noted that procurement management was deemed to be satisfactory during implementation.

c. Unintended impacts (Positive or Negative)

d. Other

11. Ratings

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



12. Lessons

The IEG selected the following main lessons from the ICR, with some modification of language.

(1) Strong government commitment is critical for creating an enabling environment for project implementation. Strong government commitment as reflected through favorable sectoral policies such as involving the electricity distribution companies and regional governments in sub-projects, increasing affordability of connections by including the connection fee in the capital cost rather than charging the user and using Solar Home Systems to serve remote populations and using low-cost technologies for grid extension helped in creating an enabling environment for project implementation.

(2) The challenges associated with implementing Right-of-Way (ROW) payments need to be addressed early in the project cycle. Based on the experience of this project, common obstacles faced on the compliance of the Right-of-Way (RoW) payments include incomplete documentation of land titles and difficulties in locating a number of dispersed land owners. These issues need to be addressed early and plans for RoWs need to be incorporated into the project's conditions of effectiveness.

(3) Complementing investment activities with technical assistance activities that are tailored to the specific needs of the project is required for addressing rural electrification efforts. Technical assistance activities such as, support to the government and the Electricity Distribution Companies in implementing sub-projects, assessment of renewable energy sources and promoting productive uses of electricity proved to be useful in implementing rural electrification sub-projects in this project.

(4). Although the promotion of productive uses of electricity can be a beneficial component of a rural electrification project, ensuring its sustainability requires consistent and adequate levels of support. Peru's experience highlighted the importance of Non-Governmental Organizations (NGOs) in assisting producers in rural areas adopt electrical equipment.

(5) The potential conflict between the long-term nature of rural electrification and short-term political objectives requires a sustained commitment and understanding of authorities to avoid problems in the program's design and implementation. Despite the highly supportive political environment in Peru, the project faced significant implementation problems due to a combination of factors including a change in government that resulted in delays in appointing management teams and reluctance on the part of Electrical Distribution Companies to participate in a rural activity that they perceived as adverse to their financial interest. Addressing these issues requires long-term commitment of the government as well as building alliances with those interested in sustainable rural electrification (such as local governments, distribution companies and other local stakeholders).

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is well-written, concise and consistent with the harmonized guidelines for ICRs. The quality of analysis and evidence is results-driven and satisfactory overall. Annex one provides clear information and



useful comments on the results indicators. The ICR also candidly discusses the issues during implementation in the wake of the change in government. On the other hand, the ICR could have provided more details on the supervision aspects and could also have incorporated an English translation of the socio-economic impact of RE1 rural electrification and productive uses promotion components. Given that this was a satisfactory project, the ICR could have provided better and more general lessons for countries implementing similar rural electrification projects.

a. Quality of ICR Rating
Substantial