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Solar panels in Guangdong generate energy savings and improve the environment.

GUANGDONG ENERGY EFFICIENCY AND ENVIRONMENT IMPROVEMENT INVESTMENT PROGRAM, TRANCHE 1

Providing Additional Power Capacity through Energy Savings

- Guangdong province has the largest and fastest growing economy in the People's Republic of China (PRC).
- Rapidly growing demand has outstripped power generation capacity in Guangdong.
- In 2008, the PRC partnered with the Asian Development Bank to create a "virtual power plant," which aimed to save 532 gigawatt-hours (GWh) of energy per year and an equivalent 107 megawatt (MW) of capacity.
- The program exceeded its targets after completion of Tranche 1 in 2011. It generated an equivalent capacity of 130 MW with an annual energy savings of 651 GWh.

CONTEXT

The People's Republic of China (PRC) became the world's largest energy consumer in 2008. Electricity consumption increased from 340 kilowatt-hours (kWh) in 1983 to 1,840 kWh in 2005.[1] Although the capacity of installed power generation rose more than 8% per year in the past 2 decades, it still failed to meet demand. More than half of the PRC's provinces experience power shortages, especially during peak summer hours.

Increased demand also caused much environmental damage. Fossil fuels account for more than half of the PRC's energy supply mix, increasing greenhouse gas (GHG) emissions and pollutants. The PRC's coal-fired power plants account for 50% of the PRC's sulfur dioxide, 80% of nitrogen oxide, and 26% of carbon dioxide emissions (footnote 1), which contribute to global warming and are linked with a number of respiratory illnesses. They also cause acid rain, which affects a third of the country. Fossil fuel combustion also pollutes the air—about 48% of cities in the PRC now fail to meet national air quality standards.

Increased energy consumption has led to more fuel imports. In 2013, the PRC imported 327.1 million tons of coal. Projections suggest that oil imports will increase to about 13.1 million barrels per day in 2030, up from 3.5 million barrels per day in 2006. By 2015, the PRC likely will import about 22% of its natural gas supply, rising to 54% by 2030 (footnote 1).

PROJECT SNAPSHOT

LOAN APPROVAL DATE:
June 2008

LOAN AMOUNT:
$35 million

BORROWER:
People's Republic of China (PRC)

EXECUTING AGENCY:
Guangdong Provincial Government

GEOGRAPHICAL LOCATION:
Guangdong, PRC

TYPE OF ENERGY PROJECT:
Energy efficiency

PROJECT COMPLETION DATE:
December 2011

In 2008, the PRC and the Asian Development Bank (ADB) embarked on an energy efficiency program to improve the PRC's energy security and environment. Dubbed the Multitranche Financing Facility (MFF): Guangdong Energy Efficiency and Environment Improvement Investment Program (Tranche 1), it focused on creating additional system capacity through an efficiency power plant (EPP) in Guangdong province. It financed up to $100 million to create an EPP equivalent to 107 megawatts (MW).

EPP is a strategic option that would help any country increase its power generation capacity without building additional power plants. Because an EEP is a virtual power plant, building an EPP does not mean constructing power generation infrastructure. Rather, it entails investments in conservation and efficiency measures that reduce energy demand and yield energy savings equivalent to the capacity generated by an actual power plant. Conservation measures include retrofitting electrical equipment for power savings and using more energy-efficient equipment and technologies.

[1] Asian Development Bank (ADB). 2008. *Report and Recommendations of the President to the Board: Proposed Multitranche Financing Facility and Administration of Grant from the Clean Energy Fund to the People's Republic of China for the Guangdong Energy Efficiency and Environment Improvement Investment Program.* April. Manila.

SOLUTIONS

Choosing Guangdong. Guangdong is in southern PRC. Its population (92 million) has grown an average 2.2% per year since 1995. Its economy is the largest and fastest-growing among all of the PRC's provinces. In 2007, before the project started, Guangdong's installed generation capacity totaled 59.3 gigawatts (GW), one of the biggest in the PRC. However, power demand has grown 13% per year since 1995, and Guangdong imports its coal, oil, and electricity (100%, 80%, and 20%, respectively) from other provinces. Power demand has outpaced capacity, causing severe power shortages during peak summer hours. High fossil-based energy consumption harms Guangdong's environment. About 86% of the province experienced acid rain in 2005 and nearly all of its cities have increasingly failed to meet national air quality standards. Guangdong was thus chosen as the best site because the project would help expand power generation capacity in the PRC's largest provincial economy and secure energy supply without further harming the environment. It was envisaged that the success of this project would potentially spur more cities in the country to explore EPPs.

