This is a new section of the Public-Private Partnership Resource Center website and is currently in draft form. Your feedback is welcome: If you would like to comment on the content of this section of the website or if you have suggestions for links or materials that could be included please contact us at ppp@worldbank.org.

Photo Credit
Rural Electrification Model for ERP, solar power plant

# Rural Electrification Model for ERP

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***On this page:*** *Rural Electrification leveraging a New-User-Tariff - Model 2 in the ERP Project Guidelines. Read more below, or visit Strategic Guidance for Country System Assessments, Guidance for Countries in Assessing ERC Projects, or Mobilizing ERC Finance.*

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**Type:** Energy efficiency

**Sector:** Energy

**Applicable Project Methodology:** AMS-III.BB.: Electrification of communities through grid extension or construction of new mini grids

This model describes a project that facilitates the expansion of electricity grid network and the installation of power lines in a region with inadequate access to electricity and having to rely on diesel generators for power. The objective of the project is to offer a consistent, affordable, and sustainable energy source to these communities with lower carbon emissions, thereby replacing the usage of fossil fuels and decreasing greenhouse gas emissions associated with fossil fuel combustion.

## Proposed Structure of this Public Private Partnership (PPP) Model

The project will be leveraging a **New-User-Tariff** model. Given the higher risk of installing new transmission infrastructure in a region with lower average electrification rates, which is also an effect of lower household incomes, allocating the fund-raising obligation to the private sector participant may result to limited or expensive financing options. Hence, in this case the government entity designs, finances, and leads project development. The private sector company can be contracted via concession agreement to carry out operations and maintenance of project under a long-term lease from the government. Once the long-term lease ends, the private-sector partner transfers management of project back to the government entity. Financing can be provided by 3rd party financiers in exchange for a portion of the ERCs generated from the project.

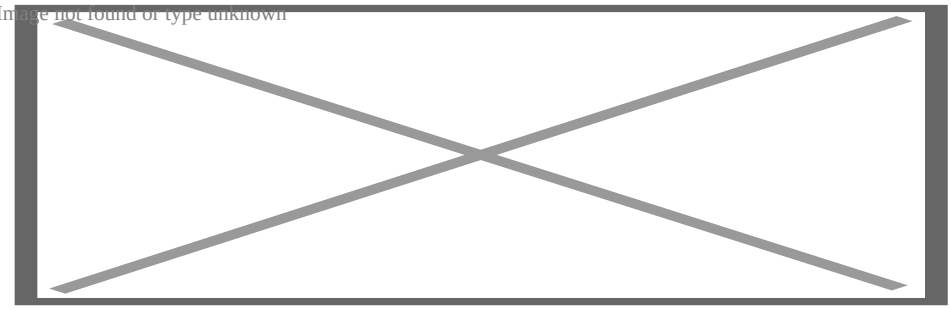
*Table 1: Model Attributes*

| Dimension | Attribute | Description |
|---|---|---|

| | | |
|---|---|---|
| Business | *New* | The model involves the creation of a new business entity to manage and operate the new transmissions infrastructure |
| | *Existing* | |
| Construction | *Build* | The model involves the government partner undertaking the build of the new transmission infrastructure |
| | *Refurbish* | |
| Private Funding | *Finance* | The government partner will be sourcing the financing for the project development in this model |
| Service | *Bulk* | The resulting project company in the model will be servicing retail customers in this region, and, hence, will be assuming billing and collection therefrom |
| | *User* | |
| Revenues | *Fees* | Revenues in this model will originate from the tariffs paid by the new retail electricity customers to the project company for power supplied |
| | *Tariffs* | |

**Proposed risk allocation of the Public Private Partnership Model**

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**Key features of PPP structure**

- Government or state-owned entity works on the design, build and financing of the electricity distribution project
- Government or state-owned entity offers long term concession agreement with a private sector entity company to carry out operations and maintenance of project
- Financing is to be undertaken by the government or state-owned entity, with additional climate financing from third party financiers in exchange for a portion of the ERC revenues
- The private sector entity is provided the concession to operate the infrastructure, which will include the license to contract to purchase electricity and distribute the same to the retail electricity consumer base at rates agreed with the power regulator

