ADB

Report and Recommendation of the President to the Board of Directors

Project Number: 39653
April 2008

Proposed Multitranche Financing Facility and Administration of Grant from the Clean Energy Fund People's Republic of China: Guangdong Energy Efficiency and Environment Improvement Investment Program

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 24 April 2008)

Currency Unit	–	yuan (CNY)
CNY1.00	=	$0.1432
$1.00	=	CNY6.982

The exchange rate of the yuan is determined under a floating exchange rate system. In this report, a rate of $1.00 = CNY7.50, the rate prevailing during loan fact-finding, was used.

ABBREVIATIONS

ADB	–	Asian Development Bank
CBRC	–	China Banking Regulatory Commission
CDM	–	clean development mechanism
CER	–	certified emission reduction
CO_2	–	carbon dioxide
EIRR	–	economic internal rate of return
EPP	–	efficiency power plant
EPP-PMO	–	EPP project management office
ESCO	–	energy service company
FFA	–	framework financing agreement
FIL	–	financial intermediation loan
FIRR	–	financial internal rate of return
FNPV	–	financial net present value
FYP	–	five-year plan
GDP	–	gross domestic product
GPG	–	Guangdong provincial government
GFTC	–	Guangdong Finance Trust Company Limited
GFTIC	–	Guangdong Finance Trust and Investment Company
LIBOR	–	London interbank offered rate
MFF	–	multitranche financing facility
NDRC	–	National Development and Reform Commission
NO_x	–	nitrogen oxide
PFR	–	periodic financing request
PRC	–	People's Republic of China
SO_2	–	sulfur dioxide
TA	–	technical assistance

WEIGHTS AND MEASURES

MW (megawatt)	–	1,000,000 watts
GW (gigawatt)	–	1,000 MW
TWh (terawatt-hour)	–	10^{12} watt-hour (Wh)
GWh (gigawatt-hour)	–	10^9 Wh
MWh (megawatt-hour)	–	10^6 Wh
kWh (kilowatt-hour)	–	10^3 Wh
t (ton)	–	1,000 kilogram (kg)
tce	–	ton of coal equivalent

NOTE

In this report, "$" refers to US dollars.

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A. Clean Development Mechanism Assessment Report
B. Detailed Power Demand Forecast
C. Detailed Economic, Financial, and Environmental Analyses of Tranche 1 Subprojects

FACILITY AND INVESTMENT PROGRAM SUMMARY

Borrower	People's Republic of China (PRC)
Classification	Targeting classification: General intervention Sector: Energy Subsectors: Energy sector development; transmission and distribution Themes: Environmental sustainability, private sector development, capacity development. Subthemes: Cleaner production, control of industrial production; private sector investment; institutional development.
Environment Assessment	FI, which involves lending through a financial intermediary.
Investment Program Description	The Investment Program is to finance an efficiency power plant (EPP) in Guangdong province, equivalent to 107 megawatts, using the financial intermediation loan (FIL) modality. Nine subprojects have been selected for the first financing tranche. The energy savings will result from retrofitting existing equipment with more efficient equipment, which in aggregate will reduce the need to construct and operate a conventional coal-fired power plant. The Investment Program requires designing a suitable EPP model as a pilot in Guangdong that can be scaled up and replicated in other high energy consuming provinces. An EPP can be developed at about half the cost of a coal-fired power plant. Energy savings from an EPP have multiple benefits: (i) energy security improves as lesser new power supply capacity will be needed to meet future demand, and less coal will be used for power generation; and (ii) the local and subregional environment improves, and the contribution to global climate change is lower because of avoided coal use. The Investment Program will consider only retrofits of proven energy efficiency technologies in the following areas: (i) motors and motor-drive systems; (ii) transformers and reactive power compensators; (iii) lighting; (iv) heating, ventilation, and air conditioning; (v) air compressors and pumping systems; (vi) recovery of waste energy from industry; (vii) industrial boilers and industrial cogeneration; and (viii) other related energy efficiency improvement projects.

Multitranche Financing Facility

The success of the pilot EPP Investment Program will depend on how quickly barriers can be lowered and necessary investments are made by end users. A multitranche financing facility (MFF) is proposed to enable Guangdong provincial government (GPG) to increase awareness of EPP, select appropriate EPP subprojects, and systematically expand and implement the Investment Program. Since this is the first EPP project for both the Asian Development Bank (ADB) and GPG, a phased implementation is planned under successive tranche loans of the MFF. While implementation of subprojects under tranche 1 is in progress, the EPP-Project Management Office (EPP-PMO) will seek applications from other high impact subborrowers with potential for higher energy savings. The experience gained during the selection and design of subprojects in tranche 1 will be used to solicit applications from other types of subborrowers (e.g., budget-funded institutions like schools and hospitals) and improve the design of subsequent subprojects.

Readily available debt is often the key barrier for energy users wanting to use energy efficiency technologies for retrofitting; this is the case in Guangdong. Such investments are different from traditional infrastructure project financing, as (i) retrofits involve numerous relatively small investments (subprojects) with short implementation periods of a few months; (ii) end users do not expand production or develop new products, i.e., no additional revenue; (iii) commercial banks lack the understanding of energy efficiency technologies and benefits; and (iv) the payback period of subprojects is shorter (generally less than 5 years). In consideration of these characteristics, use of the FIL modality is proposed, with simplified subproject approval, strengthened implementation supervision, and the required flexibility to GPG for quicker turnaround of EPP activities. Given the numerous small subprojects, ADB's direct supervision of procurement, disbursement, and subproject approval will not be necessary under the FIL modality. Further, a FIL will allow ADB loan funds to be rolled over for new subprojects as each batch of subloans is repaid, thus creating additional energy savings.

Rationale

Currently, the PRC has the second largest energy demand in the world; it is projected to become the largest energy consumer soon after 2010. Approximately, 63% of the primary energy demand is met by coal, and 82% of electricity is generated from coal. Although the country has traditionally been self-sufficient in energy, the massive increase in internal demand has resulted in increased reliance on imported energy.

The high share of coal-fired power generation results in serious environmental issues and accounts for about 50% of the PRC's sulfur dioxide emissions and 80% of nitrogen oxide emissions—both pollutants result in acid rain that falls on one third of the country. Approximately, 48% of cities fail to meet the national air quality standards. Carbon dioxide emissions from power generation account for 26% of the greenhouse gas emitted from the PRC. The PRC currently accounts for 5.1% of global carbon emissions; this is estimated to increase to 28% by 2030. Rapid implementation of energy conservation measures, including implementation of EPPs, will lower the burden for later addressing the consequence of carbon emission and climate change.

Guangdong has the largest and fastest-growing economy among all the PRC provinces; its gross domestic product (GDP) has grown at 14% per annum since 1995. Electricity consumption is dominated by energy-intensive heavy industries, with the industry and manufacturing sectors combined representing about 73% of total electricity use. The total installed power generation capacity was 59.3 gigawatts in 2007. The province has relatively low natural resource endowments. It imports 100% of coal requirements and 80% of oil needs; approximately 20% of electricity is imported from other provinces. The demand for power has outpaced supply and power shortages have been experienced during the summer peak periods. More than 75% of the generation capacity is from coal-fired power plants, which have caused serious air pollution. The energy intensity of Guangdong's economy is relatively low compared with other provinces in the PRC, however, it is high by international standards—about 3.4 times the average of member countries of the Organization for Economic Cooperation and Development in 2006. Improving energy efficiency is a high priority for GPG to help address both energy security and environmental issues. Guangdong also provides a good setting to pilot the EPP model because of its vibrant economy and the large impact that energy savings will have in comparison with less industrialized provinces.

Impact and Outcome

The impact of the Investment Program will be improved energy security and environmental conditions in Guangdong. The outcome will be improved energy efficiency in the industry and commercial sectors. The outputs will be (i) establishment of an on-lending model that will enable an EPP to be developed with annual 532 gigawatt-hours of energy savings and an equivalent 107 megawatt capacity, (ii) development of the energy service company sector in Guangdong, (iii) development of capacity for the promotion and assessment of energy efficiency projects, and (iv) replication of the EPP model in other provinces.

Investment Plan

The cost of the Investment Program is estimated at $142 million.

($ million)

Item		Cost
A.	Tranche 1	44.2
B.	Subsequent Tranches	83.8
C.	Implementation Cost	14.0
	Total	**142.0**

Sources: Guangdong provincial government and Asian Development Bank estimates.

Financing Plan

($ million)

Source	Total
A. Asian Development Bank	
1. Tranche 1	35.00
2. Subsequent Tranches	65.00
Subtotal (A)	**100.00**
B. Guangdong Provincial Government	
1. Tranche 1	5.00
2. Subsequent Tranches	9.00
Subtotal (B)	**14.00**
C. Subproject Entities	
1. Tranche 1	10.00
2. Subsequent Tranches	18.00
Subtotal (C)	**28.00**
Total (A+B+C)	**142.00**

Sources: Guangdong provincial government and Asian Development Bank estimates.

Multitranche Financing Facility Amount and Terms

The MFF will provide up to $100 million from ADB's ordinary capital resources with final terms and conditions to be established under individual loan agreements based on prevailing ADB policies. The financing will be subject to interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility, the applicable commitment charge, and such other terms and conditions set forth in the related loan and project agreements. The Government has the flexibility to choose between eligible currencies and interest rate regimes most suitable for each loan. ADB provides flexibility in terms of repayment and interest rate swaps during the financing period in accordance with the framework financing agreement, relevant loan regulations, and draft loan and project agreements. Repayment schedules can be structured in line with the specific needs of individual loans.

Allocation and Relending Terms

The ADB loan proceeds will be made available by the Government to GPG, and then onlent in yuan (CNY) to EPP subborrowers through subloan agreements. The onlending will be executed through Guangdong Finance Trust Company Limited (GFTC), a trust company acting as the financial intermediary. GPG will bear the foreign exchange risk.

Retroactive Financing

Retroactive financing may be possible under individual loans for expenditures incurred 12 months before the signing of the corresponding loan agreements, with a ceiling of up to 20% of the loan amount, in accordance with *Cost Sharing and Eligibility of Expenditures for Asian Development Bank Financing: A New Approach.* The Government and GPG were informed that approval of advance contracting and retroactive financing does not commit ADB to finance any of the proposed subprojects.

Period of Utilization

The last financing tranche should be executed by 30 June 2010 and disbursed by 31 December 2012. Each loan may be onlent to new subborrowers as subloans are repaid until the ADB loans are repaid in full.

Executing Agency and Implementation Arrangements

GPG will be the Executing Agency responsible for overall implementation of the Investment Program. GPG has established the EPP-PMO to implement the EPP; GFTC will be the financial intermediary to onlend to subborrowers. The EPP Steering Committee will provide policy direction and operating guidance, and approve subloans. If GFTC and the EPP-PMO have differing opinions on the qualification of subloan applications, the steering committee will make the final decision. The EPP-PMO will be responsible for (i) marketing and promoting EPP; (ii) reviewing and assessing EPP subproject applications based on the selection criteria and approval process for subprojects; (iii) overseeing implementation of subprojects; (iv) measuring and verifying energy savings of completed subprojects; and (v) overall monitoring, managing, and reporting for the Investment Program. Third party consultants may be hired to (i) perform independent measurement and evaluation of EPP energy savings, (ii) assist in supervising subproject implementation, and (iii) help with clean development mechanism document preparation and verification activities.

