CASE STUDIES 4

Cagayan Electric Power & Light Company

Cagayan Electric Power & Light Company (CEPALCO), a private electricity distribution company on the island of Mindanao in the Philippines, received $4 million in funding from GEF (through IFC) in 2002. The purpose of the project was to demonstrate solar PV's effectiveness (through a conjunctive-use application) in addressing distribution system capacity issues. The funds were used to build a 1 MW distributed generation solar PV power plant, which was integrated into the 80MW distribution network of CEPALCO, and operated in conjunction with an existing 7 MW small, run-of-the-river hydroelectric plant.

BACKGROUND

Mindanao is the second largest island in the Philippines. The electrical grid on the island is well developed, but isolated, and it has a total generating capacity of 1,800 MW. Most of the generation capacity is from hydroelectric plants, with seasonal changes in generation capacity occurring. The transmission infrastructure on Mindanao is unable to transport large amounts of power over 200MW across large distances without compromising system reliability. As a result, CEPALCO and other distribution companies on the island must obtain large portions of their power supply from local sources.

In 1998, CEPALCO was in discussions with IFC for general corporate financing[44] to assist with the company's expansion plans.[45] The environmental review undertaken identified the possibility for a solar PV-based project. A pre-appraisal mission took place in the Philippines in December 1998 by the then IFC's Environmental Finance Group, with the goal of investigating suitable applications for solar PV-based generating equipment within the distribution network of CEPALCO. Distributed solar PV technologies, which are by their very nature small and situated near load centers, were believed to offer the potential to address seasonal generation capacity issues. They were also considered compatible with CEPALCO's needs and the geography of the transmission system.

Based on the findings of the December 1998 pre-appraisal mission, IFC proposed to GEF a project that would use GEF funds to partially finance the installation of a nominal 1 MW solar PV-based power plant, which would be integrated with the CEPALCO power distribution network. The stated objective of the project was to demonstrate the technical, operational, and economic feasibility of using solar PV electricity supplies for supplementing and firming up the productive capacity of an existing hydro project.

The solar PV plant was designed to operate in conjunction with the recently built 7 MW Bubunawan Hydropower Plant Project, a small run-of-the-river hydroelectric power plant, which was already supplying power to CEPALCO's system. The hydroelectric plant was to operate as a load follower, varying its output with the availability of solar PV power. The water saved, when solar PV power was being produced, would be held in small ponds available at the Bubunawan plant, to be utilized for power generation during peak load periods when solar PV was not available. The addition of the solar PV plant would reduce the need for CEPALCO to purchase thermal energy during peak load periods, thus reducing CO_2 emissions. In total, the 1 MW plant was estimated to lead to a reduction in CO_2 emissions on the island of Mindanao

[44] After the solar PV plant became operational, IFC's Infrastructure Department provided CEPALCO with a local currency loan (the first provided in the Philippines) in an amount equivalent to $15 million. The funds will allow CEPALCO to pursue its expansion program through a more stable financing structure.

[45] Designed to ensure that the company remained competitive in a newly privatized environment, CEPALCO's expansion plans included forming a partnership with a subsidiary of Hawaiian Electric Industries, an international utility with private power investment objectives in the Pacific Rim, and planning an investment program geared toward efficiently expanding its system and attracting a larger customer base.

of approximately 1,200 metric tonnes annually.

The project was endorsed by the GEF Council in December 2002. CEPALCO received a $4 million convertible loan from IFC, using GEF funds, and financed the remaining $1.8 million in construction costs from CEPALCO's own cash flow and interest savings. The GEF funds were initially provided as a loan, with the understanding that the loan would be forgiven after five years of satisfactory project operation.

In the period leading up to the final approval of the funding, CEPALCO issued an international request for proposals for the construction of a turnkey 1 MW grid-tied solar PV plant. The contract was awarded to Sumitomo Corporation of Japan, which utilized solar PV modules supplied by Sharp Corporation. Construction started in August 2003 and was completed on schedule. President Arroyo of the Philippines inaugurated the plant in December 2004. Today, the CEPALCO solar PV facility represents the largest solar PV installation in the developing world, and it has been operating without incident since its commission. It remains the only solar PV power plant in the world that is operational in a conjunctive-use application with a hydro plant.

WHAT WORKED AND WHAT DID NOT

The IFC/GEF project with CEPALCO has had a strong local presence, both through the in-country IFC representative office in Manila and through the efforts of the CEPALCO management and staff, which was critical to the success of the project. The Philippine staff at CEPALCO and the contractors from Sumitomo Corporation did an impressive job, not only of obtaining more than 50 permits and licenses in place for the facility, but also of complying with a host of project finance disbursement requirements and, finally, learning to successfully operate the project since completion of construction.

During project implementation, it quickly became evident that both the local permit process and the typical project finance structure were not geared to a small 1MW-solar PV investment. On the permit side, the Philippine regulations did not make the distinction between the solar PV plant and the much larger fossil-based plants, despite the obvious environmental benefits and the proven nature of solar PV technology. As a result, the CEPALCO solar PV project management team was required to perform tasks and submit reports that were not relevant to an RE project. The convertible loan structure (grant

convertible to loan) of the project called for a rigid disbursement structure. It became apparent, however, that, in order to ensure timely completion of construction, the prescribed disbursement structure would have to serve as a guide only.

It was widely recognized at the time the project was developed that there were more cost-effective technologies available to address peak load energy supply issues. In fact, the GEF grant, provided through IFC, served to subsidize approximately 70 percent of the construction and startup costs of the CEPALCO solar PV plant. The CEPALCO solar PV project never intended to compete head-on with other alternative energy generation technologies on the basis of cost efficiency, but it did intend to demonstrate that solar PV could be used as an effective and technically reliable source of power that could be cost effective if solar PV prices declined sufficiently. Furthermore, the CEPALCO project intended to demonstrate that there are technical advantages to the operation of such a plant in conjunction with an existing small hydro plant with limited storage capacity. The plant, which has operated without incident since its inauguration in 2004, appears to date to have been successful in proving solar PV to be an effective and technically reliable technology to address peak-load energy supply issues.

CONCLUSION

The CEPALCO experience is an interesting one. Unlike other IFC/GEF climate change mitigation programs and projects, many of which were designed as market transformation initiatives, CEPALCO was designed as a stand-alone experiment to demonstrate the appropriateness of the solar PV technology (through a conjunctive-use application) in addressing distribution system capacity issues. To date, the CEPALCO solar PV plant has made a strong technical case for the reliability of utility-scale solar PV power plants. Furthermore, by avoiding the need to purchase alternative thermal energy, the CEPALCO solar PV plant has resulted in a significant reduction in greenhouse gas emissions. The plant is expected to displace 24,000 tonnes of CO_2 over its lifetime.

When the financing was provided, it was expected that solar PV prices would decrease and that solar PV technology used on a utility scale would therefore become more cost effective. Had the price of solar PV gone down as was expected (and it is still predicted to occur in the future), CEPALCO would have been a project with a high potential for replication. However, with solar PV prices having increased, the potential for replication without significant subsidization is limited. Perhaps the most important demonstration value of the CEPALCO project is that solar PV works effectively in a conjunctive-use application. It also illustrates the fact that the technical solution is not always the best market solution.