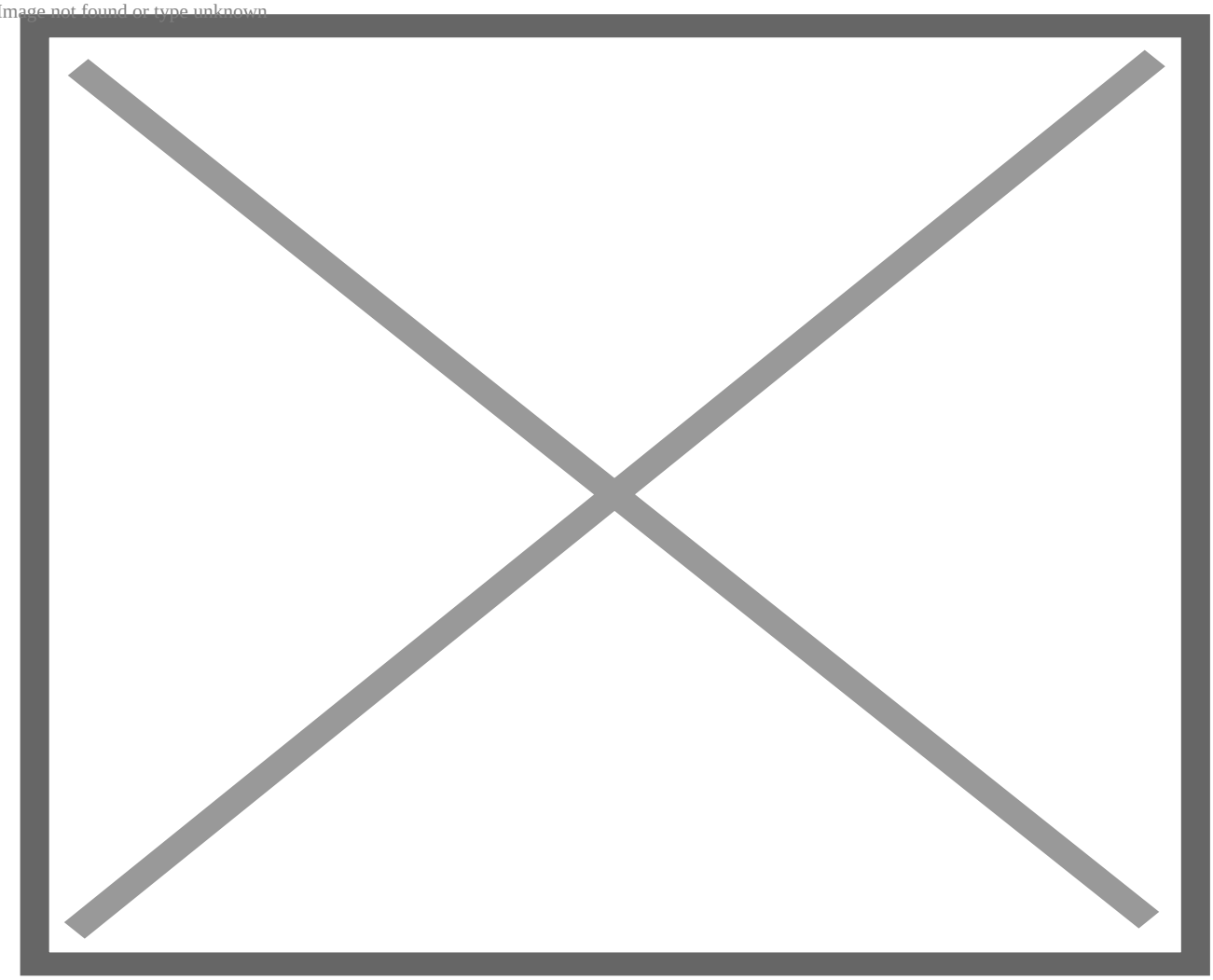
**Key considerations/risks for proposed project**

- ??????Partnering with a service provider for the project’s marketing, sales and pricing is needed to identify potential offset buyers, negotiate contracts, and secure good target price per tonne to enable the financial viability of ERC generation

- Contracting a monitoring, verification and reporting (MRV) service provider with experience in conducting MRV and preparing the necessary documents for generating ERCs in a voluntary carbon market standard will reduce risk of registration and issuance delays or bottlenecks, and strengthen credibility of project's carbon integrity quality

**Figure 1: Financing and Activity Flows for the Model**

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## Case Study: Electric Frontier Expansion Program Phase III in Peru

### Project description

The implementation of the Electric Frontier Extension Program Phase III (PAFE III) in 2013 was planned to increase electric coverage in Cajamarca, the least electrified region in Peru. The aim of the project activity was to supply electric energy for 24 hours a day, continuously, permanently, and reliably, to localities included in the 19 rural electric systems (SERs). The project included the construction of primary lines from the national grid, allowing power to be supplied to 65 districts, in the following provinces: Cajabamba, San Marcos, Cajamarca, Celendin, Contumaza, San Miguel, San Pablo, Chota, Cutervo, Santa Cruz, Jaen and San Ignacio.