Implementing energy efficiency subprojects. To create the EPP, Guangdong implemented eight energy efficiency subprojects for Tranche 1, which retrofitted, upgraded, and replaced appliances and equipment owned by end users, industries, and commercial establishments. It also implemented subprojects on waste-to-energy measures. The municipal government established the EPP Project Management Office (EPPPMO) to handle overall implementation of the energy efficiency subprojects. For Tranche 1, eight agencies ran subprojects as subborrowers.[2] Upon completion, the subprojects created an EPP capacity of 130 MW, saving 651 gigawatt-hours (GWh) per year.[3]

Strategic lending mechanism. Many companies do not seek loans for energy efficiency projects because it takes funding away from their core business operations. They would rather seek funding for business expansion or the establishment of a new business. To address this, the program used a financial intermediary loan scheme with strengthened implementation supervision and a simplified process for subproject appraisal. This scheme not only made funding for retrofits available to companies, but also gave Guangdong needed flexibility to quickly complete energy efficiency projects. It functioned as a revolving fund; new subprojects could be financed as subloans for each repaid subproject, multiplying energy savings.

Using ADB loan proceeds, the project established a special single-purpose trust fund managed by a financial intermediary, the Guangdong Finance Trust Company (GFTC). EPPPMO and GFTC appraised subproject applications and GFTC onlent[4] to financially viable EPP subprojects. Repayments of subloans, net of transfers to GPG for servicing the ADB loan, were used for further onlending. The trust was available only for EPP projects and could not be mixed with other trust funds.

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2 Guangzhou Zhiguang Electric Company implemented retrofits on 168 variable-speed and variable-frequency industrial motor drive systems for large electricity end users. Guangzhou Jinguan Company retrofitted the heating, ventilation, and air conditioning (HVAC) systems for commercial buildings and upgraded 88 sets of industrial motor drive systems. Zhuhai Secopower Transformer Company replaced 88 sets of transformers with high efficiency models for end users. Guangdong Zhongyu Technology Company installed 13,631 sets of distribution transformer station monitoring terminals for power grid utilities. Kaiping Fulai Electric Company installed 144 sets of reactive power compensators for large direct end users. Guangdong Haihong Transformer Company replaced inefficient transformers with 1,318 sets of high efficiency models. Two agencies, the Zhuhai Charlie Energy-saving Company and Guangdong SGIS Songshan Company, implemented a waste heat recovery subproject and refitted industrial boilers.

3 ADB. 2013. *Completion Report: Guangdong Energy Efficiency and Environment Improvement Investment Program, Tranche 1 in the People's Republic of China.* August. Manila.

4 Onlending refers to passing on loans to the institution requiring funding for a project or program. In turn, these intermediaries again onlend the money to a lower level of government or to users.

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The project helped Guangdong Province replace traditional light bulbs used in many streetlights with light-emitting diodes.

RESULTS

Upon completion in 2011, Tranche 1 generated EPP capacity totaling 130 MW and energy savings totaling 651 GWh per year, exceeding the initial target of the entire investment program (i.e., 532 GWh of energy savings per year and an equivalent 107 MW in capacity).