GFTC will be responsible for (i) assessing the financial capacity of subborrowers and financial viability of the subprojects, (ii) disbursing funds and administering the subloan portfolio, (iii) managing the trust account, (iv) managing subloan collaterals and guarantees, (v) taking necessary action against nonperforming loans, and (vi) ensuring that the accounts are audited yearly.

The Investment Program design is innovative, wherein onlending is through a financial intermediary and implementation of EPP subprojects is overseen by the EPP-PMO. The approach considers sustainability and replicability of the EPP model, and takes into account the current barriers of the energy efficiency market in Guangdong. Successful EPP implementation requires effective management of financial and project aspects; involvement of GFTC and EPP-PMO addresses both these requirements and their strengths are complementary.

Procurement

Procurement will follow ADB's *Procurement Guidelines* (2007, as amended from time to time). Subborrowers will be required to follow relevant procurement rules in ADB's *Procurement Guidelines* for financial intermediary and adopt appropriate procurement procedures which will include (i) reasonable prices, and (ii) fair canvassing when selecting suppliers. Procurement must be from ADB member countries. Subborrowers will be encouraged to procure goods through competitive bidding and shopping when such procedures are applicable in the interest of economy and efficiency. In case of noncompliance, GFTC will exercise the right to recall the subloan.

Project Benefits and Beneficiaries

The environmental assessment and review framework concludes that the Investment Program will provide an overall benefit to environmental conditions in Guangdong. Regional air quality will improve and greenhouse gas emissions will be lowered as the need for coal-fired power generation will be reduced. The environmental benefits include the reduction of coal use by 175,813 tons/year (t/y); and the reduction of emission of total suspended particulates by 1,785 t/y, sulfur dioxide by 4,795 t/y; nitrogen oxide by 1,066 t/y, and carbon dioxide by 415,560 t/y. Based on a methodology in ADB's *Workbook on Economic Evaluation of Environmental Impacts,* the total economic net present value of tranche 1 subprojects with environmental benefits is estimated to be about $21.9 million compared with $14.1 million without environmental benefits.

Risks and Assumptions

The PRC places high importance on energy efficiency in its 11th Five-Year Plan, and benefits from the Investment Program will ensue as long as the Government and GPG continue to make this a priority. Technical risks are addressed by ensuring that the subprojects will use only proven technology. The amount of energy savings that can be achieved is dependent on the number and magnitude of subborrowers willing to be part of the Investment Program. The EPP-PMO will undertake marketing campaigns to inform potential participants. Subloan repayment is a risk; it will be kept low by ensuring that subborrowers have a positive cash flow from energy savings, i.e., the repayment installments are lower than the reduction in monthly energy bills. GFTC will constantly monitor the repayments and make suitable interventions to recover the subloans, when required. GPG will establish an energy efficiency fund in 2008 to provide for the implementation support costs of the Investment Program, such as, the trust management fees of the financial intermediary, independent measurement and verification of energy savings from subprojects, financial incentives to attract more EPP subprojects, application costs associated with clean development mechanism, capacity building, information dissemination, and provision for subloan default.

Grant Assistance

Grant assistance not exceeding the equivalent of $2 million from the Clean Energy Fund under the Clean Energy Financing Partnership Facility is proposed to provide capacity building assistance for (i) module 1: information sharing, training of trainers, and development of tools; (ii) module 2: appraisal of EPP applications, monitoring of implementation and evaluation of energy savings; and (iii) module 3: evaluation of EPP potential, barriers, new technologies, and estimation and projection of energy savings. The initial amount, based on available donor contributions, will be for $800,000. The remaining $1,200,000 will be considered for ADB approval when additional donor contributions are in place.

Consultants financed by ADB will be recruited by GPG according to ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time). Consulting firms will be selected through international competition using the quality- and cost-based selection method. Full technical proposals will be required and these will be evaluated based on a quality-cost ratio of 80:20. To ensure continuity between the two phases, GPG will invite proposals from consulting firms for the phased implementation of activities, but the implementation of phase II activities will be linked to ADB approval of subsequent grant component of $1,200,000.

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on (i) a proposed multitranche financing facility (MFF) to the People's Republic of China (PRC) for the Guangdong Energy Efficiency and Environment Improvement Investment Program (the Investment Program), and (ii) proposed administration of a grant for Capacity Building for Energy Efficiency Implementation from the Clean Energy Fund under the Clean Energy Financing Partnership Facility. The design and monitoring framework for the MFF is in Appendix 1.

II. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

A. Performance Indicators and Analysis

2. The PRC has achieved and sustained impressive economic growth averaging 9.5% for the past two decades. It now accounts for 15% of the global economy, up from 3% in 1980. By 2010, the economy is expected to double from its 2000 level, and quadruple by 2020. Given the projected growth, demand for energy and in particular electricity is expected to continue increasing rapidly. Per capita electricity consumption has risen dramatically, increasing from 340 kilowatt-hours (kWh) in 1983 to 1,840 kWh in 2005. Currently, the PRC has the second largest energy demand in the world, and is projected to overtake the United States soon after 2010. By 2030, the PRC is expected to account for 20% of global energy demand.[1]

3. The current growth in the PRC's power generation capacity is unprecedented. Installed power generation capacity increased at an annual average of more than 8% during the past two decades. Since 2000, the annual growth of electricity consumption has been about 13%. In 2006 alone, 114 gigawatts (GW) of new capacity was installed, equivalent to the entire installed capacity in Africa and a record annual increase for any country. An additional 91 GW new capacity was added in 2007. The rapid addition of generation capacity has still not fully met the surging electricity demand; since 2002, more than half of the provinces have had to curtail power supplies during the summer peak periods. PRC electricity demand increased from 259 terawatt-hours (TWh) in 1980 to about 3,250 TWh in 2007, and is projected to increase to 7,230 TWh by 2030.

4. Approximately 69% of the PRC's primary energy demand is met from coal, and 83% of electricity is generated from coal. The PRC has the third largest proven coal reserves in the world. It is the world's largest coal producer and consumer. Coal production accounted for 38% of global production in 2005, and is projected to increase to 49% by 2030. Coal demand increased from 447 million tons of coal equivalent (tce) in 1980 to 1,563 million tce in 2005, and is projected to increase to 3,462 million tce by 2030. Coal-fired power generation, using conventional power generation technology,[2] results in serious environmental issues and accounts for about 50% of the nation's sulfur dioxide (SO_2) emissions, 80% of nitrogen oxide (NO_x) emissions, and 26% of carbon dioxide (CO_2) emissions. Acid rain, caused primarily by SO_2 and NO_x, falls on one third of the country. Approximately, 48% of the cities fail to meet the national air quality standards,[3] and the country is projected to become the world's largest emitter

[1] Projections of energy demand, electricity consumption, carbon emissions, and energy intensity are taken from various reports published by the International Energy Agency, including World Energy Outlook, 2007.

[2] The most common conventional power generation technology is based on steam turbines with subcritical parameters and pulverized coal-fired boilers. The "critical" parameter is 22.1 megapascals, or about 218 times the standard atmospheric pressure, when water changes directly from liquid to the steam phase with the addition of energy. Modern power plants based on "supercritical" or "ultrasupercritical" parameters have considerably higher transformation efficiency so require less coal input and consequently have lower emission of pollutants and CO_2.

[3] World Bank. 2007. *Cost of Pollution in China*, Class II Ambient Air Quality Standards, Conference Edition. Washington, DC.

of energy-related CO_2 in 2007. The PRC currently accounts for 5.1% of global carbon emissions; this is estimated to increase to 28% by 2030.

5. The PRC has traditionally been self-sufficient in energy. However, the rapid increase in internal demand has increased the reliance on imported energy, and since the quantities are significant in terms of international energy trade, it is impacting energy security. The PRC is anticipated to become a net importer of coal in 2007, with imports increasing to 132 million tce by 2015, representing 10% of the world's coal trade. Declining domestic oil reserves will result in surging imports, from 3.5 million barrels per day in 2006 to an estimated 13.1 million barrels per day in 2030. Imported oil is projected to increase from 49% of primary oil demand in 2005 to 65% in 2015, rising to 79% by 2030. The PRC is currently self-sufficient in natural gas; however, by 2015, it is anticipated to import about 22% of the supply, rising to 54% by 2030.

6. Improving energy efficiency of the economy is a crucial response to reducing the environmental and energy security impacts resulting from the rapidly increasing energy demand and associated increases in power generation capacity. Between 2002 and 2005, industrial value added grew by 12% per year, while energy consumption grew by 15.9%. The surge in energy demand has been largely driven by the industry sector. Energy consumption by the sector increased from 36% of total consumption in 1990 to 42% in 2005, which is substantially higher than the 29% average of member countries of the Organization of Economic Cooperation and Development. Compared with international standards, the energy intensity of the PRC economy is relatively high at 9.18 tce per $10,000 of gross domestic product (GDP) (2006), compared with 2.47 tce for the United States and 1.52 tce for Japan.

B. Analysis of Key Problems and Opportunities

1. Key Problems and Constraints

7. Guangdong province is located in the south of the PRC, with an area of 179,757 square kilometers. Its population has been growing at an annual rate of about 2.2% since 1995 and is about 92 million (2005). It has the largest and fastest-growing economy of all the provinces; its GDP has grown at a rate of 14% per annum since 1995, significantly higher than the national average. Its GDP was CNY2.24 trillion in 2005, representing approximately one eighth of the nation's total GDP. Guangdong's industry sector is export orientated and represents 32% of national exports. An analysis of the provincial power subsector is in Appendix 2. Electricity consumption is dominated by energy-intensive heavy industries including cement, iron and steel, petrochemical, chemical, clay and porcelain, glass, paper and paper products, metals, textiles and other manufacturing industries. The industry and manufacturing sectors combined represent about 73% of total electricity use; residential consumption is about 13%; and the remaining 14% is for transport, construction, farming, and others.

8. By the end of 2007, Guangdong's total installed generation capacity was 59.3 GW, which is greater than the installed generation capacity of all but 13 countries of the world. It has relatively low natural resource endowments, and imports 100% of its coal requirements, 80% of oil needs, and approximately 20% of electricity from other provinces. The demand for power has been growing at 13% annually since 1995, outpacing capacity addition. The fast growth in power demand is expected to continue reflecting rapid expansion of the economy. Since 2002, Guangdong has experienced severe power shortages during the summer peak periods, and had to curtail power supply to many industrial consumers. The estimated power shortage in the summer of 2007 was about 6.3 GW. About 75% of the generation capacity in the province is from coal-fired power plants, which has caused serious air pollution. About 86% of the province experienced acid rain in 2005; and since 2000, most of Guangdong's large cities have had an

increase in the number of days when the ambient air quality failed to meet national air quality standards. The energy intensity of Guangdong's economy is relatively low compared with other provinces in the PRC; however, it is high by international standards. In 2006, energy intensity was 5.87 tce per $10,000 GDP, which was 3.4 times the average of member countries of the Organization of Economic Cooperation and Development, 3.9 times that of Japan, and 2.4 times that of the United States.