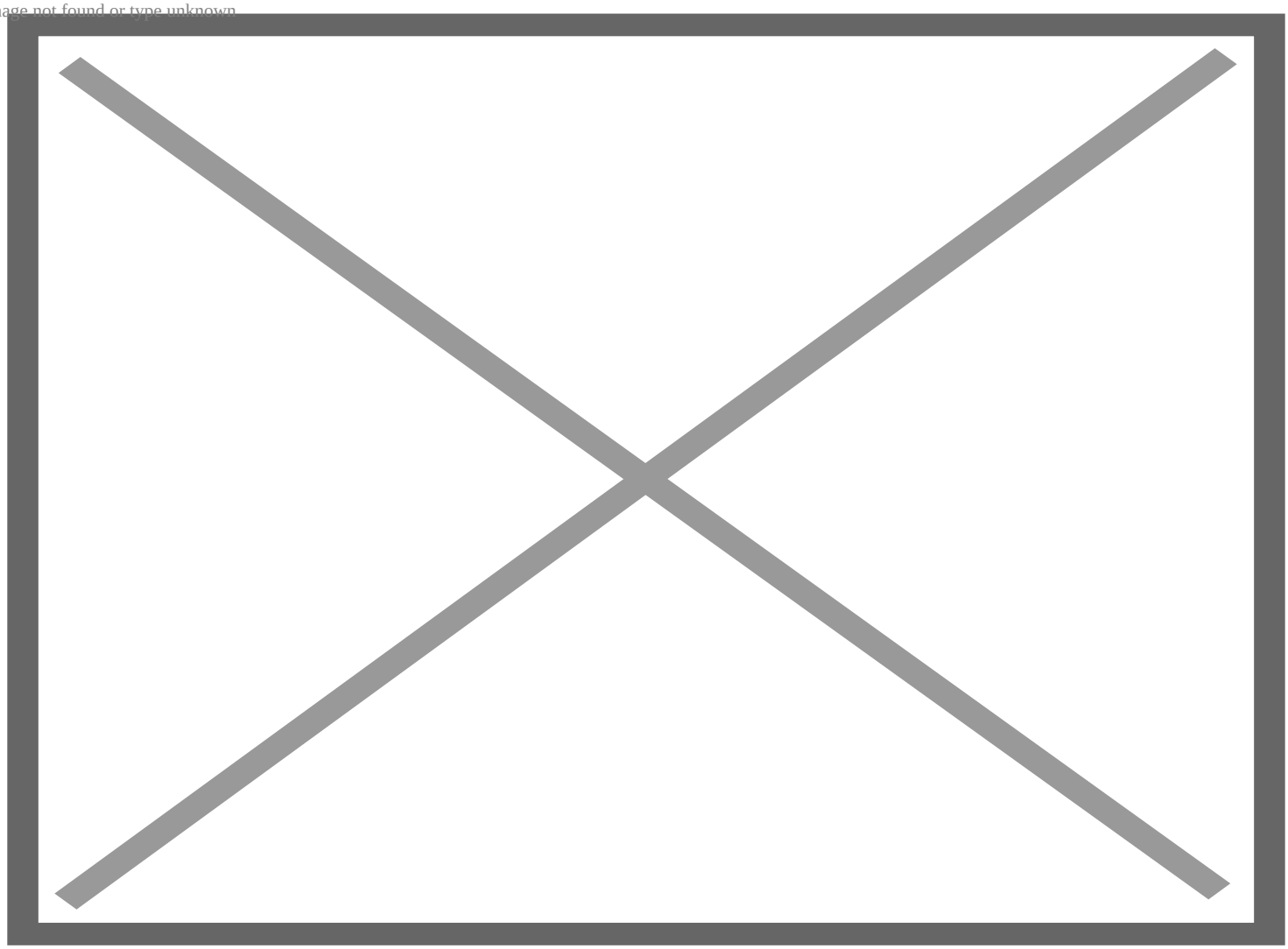
### Impact

The project was estimated to result to annual emissions reductions of 12,113 tonnes over the 10 year crediting period as the electricity supplied replaced emissions from fossil fuel combustion. The project also enabled 43,508 new households to be connected to the grid as of 2018, contributing 6% to the electrification

ratio in the area. The ERC component of the project enabled the electrification project to become financially feasible given that there will additional revenues from the carbon market, as assessed by Spanish Association for Standardisation and Certification (AENOR) in the 2015 Validation Report.