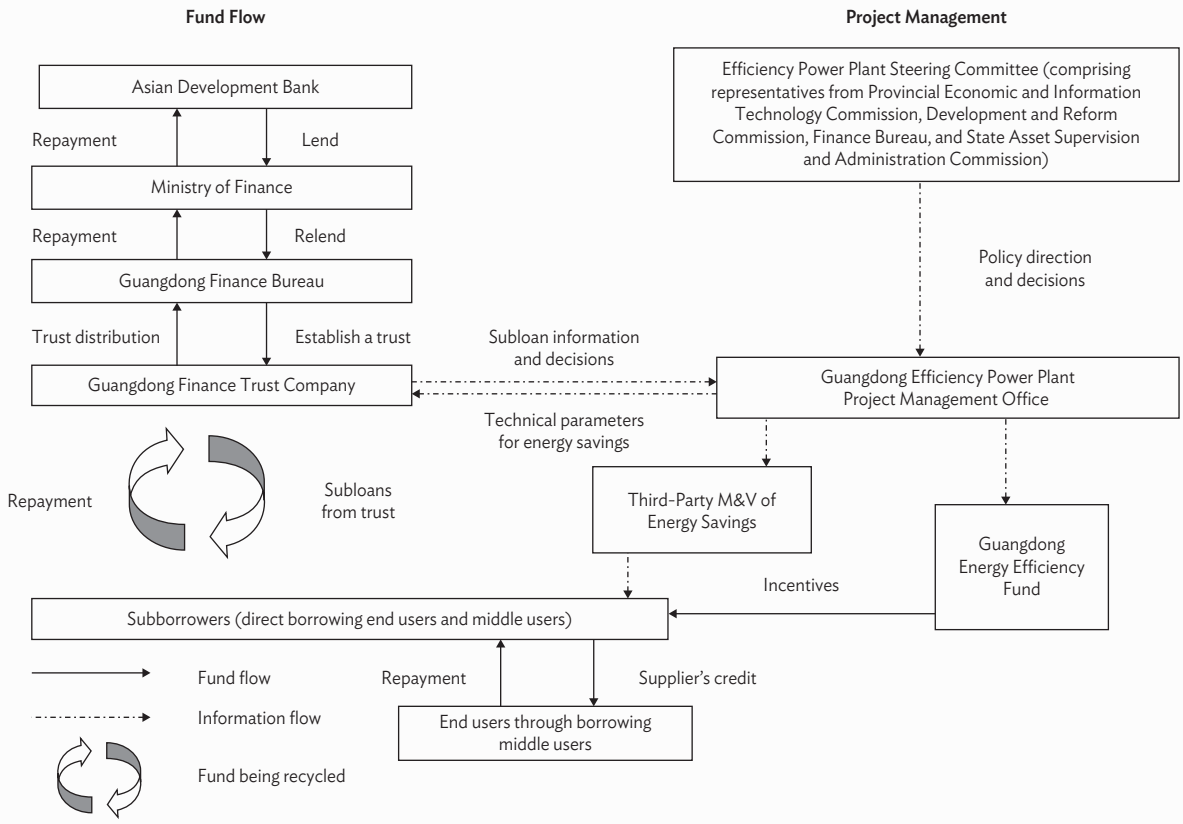
In addition, the project demonstrated how EPPs can be created in a systematic way. It tasked two entities for two aspects of program implementation. EPPPMO appraised the technical feasibility of the subprojects and subproject implementation, whereas GFTC appraised the financial viability of subborrowers and onlending. Thus, each entity complemented and supplemented the other. EPPPMO ensured smooth project implementation and timely loan repayment by subborrowers, freeing loan availability for next subproject borrower. This partnership facilitated more energy saving projects.

Moreover, the project facilitated development of two energy service companies (ESCOs). At the outset, two ESCO subborrowers implemented waste heat recovery and industry energy-efficiency retrofitting projects. By 2011, two other subborrowers had established their own ESCOs (footnote 3).

Guangdong's EPP model has attracted attention from other PRC municipalities, and many made study visits to learn about the EPP model. Figure 4.2.1 illustrates the program management and fund flow that facilitated the project's success.[5] Shandong and Hebei provinces have already replicated Guangdong's EPP model.

[5] ADB. 2009. *Project Administration Manual: Guangdong Energy Efficiency and Environment Improvement Investment Program, Tranche 1 in the People's Republic of China.* March. Manila.

Figure 4.2.1: Guangdong Energy Efficiency and Environment Improvement Investment Program, Tranche 1 Project Fund Flow and Management Structure



M&V = measurement and verification.

Source: ADB. 2009. *Project Administration Manual: Guangdong Energy Efficiency and Environment Improvement Investment Program, Tranche 1 in the People's Republic of China.* March. Manila.

LESSONS

Creating a replicable model. The structure of Guangdong's EPP model was straightforward. The project created a trust company and a project management office with distinct but complementary tasks in facilitating energy efficiency projects. Together, they were able to exceed project expectations, demonstrating that a simple structure with clear-cut delineations can ease implementation, especially in areas where EPP is relatively unknown. EPP project implementation is easier for subproject borrowers because it simplifies the whole EPP process, from loan request to completion. Other municipalities can easily replicate the model.

Savings and onlending. Subborrowers who successfully implement EPP subprojects can anticipate both energy and financial savings. Their loans yield monetary benefits, and full repayment is rolled over to the next borrower, expanding loan availability for other agencies seeking funds to implement their own EPP projects.

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The SGIS Songshan Company carried out a waste heat recovery subproject, along with industrial boiler retrofits.

A variety of efficiency power plant projects. By encouraging private companies to implement their own energy efficiency projects, the project was able to yield different kinds of energy efficiency measures. The project gave agencies wide enough parameters to propose initiatives suited to their own companies. Thus, the municipality was not confined to lighting fixture retrofits, but rather could implement a variety of energy-efficient measures that benefited the companies, the immediate community, and the environment.

Keywords

Energy efficiency, efficiency power plant, Guangdong, energy savings, energy, environment improvement, clean energy, climate change, emissions, pollution, People's Republic of China, PRC

For further reading

- http://www.adb.org/projects/documents/guangdong-energy-efficiency-and-environment-improvement-investment-program-rrp
- http://www.adb.org/features/shifting-energy-goalposts-prcs-Guangdong
- http://www.adb.org/projects/documents/mff-guangdong-energy-efficiency-environment-improvement-investment-program-t1-pcr

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