9. Improvements to the energy efficiency of the Guangdong industry sector will lower energy consumption and the need for additional power generation capacity, thereby reducing adverse environmental impacts and intermittent energy shortages, and improving energy security. Improvements in energy efficiency present the opportunity to lower energy consumption at a significantly lower economic, environmental, and social cost than installation of additional generation capacity. Improved energy efficiency also lowers end users' electricity bills, improves production efficiency, and enhances competitiveness. Key constraints to improving energy efficiency include (i) limited access to low-cost, long-term capital for utilizing energy efficiency technologies; (ii) lack of awareness among industry managers and officials about the benefits of energy efficiency technologies; (iii) agency issues, such as, shared incentives for owners and tenants of buildings; and (iv) weak supply chain of energy efficient products due to low volumes (demand) and thus higher unit prices. These barriers severely constrain private sector participation in energy efficiency investments, particularly the development of energy service companies (ESCOs), which have generally been highly effective in delivering energy efficiency benefits to industry in industrialized countries.

2. Opportunities

10. Due to the relatively large size of the Guangdong economy and its underinvestment in energy efficiency, the potential for energy efficiency improvement is large. During the next 15 years, its power subsector has an estimated cost-effective energy efficiency improvement potential of 17 GW (32% of current installed generation capacity) and 41 TWh per annum.[4] This potential can be realized at less than half the cost of construction and generation from coal-fired conventional power plants. In aggregate, investment in a broad range of energy efficiency technologies will lower energy demand in sufficient quantities to displace the requirement to construct conventional power plants. The aggregated energy efficiency investment is, therefore, referred to as an efficiency power plant (EPP) with the equivalent displaced capacity in MW terms, although the efficient equipment is installed in the premises of many consumers.

11. Power subsector analysis indicates that projects focusing on retrofitting of energy-intensive facilities at existing industrial and commercial establishments are the most cost-effective areas for energy efficiency improvement. Opportunities for retrofit efficiency investments exist for motors, transformers, lighting, air conditioning, etc. Improvement in the efficiency of energy consumption, as seen from international experience, has two significant benefits: (i) less primary energy supply will be needed for economic growth, which strengthens energy security; and (ii) less fossil fuel will be used, which will lower pollution and greenhouse gas emission. A MW of avoided power generation capacity reduces the investment in energy supply by more than $2 million, and every megawatt-hour saving will avoid 330 kilogram (kg) of coal consumption; and emissions of 780 kg of CO_2, 9 kg of SO_2, 3.4 kg of total suspended

[4] Asian Development Bank. 2005. *Technical Assistance to the People's Republic of China for Energy Conservation and Resource Management*. Manila (TA 4706-PRC, approved on 2 December, for $600,000). Part B: Prefeasibility Study of Energy Conservation and Resource Management Project in Guangdong. Draft Final Report, July 2007. Energy efficiency improvement potential is not the same as energy-saving potential. The former is achieved by using more efficient equipment and can be measured and monitored, it does not reduce output service, for example, using compact fluorescent lamps for lighting. The latter, however, generally depends on behavioral changes and often leads to foregone service, for example, switching off lights when not needed.

particulates, and 2 kg of NO_x emissions. Investment in energy efficiency allows a rapid reduction in energy demand, which is particularly important for provincial energy planning and management. An energy efficiency project can save energy in a shorter time frame (a few months) than construction of equivalent capacity conventional power plants (typically 2–4 years). It, therefore, provides provincial energy planners a useful energy supply development alternative.

12. The establishment of the energy efficiency industry in Guangdong largely depends on the development of private sector ESCOs and high-efficiency equipment manufacturers and distributors that assist industrial and other consumers improve energy efficiency at their facilities. ESCOs typically assist consumers through a shared savings contract, wherein they initially finance energy efficiency equipment and recover their investment from the savings in consumers' electricity bills. This model has been adopted internationally; however, the PRC has a number of persistent barriers including low capitalization of ESCOs and lack of access to debt from local banks. The small but developing ESCO industry in Guangdong can expand into a full energy service industry after removal of barriers.

3. Strategies of the Government and Asian Development Bank

13. The Government has implemented significant reforms in the energy sector. The national energy enterprises have autonomy for investment decisions. Coal prices are being gradually deregulated; only some of the coal used for power generation is now administratively priced. The power subsector was unbundled in 2003 with the creation of five national and several jointly owned provincial power generation companies, along with two power transmission and distribution companies that have provincial subsidiaries for satisfying consumer demand. The independent State Electricity Regulatory Commission now has a presence in all provinces. The National Development and Reform Commission regulates the retail electricity tariff. The countrywide average retail tariff in 2006 was CNY0.505/kWh ($0.0656/kWh); in Guangdong it was CNY0.682/kWh ($0.0886/kWh), the highest among all provinces. Time-of-day tariff, which leads to greater utilization of generation assets, is being used in most provinces for industrial consumers, including Guangdong. The tariff for industrial (manufacturing) consumers in Guangdong is $0.1/kWh and for commercial consumers $0.12/kWh, which is high in comparison with large consumers in industrialized countries and higher than the other provinces. However it sends a strong signal for improving energy efficiency.

14. The Government of the PRC prioritizes energy efficiency and environmental protection in the 11th Five-Year National Plan (2006–2010) (11FYP). It includes obligatory targets of improving energy intensity by 20%[5] and reducing major pollutants by 10%, including SO_2, which is emitted mostly by coal-fired power plants. Energy intensity reduced by 1.23% in 2006 and 3.7% in 2007, indicating that larger reductions will be needed during the remaining 3 years of the 11FYP. Since announcement of the targets, the State Council issued a number of guidelines and plans to strengthen the nation's efforts on energy efficiency improvement and pollutant reduction. The recently amended Energy Conservation Law became effective on 1 April 2008.

15. The 11FYP targets have been reallocated to the provinces. Guangdong has targets of improving energy efficiency by 16% and reducing SO_2 emissions by 15% by 2010. The Guangdong provincial government (GPG) recently issued a series of separate strategies to

[5] Energy intensity is the measure of energy input per unit of output, with output measured in financial or physical terms. Energy efficiency improves when less energy is consumed per unit of output. The elasticity ratio of energy consumption is the ratio of the increase in energy consumption to the growth of GDP.

support the proposed energy efficiency and pollutant reduction targets.[6] A policy framework was established for energy efficiency improvement and pollutant reduction in key sectors including (i) energy-intensive manufacturing industries, (ii) commercial and government facilities, (iii) building construction, (iv) electric equipment manufacturing, and (iv) transportation. The policy framework also allows for improved compliance and encouragement of local financial institutions to support energy efficiency improvement and pollutant reduction projects. The Guangdong Energy Conservation and Pollutants Reduction Plan specifically requires GPG to (i) expedite the pilot testing of EPP projects and promote implementation of EPP subprojects, and (ii) develop a strong ESCO industry. GPG views the Investment Program as an integral component of the provincial strategy to achieve the 11FYP energy intensity target. A summary of the GPG policy framework is attached to the framework financing agreement (Schedule 1 – Road Map and Investment Program).

16. The proposed Investment Program is consistent with the Asian Development Bank (ADB) (i) Medium-Term Strategy II, 2006–2008 strategic priority of managing the environment, and (ii) the strategic development objectives of the country strategy and program for sustainable development of energy and economic growth.[7] It is also aligned with ADB's energy sector policies.[8] ADB has been actively supporting policy reforms and the development of energy efficiency projects in the PRC, including a number of technical assistance (TA) projects for policy reforms[9] and recent inputs for designing the Investment Program.[10] In 2005, ADB

[6] Guangdong Electricity Demand Side Management Implementation Plan, 20 November 2006; Plan on Strengthening Energy Conservation Effort in Guangdong, 22 November 2006; Guangdong Provincial Mid- and Long-Term Energy Conservation Plan, 5 June 2007; Guangdong Comprehensive Energy Conservation and Pollutants Reduction Plan, 19 July 2007.

[7] ADB. 2006. *People's Republic of China: Country Strategy and Program Update (2007—2008)*. Manila.

[8] ADB. 1995. *The Bank's Policy Initiatives for the Energy Sector.* Manila; ADB. 2000. *Energy 2000, Review of the Energy Sector Policy of the Asian Development Bank.* Manila; and ADB. 2007. *Special Evaluation Study on Energy Policy 2000 Review: Energy Efficiency for a Better Future*. Manila.

[9] Some recent examples of policy-related TAs are (i) ADB. 2001. *Technical Assistance to the People's Republic of China for Pro-Poor Urban Heating Tariff Reforms.* Manila (TA 3673-PRC, approved on 19 June, for $850,000); (ii) ADB. 2002. *Technical Assistance to the People's Republic of China for Opportunities for the Clean Development Mechanism in the Energy Sector*. Manila (TA 3840-PRC, approved on 11 March, for $775,000); (iii) ADB. 2002. *Technical Assistance to the People's Republic of China for Establishing the National Electricity Regulatory Commission.* Manila (TA 3931-PRC, approved on 24 September, for $500,000); (iv) ADB. 2003. *Technical Assistance to the People's Republic of China for Power Pricing Strategy: Tariff Setting and Regulation.* Manila (TA 4117-PRC, approved on 21 May, for $500,000); (v) ADB. 2003. *Technical Assistance to the People's Republic of China for Renewable Energy for Poverty Reduction*. Manila (TA 4309-PRC, approved on 19 December, for $600,000); (vi) ADB. 2005. *Technical Assistance to the People's Republic of China for Alternative Energy Supply for Rural Poor in Remote Areas*. Manila (TA 4649-PRC, approved on 21 September, for $500,000); (vii) ADB. 2005. *Technical Assistance to the People's Republic of China for Poverty Reduction in Coal Mine Areas in Shanxi Province*. Manila (TA 4566-PRC, approved on 15 February, for $500,000); (viii) ADB. 2005. *Technical Assistance to the People's Republic of China for Alternative Livelihood Options to Facilitate Coal Sector Restructuring.* Manila (TA 4680-PRC, approved on 2 November, for $300,000); (ix) ADB. 2006. *Technical Assistance to the People's Republic of China for Support for Establishment of the Clean Development Mechanism Fund*. Manila (TA 4812-PRC, approved 30 June, for $600,000); and (x) ADB. 2006. *Technical Assistance to the People's Republic of China for Coal Mine Safety Study*. Manila (TA 4849-PRC, approved on 17 October, for $600,000).