*Figure 2: Structure of Case Study PPP*

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JICA provides a loan to Cajamarca regional government to partially finance the project. FONAM PERU, a non-profit organization promoting investment in environmental projects, is developing requirements for registering PAFE III in the VCS Standard. FONAM works with the government to create the Project Description. The regional government of Cajamarca will develop and promote all 19 electrification components, while three concessionaries, Hidrandina S.A., Electronorte S.A, and Electroriente S.A, will handle operation and maintenance of the project.

## Summary of the Model Financials

Assuming similar scale, context, and project arrangements as in the case study of electrifying an additional 40,000 households, the model's Net Present Value (NPV) without ERC in- and outflows – only considering non-ERC inflows through other revenue streams or cost savings enabled by the project – is positive at $222.5 million (M)[1]. With ERC cashflows, the total project will have a positive NPV of $222.9M, which provides added value to make these types of projects more financially attractive, given the large capital outlay to finance the installation of the mini-grid.

*Table 2: Summary of sources of inflows and outflows and key assumptions*

| Value component | Assumptions | Sources |
|---|---|---|
| ERC revenues or inflows | • Three issuances across the project's 10-year crediting period, at year 3, year 7 and year 10<br>• $7.35 per tonne today for 40,377 estimated tonnes of ERCs likely generated in the first issuance<br>• 10% price increase to $8.09 for 80,753 estimated tonnes of ERCs likely generated for the second and third issuance | Average price of Transport project in Asia, registered under Verified Carbon Standard (VCS) |
| Non-ERC revenues or inflows | • Expected annual energy consumption: 18,986.34 megawatt hours (MWh)<br>• Kerosene/Diesel cost per unit: $1.24 per Litre<br>• Kerosene/Diesel cost per unit: $3.1 per kilowatt hours (kWh)<br>• Tariff cost: $0.195 per KWh | PAFE expansion case study benchmark, World Bank database - Cost of doing business, Global Petrol Prices |
| Project investment and implementation cost | • Installation of mini-grid expansion luminaires of $59,702,495<br>• Operating and maintenance costs assumed to be 5% of total investment and installation costs | PAFE expansion case study benchmark |
| ERC generation | • $10,000 for the project's registration and first issuance<br>• $15,000 for each verification process across three issuance cycles<br>• $0.14 per tonne for subsequent issuances | Verra Fee Schedule |

*Table 3: Net cashflows summary (in USD)*

| Components | Sum of initial outlays | Sum of in- or outflows from crediting period | Total cashflow |
|---|---|---|---|
| ERC Component | | | |
| Revenues/Inflows | 0 | 950,097 | 950,097 |
| Costs/Outflows | 0 | -71,958 | -71,958 |
| Net value | 0 | 878,139 | 878,139 |
| Primary/Non-ERC Component | | | |
| Revenues/Inflows | 0 | 46,045,253 | 46,045,253 |
| Costs/Outflows | -59,702,496 | -2,985,125 | -62,687,621 |
| Net value | -59,702,496 | 43,060,129 | -16,642,367 |
| Net Present Values | | | |
| Total Project | $2,701,686 | | |
| ERC Component | $418,600 | | |
| Non-ERC Component | $2,283,086 | | |

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*Footnote 1*: All prices are expressed in United States Dollars (USD)

**Related Content**

- **Guidance for Countries in Assessing ERC Projects (Download PDF version)**

**Additional Resources**

- Climate-Smart PPPs
- Finance Structures for PPP

*This section is intended to be a living document and will be reviewed at regular intervals. The Guidelines have not been prepared with any specific transaction in mind and are meant to serve only as general guidance. It is therefore critical that the Guidelines be reviewed and adapted for specific transactions. Unless expressly stated otherwise, the findings, interpretations, and conclusions expressed in the Materials in this Site are those of the various authors of the Materials and are not necessarily those of The World Bank Group, its member institutions, or their respective Boards of Executive Directors or member countries. For feedback on the content of this section of the website or suggestions for links or materials that could be included, please contact the Public-Private Partnership Resource Center at ppp@worldbank.org.*