

REwiRE: Rural Electrification with Renewable Energy

Purpose and Need: Globally, 1.3 billion people lack access to electricity, an estimated 84% of whom live in rural areas. Electricity is a critical enabler of economic development and improved health and education. According to the World Bank, rural electrification has a positive impact on household income, public health, educational attainment, and quality of life.

Unfortunately, extending the national grid can be expensive, particularly for remote, isolated rural areas with low aggregate demand for electricity. In such cases, off-grid electrification through the installation of mini-grids is the most cost-effective option.

Despite the existence of mini-grid technology, several problems plague rural electrification efforts. Local ownership is not emphasized, which affects project sustainability. Distributed solar home systems focus on household electrification but neglect electrification of productive activities like welding, electric water pumps, or lighting for small-scale enterprises. Moreover, rural electrification initiatives lack adequate financing to be sustained or scaled up. The small size and high transaction cost of a single mini-grid investment is prohibitive relative to the requirements of most multilateral agencies and institutional investors.

Indonesia is a country plagued by all of these issues. 82 million citizens (36%) still lack electricity access, particularly the remote populations living on many of the archipelago's 18,000 islands. Fuel shipments to these islands are intermittent and costly. On the upside, this renders renewable energy more affordable and reliable than the status quo. High fuel costs, low electrification rates, abundant renewable resources, and strong government support make Indonesia the ideal venue for widespread installation of mini-grid systems.

REwiRE will innovate on traditional project finance methods to bundle multiple village-scale mini-grid projects with congruent characteristics into a package large enough to attract institutional investors, justify the transaction costs of funding from multilateral agencies, and mitigate risk through co-ownership with community organizations.

Project REwiRE: Starting in Indonesia, REwiRE will develop renewable energy-based mini-grid projects across several remote villages lacking electricity using an innovative financing and tariff structure, combined with a sustainable, cost-effective operation and maintenance (O&M) scheme. Our pilot project will be on Sumba Island in Nusa Tenggara Timur (NTT) province, an ideal site for its size, population density, renewable resources, and low electrification rates (about 30%). Winrock International conducted a renewable resources assessment of the island in 2010 and found 4.5MW of potential for micro-hydro, as well as promising wind and solar resource potential. We will focus on providing electricity for 80% of those who currently have no access (367,505 people out of the total population of 459,381 lacking electricity). Simultaneously, we will focus on displacing intermittent, expensive, and dirty electric service from diesel generators. To accomplish this, REwiRE will finance 25 village mini-grid systems throughout Sumba's 11,052 square kilometers.

Ownership and Capital Structure: REwiRE will use a unique project finance structure to implement a community ownership model and align incentives at all levels—from founders to investors to villagers. There are 130,000 community co-operatives across many industries in Indonesia. Our partner NGO (IBEKA) has already leveraged the co-op model for successful and profitable community co-ownership, operation, and maintenance of micro-hydro facilities with private sector partners throughout the country.

The mini-grid (“the project”) in each village will be housed in a Special Purpose Vehicle (SPV), which will be a 50-50 Joint Venture (JV) between a community co-op and REwiRE. The SPV is responsible for connecting and selling electricity directly to villagers or to the national utility (PLN) where applicable. All project SPVs will be aggregated under a holding company, REwiRE LLC. All grants, financing, and multilateral credit enhancements will occur at the level of the holding company to minimize transaction cost. This innovative bundling will provide project diversification, scale impacts, and create a sizeable portfolio to attract institutional investors. Please refer to the Appendix for an illustration of the capital structure.

Revenue Mechanism: The primary source of revenue will be electricity sales at 10¢/kWh managed by the co-op. Given the unreliable supply of electricity under current conditions, and the high cost of kerosene lanterns, the villagers will be willing to pay a premium on highly subsidized diesel-based electricity prices (6¢/kWh; 20-25¢/kWh without subsidies). World Bank data shows willingness to pay is higher than supply costs¹. Furthermore,

¹ Willingness to pay in Indonesia averages 10¢/kWh. (World Bank. “The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits.” *Independent Evaluation Group Impact Evaluation*. 2008.)

REwiRE: Rural Electrification with Renewable Energy

the Indonesian government plans to cut diesel subsidies by as much as 30% in April 2012, with further cuts expected in the future. If PLN eventually wishes to extend the national grid and connect to the REwiRE mini-grids, a Power Purchase Agreement (PPA) will establish each mini-grid as an Independent Power Producer (IPP).