[10] Some examples of recent energy efficiency related TAs are (i) ADB. 2001. *Technical Assistance for Promotion of Renewable Energy, Energy Efficiency, and Greenhouse Gas Abatement*. Manila (TA 5792-REG, approved on 4 January, for $5,000,000); (ii) ADB. 2005. *Technical Assistance to the People's Republic of China for Energy Conservation and Resource Management.* Manila (TA 4706-PRC, approved on 2 December, for $600,000); (iii) ADB. 2006. *Technical Assistance to the People's Republic of China for Preparing Energy Conservation and Resource Management Project.* Manila (TA 4819-PRC, approved on 19 July, for $300,000; this was increased to $620,000 on 28 September 2007); (iv) ADB. 2007. *Technical Assistance to the People's Republic of China for Promoting Resource Conservation and Energy Efficiency*. Manila (TA 4948-PRC, approved on 2 July, for $400,000); and (v) ADB. 2007. *Technical Assistance for Supporting the Implementation of the Energy Efficiency Initiative in Developing Member Countries.* Manila (TA 6392-REG, approved on 30 March, for $2,300,000).

launched the Energy Efficiency Initiative, which supports energy efficiency and renewable energy projects through a range of innovative grant and financing mechanisms.

4. Lessons

17. ADB's experience in the PRC's energy sector indicates that projects are generally well planned and implemented smoothly. The overall implementation performance of ADB's energy portfolio is satisfactory (Appendix 3). Several lessons from previous financial intermediation loans (FILs) and project loans relate to innovative financing of energy projects. First, to capture the small-scale segment of the energy efficiency market, typically overlooked by financial institutions, ESCOs must be developed; they are currently limited in their capacity to serve consumers by their access to capital. Therefore, the Investment Program will extend loans for the emerging ESCO industry in Guangdong. This is consistent with the initial findings of three ongoing country studies—Brazil, PRC, and India—being implemented by the World Bank and United Nations Environment Programme.

18. Second, some projects encountered difficulty in adequately verifying actual energy efficiency improvements; this detracts from demonstrating project benefits. The Investment Program includes an independent postinstallation verification and monitoring component to capture the project benefits. Third, some FILs encountered implementation difficulties due to lack of technical capacity in project identification and assessment within the financial intermediary. This issue will be addressed by the EPP Project Management Office (EPP-PMO) providing technical support. Fourth, some demonstration projects have not been replicated. The Investment Program will improve the probability of replication by providing targeted support for ESCOs and working with the National Development and Reform Commission to widely disseminate lessons and propose the EPP model to other provinces.

19. Other approaches for reducing energy demand are being designed. The Energy Efficiency Multi-Project Financing Program prepared by ADB's Private Sector Operations Department in 2007 has a guarantee mechanism for domestic banks when a preselected ESCO provides the technical services for improving energy efficiency in buildings. The World Bank is preparing a normal FIL, which includes capacity building input from the Global Environment Facility; and another private sector proposal extends guarantees for loans offered by partner domestic banks to utility companies to help consumers improve their efficiency of gas and district heat use. Considering the extremely large potential for improving energy efficiency in the PRC, pilot implementation of various approaches is justified.

III. THE PROPOSED INVESTMENT PROGRAM

20. The Investment Program is to finance, for up to $100 million, an EPP investment in Guangdong province equivalent to 107 megawatt (MW). Appendix 4 provides a summary of the estimated energy (in terms of megawatt-hours) and demand (MW) savings for the nine subprojects included in the first financing tranche and the Investment Program. The energy savings will result from retrofitting existing equipment with more efficient equipment, which in aggregate will reduce the need to construct and operate an equivalent coal-fired conventional power plant. The proposed Guangdong EPP will be the first of its kind in the PRC. It requires designing a suitable model as a pilot in Guangdong that can be scaled up and replicated in other high energy consuming provinces.

A. Impact and Outcome

21. The impact of the Investment Program will be improved energy security and environmental conditions in Guangdong. The outcome will be an improvement in energy efficiency in industry and commercial sectors in Guangdong.

B. Outputs

22. The outputs include (i) establishment of an onlending model that will enable an EPP to be developed with annual 532 gigawatt-hours of energy savings and an equivalent 107 MW capacity, (ii) development of the ESCO sector in Guangdong, (iii) development of capacity for promoting and assessing energy efficiency projects, and (iv) replication of the EPP model in other provinces. Implementation of the EPP will avoid consumption of 175,813 tons/year (t/y) of coal, resulting in emission reductions of 415,560 t/y of CO_2, 1,785 t/y of total suspended particulates, 4,795 t/y of SO_2, and 1,066 t/y of NO_x. Postinstallation verification and monitoring will be carried out by a third party to ensure energy savings are achieved.

C. Special Features

1. Benefits of the FIL Modality

23. Readily available debt is often the key barrier for energy users wanting to use energy efficiency technologies for retrofitting; this is the case in Guangdong. The characteristics of such investments are different from traditional infrastructure project financing, hence, need special consideration; for example, (i) retrofits involve numerous relatively small investments (subprojects) with short implementation periods of a few months; (ii) end users[11] do not expand production or develop new products, i.e., no additional revenue; (iii) commercial banks lack the understanding of energy efficiency technologies and benefits; and (iv) the payback period of subprojects is shorter (generally less than 5 years). Despite the benefits, energy users are disinclined to seek loans to retrofit energy efficient equipment and prefer to obtain capital for expansion and new business. In consideration of these characteristics, the use of the FIL modality is proposed with strengthened implementation supervision, and simplified subproject appraisal giving GPG the required flexibility for quicker turnaround of EPP activities. Given the numerous small subprojects, ADB's direct supervision of procurement, disbursement, and subproject approval will not be necessary under the FIL modality. Further, an FIL will allow ADB loan funds to be rolled over for new subprojects as each batch of subloans is repaid, thus creating additional energy savings.

24. The Investment Program will finance goods and services to reduce energy consumption and create savings for subborrowers. The financial intermediary, in this case a registered trust company, will manage the special purpose trust that will be established using ADB loan proceeds. The financial intermediary will appraise subproject applications and onlend to financially viable EPP subprojects. Repayments of subloans, net of transfers to GPG for servicing the ADB loan, will be used for further onlending. By law and under regulatory oversight, the trust company is required to administer the funds according to the terms of the trust agreement and may not commingle the funds with other trust funds. Unlike a commercial bank, the trust account will be kept distinct from its own assets, which offers protection against adverse results from other financial operations of the company. Thus, GPG will be able to ensure that ADB loan proceeds are only used to implement EPP subprojects and will not be

[11] In this report, the term end user refers to the entity that will borrow to retrofit equipment in its own facilities; the term middle user refers to the entity that will borrow to retrofit equipment in facilities owned by other users of electricity.

exposed to other banking risks. The trust company will earn a management fee from GPG for the service.

25. ADB's *Operations Manual*[12] defines and establishes the criteria for eligible financial intermediaries that onlend funds under the FIL modality. These include: (i) financial soundness; (ii) adequate credit and risk financial management practices; (iii) compliance with prudential regulations; (iv) acceptable corporate and financial management practices; (v) sound business objectives and strategy; (vi) autonomy in lending and pricing decisions; and (vii) adequate policies, systems and procedures to assess and monitor the economic, social, and environmental impacts of subprojects. In addition, financial intermediaries should have or develop capacity to mobilize domestic resources. In the past, financial intermediaries have usually been commercial or development banks and the requirements were structured accordingly. For this Investment Program, a special single purpose trust that supports GPG's energy efficiency program will be established and managed by a duly registered trust company, the Guangdong Finance Trust Company Ltd. (GFTC). As a result, criteria (vi) and (vii) above are not applicable to GFTC, and will be carried out by other participating entities. Lending and pricing decisions will be made by GPG as it bears the risk of the project, EPP-PMO will undertake the requirement in item (vii). Due diligence of GFTC indicates that the company is financially sound, has adequate credit and risk management policies, acceptable corporate and financial management practices, complies with prudential regulations and has a sound business strategy. Given that GFTC is neither a commercial bank nor a development financial institution, as has been the case in FILs in the past, the requirement to relend ADB's loan proceeds to a financial intermediary[13] is not applicable; instead of relending the loan proceeds, it will be made available to GFTC through a trust agreement.

26. While GFTC may review and reject any subproject that does not meet its financial or credit risk thresholds, it will not have autonomy to set the interest rate, as the Investment Program is designed to promote investment in energy efficiency technologies which may include incentives. Rather, GFTC's revenue will be derived from management fees and its interest will be protected through the trust agreement. The current barriers to borrowing for EPP subprojects have prevented the establishment of a benchmark interest rate for such loans from domestic banks. However, the trust agreement with GPG will allow GFTC to keep the term of the subloans as 5 years to match the payback period of the subprojects. The interest rate will be set within the allowable band of the 6-month interest rate set by the People's Bank of China for lending by commercial banks.[14] Onlending will be restricted to EPP subprojects that satisfy the selection criteria agreed under the Investment Program and that have been technically appraised by the EPP-PMO. Moreover, the selection criteria exclude lending for subprojects that involve land acquisition or involuntary resettlement, which significantly lowers the safeguard risks.

2. Use of the Multitranche Financing Facility

27. The success of this pilot EPP Investment Program will depend on how quickly barriers can be lowered and necessary investments are made by end users. An MFF is proposed to enable GPG to increase the awareness of EPP, recruit appropriate EPP subprojects, and expand and implement the Investment Program in a systematic manner. A phased implementation is planned under successive tranche loans of the MFF to manage the risk of the

[12] ADB. 2003. *Operations Manual*. Section D6/BP: Financial Intermediation Loans. Manila.
[13] ADB. 1987. *Review of Bank Policies on Credit Lines to DFIs*. Manila. (R27-87).
[14] Commercial banks in PRC do no have the complete freedom to set interest rates. However, the People's Bank of China allows interest rates to be fixed within a narrow band to reflect the credit risk of the borrower.

innovative approach for reaching out to end users. While implementation of subprojects under tranche 1 is in progress, the EPP-PMO will seek applications from other high impact subborrowers with potential for higher energy savings. The experience gained during the selection and design of subprojects in tranche 1 will also be used to solicit applications from other types of subborrowers (e.g., budget-funded institutions like schools and hospitals) and improve the technical design of subsequent subprojects.

3. Potential Benefits from Use of the Clean Development Mechanism

28. The rigor of the subproject certification functions in the Investment Program creates an opportunity for the EPP-PMO to help borrowers develop the subprojects into clean development mechanism (CDM) projects and consolidate them for registration for certified emission reductions (CERs). The CDM is a market-based arrangement under the Kyoto Protocol allowing industrialized countries with greenhouse gas reduction commitment to invest in projects that reduce carbon emission in developing countries as an alternative to more expensive emission reductions in their own countries. CERs will be achieved under the Investment Program by the avoided equivalent of coal-fired generation.

29. The subprojects identified under tranche 1 have potential carbon revenue ranging from 5% to 10% of the subprojects' total investment cost. This is a conservative estimate based on the cumulative CO_2 emission reductions until 2012, the end of the first commitment period under the Kyoto Protocol. Once the CERs are registered, the Asia Pacific Carbon Fund administered by ADB under the Carbon Market Initiative can consider upfront purchase of a maximum of 50% of the CERs generated by 2012.[15] Potential payments range from $1.2 million to $2.4 million.

4. Private Sector Participation

30. ESCOs have played an important role in implementing energy efficiency projects in developed countries. Their business model requires considerable capital because the repayments from end users are spread over a longer period to keep within the actual saving in electricity expenditure. In Guangdong and elsewhere in the PRC, ESCOs are still a fledgling industry due to limited access to capital, as local banks lack knowledge of energy efficiency matters and have been reluctant to lend when sales revenues are not being increased. The Investment Program will extend a line of credit to ESCOs that they can draw upon for installing efficient equipment in their client's premises and recover their cost over the duration of the subloan. It will thereby demonstrate a model for appropriately assessing financial and technical risks, monitoring implementation and evaluating savings that local banks can use to support private sector ESCOs and end users' EPP subprojects.

5. Replicability

31. The simplified onlending, application assessment, and procurement procedures proposed under the Investment Program are designed to facilitate participation of a wide variety of EPP subprojects. At the same time, it will have a stronger mechanism for supervision of implementation and evaluation of results through the EPP-PMO, and third party measurement and verification of results. In cases where subprojects result in a lower saving, the EPP-PMO will have the responsibility to (i) engage other end users to take subloans and implement EPP subprojects, and/or (ii) tighten the technical eligibility criteria for subprojects in subsequent tranches. Once the model is adopted by the wide variety of EPP subborrowers, its scalability

[15] The proceeds from the sale of CERs cannot be commingled with the subloans. When such sales take place, part of the proceeds will be transferred to the EPP-PMO in consideration of its aggregation of the small subprojects, and used for promoting more EPP subprojects.

and replicability will be assured, and GPG may attract other external resources for its energy efficiency programs.

D. Program Investment Plan

32. The Investment Program cost is estimated at $142 million (Table 1).[16] The total cost includes physical and price contingencies, and interest and other charges during implementation. Details of the subproject investment costs are in Appendix 5.

Table 1: Program Investment Plan
($ million)

Item	Amount
A. First Tranche	
Base Cost[a]	
a. Three End-User EPP Subprojects	5.6
b. Six Middle-User EPP Subprojects	38.6
Subtotal (A1)	**44.2**
Subtotal (A)	44.2
B. Subsequent Tranches	83.8
C. Implementation Cost[b]	14.0
Total	**142.0**

EPP = efficiency power plant.
[a] In mid-2007 prices; includes physical and price contingencies, interest, and commitment charges.
[b] Includes trust management fees, independent measurement and evaluation costs, clean development mechanism preparation and registration cost, provisions for loan defaults, EPP-Project Management Office administrative cost, and other implementation costs.
Sources: Guangdong provincial government and Asian Development Bank estimates.

E. Financing Plan

33. The Government has requested financing of up to an equivalent of $100,000,000 from ADB's ordinary capital resources to help finance the Investment Program. Financing will be provided in accordance with ADB policy.[17] The MFF will extend multiple loans[18] to finance energy efficiency subprojects under the Investment Program, subject to the submission of a related periodic financing request (PFR) by the Government and execution of the related loan and project agreements. The Government has entered into a framework financing agreement (FFA) with ADB, and is obligated to comply with its requirements.[19] The minimum amount of a PFR will be $20,000,000. Each PFR will be accompanied by a list of EPP subprojects identified for financing. All provisions of the loan regulations applicable to loans based on the London interbank offered rate (LIBOR)[20] will apply to each loan, subject to any modifications that may be included under the individual loan agreement. The Government has the option to choose between eligible currencies and the interest rate regime for each loan. The specific terms for each loan will be based on the related PFR with interest rate to be determined in accordance with ADB's LIBOR-based lending facility and the applicable commitment charge, and such other terms and conditions set forth in the draft loan and project agreements. The Government has provided ADB with (i) the reasons for its decision to borrow under ADB's LIBOR-based lending

[16] An exchange rate of CNY7.5 = $1 has been used for estimation and analysis, which corresponds to the rate during loan Fact-Finding Mission.
[17] ADB. 2005. *Innovation and Efficiency Initiative: Pilot Financing Instruments and Modalities.* Manila.
[18] The number of tranches is anticipated to be between two and four depending on the readiness of subborrowers.
[19] The draft framework financing agreement formed part of the Memorandum of Agreement of the Fact-Finding Mission, which was signed by GPG and endorsed by the Ministry of Finance. The framework financing agreement was signed on 2 April 2008.
[20] ADB. 2001. *Ordinary Operations Loan Regulations Applicable to LIBOR-Based Loans Made from ADB's Ordinary Capital Resources.* Manila.

facility on the basis of these terms and conditions, and (ii) an undertaking that these choices were its own independent decision and not made in reliance on any communication or advice from ADB. Pursuant to the FFA, the Government submitted the first PFR to ADB for tranche 1 in the amount of $35,000,000 as an FIL. It will have a term of 15 years. GFTC will onlend the loan proceeds for eligible subprojects. Consequently, repayment of the principal to ADB will be during the last 3 years. Subsequent tranches could support similar FIL or project loans.

34. Financing for each EPP subproject is inclusive of 20% equity by each subloan borrower. GPG's contribution, about 10% of the Investment Program, will be used to cover fees for trust account administration, independent measurement of energy savings, financial incentives to attract more EPP contributors, and other implementation-related costs. The financing plan for the Investment Program is in Table 2.

Table 2: Financing Plan
($ million)

Source		Total
A.	**Asian Development Bank**	
	1. Tranche 1	35.00
	2. Subsequent Tranches	65.00
	Subtotal (A)	**100.00**
B.	**Guangdong Provincial Government**	
	1. Tranche 1	5.00
	2. Subsequent Tranches	9.00
	Subtotal (B)	**14.00**
C.	**Subproject Entities**	
	1. Tranche 1	10.00
	2. Subsequent Tranches	18.00
	Subtotal (C)	**28.00**
	Total (A+B+C)	**142.00**

Sources: Guangdong provincial government and Asian Development Bank estimates.

35. The borrower of each loan under the Investment Program will be the PRC, and the loan proceeds will be re-lent from the Government to GPG on the same terms and conditions as the ADB loan. GPG, through GFB, will entrust the loan proceeds to GFTC for onlending to EPP subborrowers. The interest rate will be set within the allowable band of the 6-month interest rate set by the People's Republic of China for lending by commercial banks. GFTC will set up a trust account specifically for this purpose. GPG will bear the foreign exchange risk as it is best suited to manage the risk because of its larger portfolio of foreign-funded investments, and its willingness to support the Investment Program as it relates to public goods, namely, energy security and environmental improvement.

F. Implementation Arrangements

1. Investment Program Management

36. GPG will be the Executing Agency responsible for overall implementation of the Investment Program. GPG has established the EPP-PMO to implement the energy efficiency subprojects and will entrust GFTC as the financial intermediary for the purpose of lending to the subborrowers. The EPP Steering Committee (steering committee) is also in place comprising senior officials from Guangdong Province Economic and Trade Commission, Guangdong Development and Reform Commission, Guangdong Finance Bureau, and State Assets Supervision and Administration Commission. The committee will provide policy direction and operating guidance, and approve subloans. The EPP-PMO will be responsible for nonfinancial and technical assessment of applications and supervision of EPP subproject implementation.

37. GFTC, under the terms of a trust agreement with Guangdong Finance Bureau (representing GPG), will establish a separate unit to administer the trust. Its onlending responsibilities will include assessing the financial viability of the subprojects, disbursing funds and managing the subloan portfolio, including subloan collateral and guarantees, and preparing financial statements. For internal control purposes, GFTC maintains segregation of duties for the various functions of administration, financial accounting, and legal matters. It currently has adequate staff for managing the tranche 1 subloan portfolio. Additional staff will be engaged, as necessary, when the number of subloans increases. In the event that GFTC does not meet performance standards to the satisfaction of ADB and GFB, or its financial health deteriorates significantly, GPG may, in consultation with ADB, propose a new financial intermediary. The overall Investment Program management and onlending model is presented in Appendix 6. An assessment of financial management of GFTC is in Appendix 7. Details of the Investment Program implementation arrangement are presented in Appendix 8.

2. Subproject Selection Criteria

38. The Investment Program will consider only retrofits of proven energy efficiency technologies in the following areas: (i) motors and motor-drive systems; (ii) transformers and reactive power compensators; (iii) lighting; (iv) heating, ventilation, and air conditioning; (v) air compressors and pumping systems; (vi) recovery of waste energy from industry; (vii) industrial boilers and industrial cogeneration; and (viii) other related energy efficiency improvement projects.

39. The EPP subprojects have been selected according to the criteria set out in Appendix 9. The EPP-PMO will apply the same criteria in the selection of subsequent subprojects. Subprojects that involve land acquisition or resettlement issues will not be considered. In subsequent batches of onlending, individual subloans that exceed $10 million (the free limit) will be subject to prior review by and approval from ADB. For individual subloans below the free limit, ADB reserves the right to review subproject proposals and refuse financing for any subproject that does not meet the eligibility criteria or comply with ADB guidelines.

3. Implementation Period

40. The Investment Program will be implemented over 5 years between 2008 and 2012. The majority of tranche 1 loan is expected to be disbursed in 2008 soon after loan effectiveness, enabling energy savings and demand reduction to be realized from 2008. The PFRs for the subsequent tranches are expected in late 2008 and in 2009. The disbursement of the last tranche will be completed not later than 31 December 2012. Onlending to EPP subborrowers will take place according to the implementation schedule set forth in the subproject agreement signed by the EPP-PMO and the subborrowers. As subloans are repaid, the repayments, net of debt service payments to ADB, will be used to finance further batches of EPP subprojects, thereby multiplying the benefits of the ADB loan.

4. Procurement and Disbursement

41. Procurement will be done in accordance with ADB's *Procurement Guidelines* (2007, as amended from time to time). Subborrowers will be required to follow the relevant procurement rules in ADB's *Procurement Guidelines* for financial intermediaries, and adopt appropriate procedures including (i) payment of reasonable prices; and (ii) fair canvassing when selecting suppliers. Procurement must be from ADB member countries. Subborrowers will be encouraged to procure goods through competitive bidding or shopping when such procedures are most

appropriate in the interest of economy and efficiency. In case of noncompliance, GFTC will exercise the right to recall the subloan. The procurement plan is in Appendix 10.

42. Disbursements under each PFR will be in accordance with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time). The loan proceeds will be paid through GFB to a trust account that will be set up upon loan effectiveness of the first loan at a commercial bank acceptable to ADB. The transfer of such loan proceeds from GFB to the trust account should take place promptly within 5 working days from approval by the State Administration of Foreign Exchange Guangdong Branch. The trust account will be managed by GFTC. The withdrawal request for any subproject loan proceeds will be supported by a withdrawal application, and certification from the GFB that the subloan and subproject agreements for the subproject have been executed between GFTC, EPP-PMO, and the related subborrower, respectively, and include terms and conditions specified in related legal agreements with ADB, and are legally binding upon the parties. This certification will be a condition for loan disbursement. Additionally, each withdrawal request needs to be supported by the simultaneous application for subloan approval and withdrawal for subloans not exceeding the free limit of $10,000,000.00. For subloans in excess of the free limit, copies of the subloan and subproject agreements will be submitted together with the subloan approval and withdrawal statement. The disbursements under each subloan may be in several installments based on the readiness of the subproject.