Financial Projections and Returns:

Potential investors and respective target returns are listed in Table 1. The robust triple-bottom line aspect of REwiRE projects will attract funding from impact investors, such as the World Bank and the Acumen Fund.

Table 1. Potential Investors and Returns

Investor Type	Capital Contribution	Target IRR	Seniority
Institutional Investors	30-50%	10-12%	Senior
Founding Partners	5%	10-12%	SubTier1
Impact Investors	15-30%	5% - 7%	SubTier1
World Bank Grant ²	30%	0%	SubTier2

REwiRE will initially be capitalized with \$4 million to build 3 mini-grids, and rapidly scale to develop 25 mini-grids, using a combination of complementary renewable resources on Sumba over a period of 3-5 years. These mini-grids will serve over 61,250³ households; estimated total peak load is 11.2 MW.⁴ REwiRE will use innovative differential pricing methods to maximize revenues. A portion of the co-op's return on equity will be used to subsidize connection costs for the poorest members of the community, leading to high social impact. Tariff discounts will be provided to electrify income-generating activities (such as lighting for small-scale enterprises) thereby reinforcing villagers' credit quality and ability to pay over the life of the asset.

REwiRE will establish regional O&M offices to aggregate data from a mobile phone-based payment system and provide maintenance support. REwiRE will work with the community co-op using the Renewable Energy Project Support Office (REPSO) model to train and retain local villagers to perform maintenance functions.

Growth Potential: Once the initial grid is in place, there are opportunities to generate additional revenue through grid expansion and rate re-adjustment as consumption and ability to pay increase. We expect to scale up by providing electricity to all the small islands of NTT, plus other villages in Indonesia with similar geographies and demographics. Given that Indonesia's peak power demand is increasing by 7.5% annually, there is significant domestic growth potential for this model. Once proven, the model can be generalized to other emerging economies (India, Bangladesh, Nigeria, and Kenya) with concentrated populations in remote areas sharing similar geographic characteristics, enabling the potential for \$3-5 billion in large-scale capital deployment. We will serve the interests of impact investors by monitoring, measuring, and reporting social impact using the World Bank IEG-ESMAP methodology that accounts for health, education, welfare, and productive use benefits.

Risk Mitigation: Local ownership and strong governmental support for renewable energy on Sumba mitigates political risk. REwiRE will avoid common pitfalls of rural electrification schemes by introducing cheap, proven, simple, and modular renewable energy technology, thereby minimizing technology risk. The island has diverse renewable energy resources, allowing flexibility to target the lowest cost generation options.⁵ We will mitigate counterparty risk by engaging established village co-ops as partners. The aggregation of village mini-grid projects reduces the cash flow and business risks.

We will also seek a credit enhancement from a multilateral agency such as the Asian Development Bank (ADB) to guarantee a minimum 6% return to institutional investors after ten years in the event of market or technical contingencies. Eliminating demand and construction risks will attract institutional investors, and the ADB will favor offering a backup guarantee over an explicit grant to avoid tying-up their valuable capital.

REwiRE founders have over 15 years of combined professional experience in renewable energy, finance, engineering, consulting, and multilateral agencies. The Indonesian government and NGOs (e.g. IBEKA, HIVOS) are leading numerous initiatives to support rural electrification on the island, and IBEKA will provide on-site technical expertise to complement our efforts. One of our founders is fluent in Bahasa Indonesia and will conduct a weeklong visit to Sumba in March 2012 to identify potential sites, partners and personnel on the ground.

² Global Partnership Output-Based Aid (GPOBA) or "performance-based aid" is a grant through the World Bank to provide access to basic services for the poor in developing countries.

³ About 80% of the households on Sumba Island that lack electricity access, assuming each household includes six individuals.

⁴ Current peak load on Sumba Island is approximately 6 MW, but this serves only about 30% of the population. 11.2 MW of peak load assumes our projects electrify about 80% of the households on Sumba Island that currently lack electricity access.

⁵ We will use computer models recommended by the World Bank in their RE Tool Kit, particularly HOMER and Hybrid2, to determine the best grid configuration and combination of renewable technologies for the villages from geographic, economic, and renewable resource parameters.

REwIRE: Rural Electrification with Renewable Energy

Appendix: Capital Structure