5. Advance Contracting and Retroactive Financing

43. Due to the urgency of meeting annual energy savings targets set out in Guangdong's 11FYP, the EPP-PMO proposes commencing implementation of some EPP subprojects included in tranche 1 prior to ADB's approval of the Investment Program and accompanied PFR for tranche 1. For these subprojects, the Government has requested approval of advance contracting and retroactive financing. For each loan under the MFF, GPG may request advance contracting for the required energy efficient equipment, and retroactive financing of up to 20% of the first loan provided such expenses were incurred in accordance with procurement practices acceptable to ADB. The Government has been informed that provision of advance contracting and procurement and retroactive financing does not commit ADB to finance the subprojects. For subsequent tranches, retroactive financing of otherwise eligible expenditures may be considered and allowed by ADB Management when included in a PFR. Total retroactive financing will not exceed an amount equivalent to 20% of the individual loan and must have been incurred not more that 12 months before the signing of the related legal agreements.

6. Anticorruption Policy

44. ADB's *Anticorruption Policy* (1998, as amended to date) was explained to and discussed with the Government, GPG, EPP-PMO, and GFTC. Consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Investment Program. To support these efforts, relevant provisions of ADB's *Anticorruption Policy* (1998) are included in the loan regulations and bidding documents under the Investment Program. In particular, all contracts financed by ADB in connection with the Investment Program shall include provisions specifying the right of ADB to audit and examine the records and accounts of the financial intermediary, the EPP-PMO, subborrowers, and all contractors, suppliers, consultants, and other service providers as they relate to the Investment Program. In addition, the following characteristics of the Investment Program promote transparency and strengthen governance: (i) dual scrutiny of the subprojects (technical, economic, environmental, and social by the EPP-PMO and financial by GFTC); (ii) the use of trust agreement (between

GFB and GFTC), and subloan and subproject agreements; and (iii) an information campaign to be carried out by the EPP-PMO to inform enterprises and other large energy consumers about the Investment Program and their entitlements.

7. Accounting, Auditing, and Reporting

45. GFB, GFTC, the EPP-PMO, and each EPP subborrower will ensure that proper accounts and records are maintained and audited in a timely manner to adequately identify the use of loan proceeds. The EPP-PMO, in cooperation with GFTC, will prepare and provide ADB with quarterly progress reports on program implementation. These reports will include a description of progress made during the review period, problems encountered and remedial actions taken, and subsequent activities to be undertaken. GFTC will submit quarterly financial reports to ADB on each subproject showing transactions during the quarter; loan defaults, if any; and any other relevant information. GFTC will submit its audited annual financial statements to ADB within 6 months after the fiscal year-end. The audit report will include an opinion on the use of the GPG account and the trust account and subloan approval and withdrawal procedures. The EPP-PMO, in cooperation with GFTC, will submit a project completion report to ADB within 6 months of physical completion of the first batch of subprojects financed under each financing tranche, and an investment program completion report within 6 months of physical completion of all ADB-supported activities and subprojects under the Investment Program, i.e., after all the ADB loans extended under the Investment Program are repaid.

8. Investment Program Performance Monitoring and Evaluation

46. The investment program performance and monitoring system indicators and their relevance were discussed with GPG, EPP-PMO, and GFTC during project preparation. The indicators are based on the monitoring indicators in the design and monitoring framework. The EPP-PMO, in cooperation with GFTC, will ensure that within 6 months of the effective date of the first loan agreement under the Investment Program, a performance and monitoring system is established. The system will be in a form and substance acceptable to ADB in accordance with the Investment Program performance indicators. The system should also include a detailed plan for measuring and verifying actual energy savings of the implemented subprojects. The EPP-PMO and GFTC will undertake periodic project performance review under each subloan, in accordance with the performance and monitoring system to evaluate the scope, implementation arrangements, progress, achievements of the claimed energy savings, and other benefits of the projects and the overall Investment Program.

9. Investment Program Review

47. ADB, GPG, EPP-PMO, and GFTC will meet regularly as required to discuss progress of the individual subloan portfolios and any changes to implementation arrangements or remedial measures required for achieving the objectives of the Investment Program. Results of independent postinstallation verification and monitoring of energy savings will be considered. ADB and GPG will undertake joint reviews of the Investment Program until it is fully disbursed. GPG will develop a monitoring plan and ensure that periodic progress and financial reports are submitted to ADB regularly.

IV. CAPACITY BUILDING GRANT FOR ENERGY EFFICIENCY IMPROVEMENT

48. The EPP-PMO is assessed to have reasonable technical expertise for energy conservation activities. However, considering the innovative design of the Investment Program, areas identified as requiring assistance include technical assessment for certain energy

efficiency technologies, economic analysis of subprojects in accordance with ADB guidelines, measurement and verification of energy savings from subprojects, and development of CDM projects.

49. GPG will build the capacity of the EPP-PMO. It plans to establish the Guangdong energy efficiency fund to support such activities and meet other related expenses, such as the trust management fees of the financial intermediary, independent measurement and verification of energy savings from subprojects, financial incentives to attract more EPP subprojects, application costs associated with CDM, information dissemination, provision of subloan default, and other investment program implementation costs. The fund will be financed by (i) provincial government budget, (ii) provincial energy surcharge on high energy users, and/or (iii) international donor grant support. GPG has tentatively agreed to fund $1.5 million for EPP-PMO operations in 2008 including third-party savings measurement and verification activities.

50. The Government has also requested continued ADB support for the Investment Program, particularly in the area of market analysis of the potential energy savings in Guangdong, implementation support, and training in various aspects of energy efficiency activities. The scope of the project preparatory TA (footnote 10, iii) was expanded to include the initial training of EPP-PMO staff, as it processes applications for subsequent tranches. Further, a grant of $2,000,000 is proposed for capacity building for energy efficiency implementation to be sourced from the Clean Energy Fund under the Clean Energy Financing Partnership Facility. While several donor countries have indicated their intent to contribute to the Clean Energy Fund, the full contributions have not yet been made. The initial approval, based on the allocation from the available donor contribution, will be for $800,000[21], which will provide the resources for implementing activities included in the first phase. The remaining $1,200,000 will be considered for ADB approval when additional donor contributions are in place and the allocation is approved under the guidelines for the Clean Energy Financing Partnership Facility, which is expected in mid-2008. The terms of reference, the division of consulting services inputs, and cost estimates of the two phases are in Appendix 11.

51. Consultants under the grant will be recruited by GPG according to ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time). Consulting firms will be selected through international competition using the quality- and cost-based selection method. Full technical proposals will be required and be evaluated based on a quality-cost ratio of 80:20. To ensure continuity between the two phases, GPG will invite proposals from consulting firms for the phased implementation of activities, but the implementation of phase II activities will be linked to ADB approval of the subsequent grant components of $1,200,000. Grant proceeds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time); direct payment and reimbursement procedures will be used.

V. INVESTMENT PROGRAM BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS

A. Environmental Benefits and Impacts

52. An environmental assessment and review framework prepared for the Investment Program (Appendix 12) concludes that the Investment Program will provide an overall benefit to the environmental conditions in Guangdong. Regional air quality will improve and greenhouse gas emissions will be reduced as the need for coal-fired power will be reduced. The environmental benefits include reduction of coal use and emissions (para. 22). Based on ADB's *Workbook on Economic Evaluation of Environmental Impacts,* the total economic value of the

[21] Contributor: Government of Australia.

quantifiable environmental benefits from reduced air emissions is estimated to be about $7.8 million (Appendix 13) over the life of tranche 1. Unquantifiable environmental benefits are also significant.

53. Because the Investment Program deals with only retrofits of existing facilities at consumer sites, the potential environmental impacts are limited to disposal of the replaced electrical and mechanical equipment and appliances. Disposal will comply fully with GPG regulations to minimize any potential impacts. In accordance with ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003), the first tranche of the Investment Program is classified as FI as all the subprojects have insignificant environmental impacts.

B. Economic Analysis

54. A forecast of the electricity demand in Guangdong considered trends, structural changes, efficiency improvements, GDP growth, and other important factors affecting energy demand Electricity demand (GWh) was conservatively forecast to grow at more than 10% for 2007–2011 and about 8% for 2016–2020; peak system load (MW) is projected to grow at more than 9% from 2007 to 2015 and about 7% from 2016 to 2020 (Appendix 2). EPP is a least-cost option to help balance power demand and supply in Guangdong; it will cost about half of the cost of power supply from a conventional coal-fired power plant.

55. The economic internal rate of return (EIRR) was calculated to assess the economic viability of the subprojects. The economic analyses were performed according to ADB's *Guidelines for Economic Analysis of Projects* (1997). The economic costs include capital costs, and operation and maintenance costs. Appropriate conversion factors were used to convert financial values into economic values. Values are expressed in 2007 local currency. The economic benefits mainly include the cost savings of electricity and coal. The economic benefits of avoided air emissions were also considered. The estimated EIRR and economic net present values for the subprojects are shown in Table 3. For tranche 1, the EIRR is estimated at 23.3% without environmental benefits and 28.9% with the benefits. The economic net present value is $14.1 million without environmental benefits and $21.9 million with. Sensitivity and risk analyses modeling were performed for adverse scenarios, and the EIRRs were found to be stable and robust. The EIRR of tranche 1 would decrease to (i) 22.7% if the subprojects experience a cost overrun of 20%; (ii) 20.7%, if the benefits reduce by 20%; (iii) 24.1%, if the subprojects experience a commissioning delay of 1 year; and (iv) 18.5%, if (i), (ii), and (iii) all happen. Even under the unlikely case of (iv), the EIRR for tranche 1 is still significantly higher than 12%. Additional information about the economic analyses is in Appendix 13.

Table 3: Summary of Economic Internal Rate of Return and Economic Net Present Value

Subcomponent	Without Environmental Benefits		With Environmental Benefits	
	EIRR (%)	ENPV ($1,000)	EIRR (%)	ENPV ($1,000)
Fenghua Advanced Technology Co.	23.5	1,164	30.7	1,865
Guangzhou Iron and Steel Co.	33.0	669	41.8	1,007
Huizhou South Thermo-Electricity Co.	34.0	1,976	44.7	2,928
Hongtai Trade Co.	24.8	1,386	31.7	2,118
Jinguan Energy Services Co.	23.3	1,200	28.8	1,992
Haihong Co. Ltd.	16.4	275	20.9	60
Zhiguan Electric Co.	17.3	2,694	22.8	5,302
Laifu Electric Co.	34.8	1,121	39.5	14,899
Zhuhai Secopower Transformer Co.	31.2	423	36.5	586
Total for tranche 1	23.3	14,083	28.9	21,850

Co = company, EIRR = economic internal rate of return, ENPV = economic net present value.
Source: Asian Development Bank estimates.

C. Financial Analysis

56. **Financial Internal Rate of Return (FIRR) and Financial Net Present Value**. The FIRR and financial net present value were computed for each of the nine subprojects as well as for all the nine subprojects combined (Table 4). The financial analyses were carried out in accordance with ADB's *Financial Management and Analysis of Projects* (2005).[22] The financial costs include capital costs, and operation and maintenance costs. The financial benefits are based on the cost savings for electricity resulting from reduced electrical consumption. To be conservative, the potential revenue from sale of the CERs under the CDM is not included in the FIRR calculation. The weighted average cost of capital is estimated to be 7.5%. The FIRRs for each of the nine subprojects are higher than the weighted average cost of capital, confirming the financial viability of the subprojects. The FIRR for tranche 1 is estimated at 16.6% and the financial net present value at $21.3 million. Sensitivity analyses show that the FIRR is stable and robust under various adverse scenarios. The overall FIRR would decrease to (i) 12.8% if the subprojects experience a cost overrun of 20%; (ii) 11.3%, if the benefits are lowered by 20%; (iii) 14.4%, if commissioning is delayed by 1 year; and (iv) 4.3%, if (i), (ii), and (iii) all happen. The detailed project financial analysis is in Appendix 14.

Table 4: Summary of Financial Internal Rate of Return and Financial Net Present Value

Subproject	FIRR (%)	FNPV ($1,000)
Fenghua Advanced Technology Co.	16.5	1,231
Guangzhou Iron and Steel Co.	24.3	689
Huizhou South Thermo-Electricity Co.	22.5	1,771
Hongtai Trade Co.	18.4	1,487
Jinguan Energy Services Co.	16.4	1,235
Haihong Co. Ltd.	11.5	344
Zhiguan Electric Co.	13.2	3,633
Laifu Electric Co.	26.4	12,140
Zhuhai Secopower Transformer Co.	23.1	446
Total for tranche 1	**16.6**	**21,271**[a]

Co = company, FIRR = financial internal rate of return, FNPV = financial net present value.
[a] Less than the sum of subprojects due to the inclusion of implementation costs.
Source: Asian Development Bank estimates.

57. **Financial Performance of GFTC**. GFTC is owned by GPG and is the only provincial trust company operating in Guangdong. Strict new rules and regulations introduced by the China Banking Regulatory Commission, following the industry shakeout during the Asian financial crisis, has led the company to reorganize its operations and strengthen its finances. The new regulations mean that GFTC has been provided with paid-up capital of CNY565 million ($75 million), and must maintain complete separation between its trust operations and its own proprietary investments, avoid taking deposits or secure loans against its own balance sheet, and conduct its trust business with arms length transactions at fair market prices. Conditions that favor GFTC include Guangdong's rapid economic development; the strengthened financial market regulatory framework of the China Banking Regulatory Commission, and GFTC's own good reputation and financial strength. However, negative elements include lack of understanding of trust companies by the general public, lack of innovation, and overregulation.

58. By the end of 2006, GFTC had fully written off non-performing assets and disposed of loans that no longer comply with current trust company regulations. The successful cleaning up of the balance sheet was facilitated by GFTC using its own proprietary capital to earn good returns in the buoyant economic conditions that prevailed during 2006. Revenues virtually doubled to reach CNY118 million ($15 million), while operating profits grew from CNY20 million

[22] ADB. 2005. *Financial Management and Analysis of Projects.* Manila.

in 2005 to reach CNY96 million in 2006—an almost five-fold increase. These returns were sufficient to cover the write-off (CNY60 million) of the remaining nonperforming loans and provide an after-tax profit of CNY12 million. Fee income from managing trusts made a relatively minor CNY5.6 million (5%) contribution to revenue, but enabled GFTC to leverage its professional capabilities and take advantage of its ability to do business in a field that offers a relatively more stable income stream than its other activities. GFTC anticipates that planned increases in its trust management activities will reduce its dependence on the speculative and volatile securities trading business, and thereby help stabilize returns from one year to the next. GFTC managed more than 40 trusts in 2006 with a total of CNY995 million ($133 million) under trust management at year-end. Trust accounts under GFTC management are projected to grow from around 5% of revenues in 2006 to 25% by 2012, thereby ensuring steady financial returns. Management of GPG's EPP trust will greatly assist GFTC to achieve this objective. The overall profit forecasts to 2012 anticipate that the 26% after-tax operating return on capital employed in 2006 is likely unsustainable; and while potential returns from stocks may be volatile from year to year, the trend will align closely with the overall national economic growth rate. Growth in the trust management portfolio is a potentially profitable development, but will require more intensive staff supervision and higher administrative and general costs. Its experience and good record indicate that the company is capable of managing the proposed Investment Program.

D. Social Benefits and Poverty Reduction

59. By including only retrofits of existing electricity consuming facilities, the Investment Program will not involve any land acquisition or resettlement. Therefore, no land acquisition or resettlement plan is needed. Negative social impacts resulting from worker layoffs are unlikely. The improvement in energy security and environmental quality under the Investment Program will benefit the poor more than the general population, as the poor are generally more vulnerable under adverse circumstances. The Investment Program will create a number of jobs in the energy efficiency service sector. In addition, it will reduce coal consumption, free up resources, and lower the risks associated with coal mining and transportation. The summary poverty reduction and social strategy is presented in Appendix 15.

E. Risks

60. Risks associated with potential changes in Government policy and uncertain power demand in Guangdong are minimal. In fact, the Investment Program is an integral part of Guangdong's FYP, which mandates 16% energy efficiency improvement during 2005–2010, and 28% improvement during 2005–2020. An analysis of the demand for electricity shows that the province will continue to need additional power supply to sustain its economic development, regardless of whether this is to be provided through coal-fired power plants or EPPs. Macroeconomic conditions are expected to continue to be sound with continuing political stability in the PRC. Strong economic performance is expected in Guangdong based on GPG's projections and its growth trends.

61. All subprojects included in tranche 1 are based on proven and established technologies; and involve installation of energy efficiency equipment and appliances that have been used successfully in the PRC. In addition, most of the proposed retrofits can be implemented within a relatively short time, i.e., 1 to 4 months. For subsequent tranches, all subprojects will use similar proven energy efficiency technologies with reliable, measurable, and verifiable energy and capacity savings. Third party measurement of actual energy savings of implemented subprojects will be carried out to verify the subprojects' energy savings. Should the actual energy savings be less than originally calculated, the EPP-PMO will be required to strengthen

technical eligibility criteria and/or recruit more EPP subprojects in each cycle of lending. Thus, the technical risks of the Investment Program are minimal.

62. The economic analysis of all subprojects included in tranche 1 suggests little economic risk. Sensitivity and risk analyses indicate tranche 1 will be economically viable under various adverse scenarios.

63. The subloan credit risks are minimized in various ways, including (i) requiring the posting of collateral and/or guarantees, (ii) checking credit and financial criteria when appraising applicants, (iii) accepting only subprojects with investment payback periods of less than 5 years to ensure adequate cash flow for subloan repayments, and (iv) requiring subborrowers to assume at least 20% of total subproject investment cost. GFTC will constantly monitor the repayments and make suitable interventions to recover the subloans, when required.

64. Successful implementation requires sound project and financial management. The involvement of GFTC and the EPP-PMO addresses both requirements as their strengths are complementary; they have adequate capacity, but the innovative design of the Investment Program will necessitate additional training. Supplemental TA support provided by ADB would further assist GPG in strengthening their capacities. GPG has given its support for the model through budgetary support for part of the costs incurred by GFTC and the EPP-PMO.

65. The key EPP-PMO personnel are former senior staff from Guangdong Energy Conservation and Monitoring Center with expertise in marketing and implementing energy conservation projects. To ensure better implementation results, the Clean Energy Fund grant for capacity building will enable GPG to recruit experienced consultants to strengthen the EPP-PMO in the areas of technical assessment; savings measurement and verification; carbon certification under the CDM; and investment program management, monitoring, and compliance. GFTC has more than 20 years experience in trust management, and was one of the few trust companies to be issued a license to operate by China Banking Regulatory Commission.

66. An additional risk is that end users may not wish to carryout retrofit projects to improve energy efficiency. To address this, the Government and GPG have announced aggressive targets and action plans to require end users to reduce energy consumption per unit of GDP. Further, energy efficiency programs help to mitigate the adverse impacts of energy generation and its use on the environment. They foster rational use of energy that conserves natural resources, thus helping to reduce dependence on fossil-based generation; they also relieve the shortage of energy supply. The Government has carried out public information campaigns to raise awareness. For end users, retrofits of energy efficient equipment reduce operating costs and increase productivity, so will be inherently attractive. Lowering the barriers for debt financing will encourage end users to implement EPP subprojects and avail of the benefits.

VI. ASSURANCES

A. Specific Assurances

67. In addition to the assurances included in the framework financing agreement, the Government and GPG have given the following assurances, which will be incorporated in the related legal documents as appropriate:

(i) **Auditing and accounting.** GPG, EPP-PMO, GFTC, and each subproject will maintain proper accounts and records, and ensure that such accounts are audited in a timely manner to adequately identify the use of loan proceeds in

such a manner and detail as may be specified under the loan agreement and project agreement(s).

(ii) **Guangdong energy efficiency fund.** GPG will establish an energy efficiency fund not later than 31 December 2008 to provide for: (a) direct financial incentives for EPP subprojects based on actual energy savings, (b) capacity building and information dissemination activities, (c) promotion of clean development mechanism, (d) expenses related to the EPP-PMO and GFTC for the Investment Program implementation, and (e) other activities designed to promote energy conservation.

(iii) **Energy efficiency policy framework.** GPG will establish by 31 December 2008 an energy efficiency policy framework to expand and accelerate participation of end users in energy efficiency improvement. As a minimum, GPG will establish by 31 December 2008 (a) maximum per-unit energy consumption for selected energy-intensive industries such as cement, iron and steel, metals, electricity generation, transmission and distribution, petrochemical, chemical, paper, construction materials, and other industries, and related energy auditing and enforcement regulations; and (b) incentives (such as direct financial incentives funded by the GPG budget to end users based on achieved energy savings) to overcome financial barriers to end users' participation in energy efficiency improvement projects.

(iv) **Policy change.** GPG shall inform ADB in due course of any changes in its energy efficiency regulations, power pricing, and power dispatch and other similar policies that may adversely affect the financial viability of each financing tranche under the Investment Program.

(v) **Governance.** GPG will ensure that GFTC maintains proper internal controls in its operations. GFTC will adopt acceptable computerized accounting and management information systems, and prepare financial statements and reports in accordance with national accounting standards.

(vi) **Development of an EPP market.** GPG will ensure that the EPP-PMO undertakes measures to promote energy efficiency and that adequate staff are trained and deployed to fully implement the Investment Program.

(vii) **Compliance with national labor laws.** GPG will ensure that any new employment generated by the subprojects financed by ADB will comply with national labor laws.

(viii) **Subprojects and subloans.** GPG will ensure that the EPP-PMO and GFTC will (a) select subprojects in accordance with the agreed criteria; and (b) execute subloan and subproject agreements in form and substance acceptable to ADB, including terms and conditions agreed between GPG and ADB.

B. Condition for Loan Effectiveness

68. For the first loan only, the trust agreement, in form and substance satisfactory to ADB, will have been executed between GFB and GFTC, and will have become effective and binding upon GFB and GFTC in accordance with its terms.

C. Condition for Loan Disbursement

69. The first loan will be disbursed when GFB certifies to ADB that the subloan and subproject agreements of the amount to be withdrawn have been executed between GFTC, EPP-PMO, and the relevant subborrowers, in form and substance acceptable to ADB, and have become effective and binding upon the parties to the agreements.

VII. RECOMMENDATION

70. I am satisfied that the proposed multitranche financing facility would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve

(i) the provision of loans under the multitranche financing facility in an aggregate principal amount not exceeding $100,000,000 to the People's Republic of China for the Guangdong Energy Efficiency and Environment Improvement Investment Program from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; and such other terms and conditions as are substantially in accordance with those set forth in the Framework Financing Agreement presented to the Board; and

(ii) the administration by ADB of a grant not exceeding the equivalent of $800,000 to the People's Republic of China for Capacity Building for Energy Efficiency Implementation to be provided by the Clean Energy Fund under the Clean Energy Financing Partnership Facility.

Haruhiko Kuroda
President

28 April 2008

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
Impact Improvement of energy security and environmental conditions in Guangdong province	Guangdong's overall energy efficiency improved by 16% and emissions of SO_2 reduced by 15% by 2012	Project implementation reports, including monitoring and verification data Statistical yearbook of Guangdong	**Assumptions** • The PRC remains committed to improving energy efficiency and environmental protection • Sound macroeconomic and financial conditions in the PRC and Guangdong
Outcomes Improvement in energy efficiency in industry and commercial sectors in Guangdong province	Energy savings of 532,767 MWh/yr Electricity bills for subprojects reduced by $15.1 million by end of tranche 1 and $42.6 million by end of Investment Program Substitution for 175,813 t/yr coal including emission reduction of 415,560 t/yr CO_2, 1,785 t/yr TSP, 4,795 t/yr SO_2, and 1,066 t/year of NO_x by 2012	Project implementation reports Statistical yearbook of Guangdong Subproject completion reports Multitranche financing facility (MFF) completion reports Investment program reports Postinstallation monitoring and verification results	**Assumptions** • Energy efficiency continues to be a priority for the PRC and Guangdong • The proposed loan terms and procurement guidelines are attractive to ESCOs and direct energy users **Risk** • Insufficient capacity to implement the Investment Program
Outputs EPP model established ESCO sector developed in Guangdong Capacity developed for promotion and assessment of energy efficiency projects Replication of the EPP model	Development of 107 MW EPP by 2011 Subloans amounting to $200 million extended within 15 years Financial support provided for at least six ESCOs Two workshops held on EPP, 20 end users trained on CDM, public education program implemented by 2012 Similar programs for reducing power demand introduced to two other provinces by 2009	Project implementation reports, including monitoring and verification data Project financial reports Subproject completion reports MFF completion reports Investment Program reports Postinstallation monitoring and verification results	**Assumptions** • Approval of tranche 1 of EPP subprojects by first half of 2008 and subsequent tranches by late 2008 and 2009 • Project is implemented as planned without delay **Risks** • Energy savings are less than calculated • Subborrowers are not creditworthy • The EPP-PMO may not be able to identify new subprojects

Activities with Milestones	Inputs
Activity 1: Tranche 1 1.1 ADB approves tranche 1 by mid-2008 1.2 GFTC and the EPP-PMO establish an investment program performance and monitoring system within 6 months of the effective date of the first loan agreement 1.3 Conduct workshops on EPP and CDM (June 2008–June 2009) 1.4 Dialogue with the PRC and provincial governments by end of 2008 Activity 2: Tranche 2 2.1 ADB approves tranche 2 by end of 2008 Activity 3: Tranche 3 3.1 ADB approves tranche 3 by end of 2009 3.2 Finalization of Investment Program by end of 2024 (**Note:** Tranches 2 and 3 are indicative as the time, number, and amount of the tranches may change). Activity 4: Guangdong Energy Efficiency Fund 4.1 GPG establishes Guangdong energy efficiency fund by the end of 2008 Activity 5: Reporting 5.1 GFTC submits quarterly financial subproject reports within 45 days of the end of each quarter 5.2 GFTC and the EPP-PMO submit quarterly progress reports on investment program implementation within 45 days of the end of each quarter 5.3 GFTC submits audited annual financial reports within 6 months after the fiscal year-end 5.4 GFTC and the EPP-PMO submit a project completion report within 6 months from physical completion of the first batch of subprojects financed under each financing tranche 5.5 GFTC and EPP-PMO submit an MFF completion report within 6 months from physical completion of all subprojects under the MFF	Program Investment: $142 million • ADB: $100 million • Subborrowers: $28 million • GPG: $14 million Tranche 1 • ADB: $35 million • Subborrowers: $10 million • GPG: $5 million Tranche 2 • ADB: $35 million • Subborrowers: $10 million • GPG: $5 million Tranche 3 • ADB: $30 million • Subborrowers: $8 million • GPG: $4 million Grant for Capacity Building for Energy Efficiency Implementation from Clean Energy Fund under the Clean Energy Financing Partnership Facility • ADB: $800,000 in phase I and $1,200,000 in phase II Additional capacity building assistance will be sought, as necessary, for implementation of the Investment Program

ADB = Asian Development Bank, CO_2 = carbon dioxide, CDM = clean development mechanism, EPP = efficiency power plant, EPP-PMO = EPP project management office, ESCO = energy service company, GFTC = Guangdong Finance Trust Company Limited, GPG = Guangdong provincial government, MW = megawatt, MWh = megawatt-hour, NO_x = nitrogen oxide, PRC = People's Republic of China, SO_2 = sulphur dioxide, t/yr = tons/year; TSP = total suspended particulates.

SECTOR ANALYSIS

A. Guangdong Power Subsector

1. Guangdong, with a population of about 92 million, has the largest and fastest growing economy among all the provinces in the People's Republic of China (PRC). Its gross domestic product (GDP) has grown by 14% per year since 1995; and was about CNY3.07 trillion in 2007, representing approximately one eighth of the nation's total GDP. The high growth was accompanied by rapidly growing electricity demand. The growth in demand for power averaged 13% annually since 1995, outpacing that of capacity addition. Since 2002, Guangdong has been experiencing power shortages during the summer peak periods, and has had to curtail power supply to many industrial consumers. During the summer of 2007, the shortage was estimated to be 6,250 megawatts (MW). Electricity consumption and demand in Guangdong is provided in Table A2.1.

Table A2.1: Electricity Consumption and Demand in Guangdong Province, 1995–2007

Year	Electricity Consumption (GWh)	Annual Growth Rate (%)	Electricity Demand (MW)	Annual Growth Rate (%)
1995	78,768	7.6	13,600	7.5
1996	85,771	8.9	14,960	10.0
1997	91,886	7.1	16,530	10.5
1998	98,787	7.5	17,730	7.3
1999	108,626	10.0	19,530	10.2
2000	133,458	22.9	23,500	20.3
2001	145,842	9.3	25,800	9.8
2002	168,783	15.7	28,630	11.0
2003	203,129	20.4	34,000	18.8
2004	238,714	17.5	39,700	16.8
2005	267,356	12.0	44,150	11.2
2006	299,105	11.9	49,700	12.1
2007	339,301	13.0	55,829	12.3

GWh = gigawatt-hour, MW = megawatt.
Source: Guangdong provincial government and Asian Development Bank estimates.

2. By the end of 2007, Guangdong's total installed generation capacity was 59,323 MW. Coal-fired power plants account for 45,109 MW (76%), hydropower 7,830 MW (13%), nuclear power 3,780 MW (6.4%), pumped storage 2,400 MW (4%), and wind power 204 MW (0.3%). Guangdong imports electricity from other provinces to meet about 20% of its electricity demand. The coal-fired power plants contribute significantly to environmental problems.

3. Demand for electricity is expected to continue its rapid growth. An econometric model was used to forecast demand considering growth in GDP and population, structural changes in industries, and efficiency improvement (Table A2.2).

Table A2.2: Projections of Guangdong's Electricity Consumption and Demand

Year	Electricity Consumption (GWh)	Annual Growth Rate (%)	Electricity Demand (MW)	Annual Growth Rate (%)
2008	380,696	12.2	62,403	11.8
2009	422,572	11.0	69,418	11.2
2010	469,055	11.0	76,869	10.7
2011	515,492	9.9	84,750	10.2
2012	566,525	9.9	93,056	9.8
2013	622,611	9.9	101,784	9.4
2014	684,250	9.9	110,927	9.0
2015	751,991	9.9	120,483	8.6
2016	810,646	7.8	130,445	8.3
2017	873,876	7.8	140,809	8.0
2018	942,039	7.8	151,571	7.6
2019	1,105,518	7.8	162,726	7.4
2020	1,094,728	7.8	174,270	7.1

GWh = gigawatt-hour, MW = megawatt.
Source: Asian Development Bank estimates.

4. Electricity consumption is dominated by energy-intensive heavy industries, including cement, iron and steel, petrochemicals, chemicals, clay and porcelain, glass, paper and paper products, metals, textiles, and other manufacturing industries. Industrial and commercial consumers account for about 73% of total electricity consumption; residential consumption is only about 13% (Table A2.3).

Table A2.3: Guangdong Province Sector Electricity Consumption (2007)

Sector	Electricity Consumption (GWh)	Total (%)
1. Farming, Forestry, and Agriculture	8,822	2.6
2. Industry	229,367	67.6
3. Construction	4,750	1.4
4. Transport	4,072	1.2
5. Wholesale and Retail Trade and Catering Services	20,019	5.9
6. Residential Consumption	43,770	12.9
Urban	27,823	8.2
Rural	15,947	4.7
7. Others	28,501	8.5
Total	**339,301**	

GWh = gigawatt-hour.
Source: National Bureau of Statistics, and Energy Bureau of National Development and Reform Commission of the PRC. 2006. *China Energy Statistical Yearbook*. Beijing.

5. Many of the industrial facilities are old with relatively low-efficiency capital stock. Although the size of Guangdong's economy would rate among the top 20 countries, overall energy efficiency lags international standards. In 2006, energy efficiency in terms of standard tons of coal equivalent (tce) per $10,000 GDP was 5.87, 3.4 times the average of member countries of the Organization of Economic Cooperation and Development, 3.9 times that of Japan, or 2.4 times that of the United States. Guangdong's electricity efficiency in 2005 was 1,195 kilowatt-hours (kWh) per CNY10,000 GDP, ranking it 14th among the PRC provinces. The potential for energy efficiency improvement is large; the power subsector has an estimated cost-effective energy efficiency improvement potential of 17,000 MW and 41,210 gigawatt-hours per year energy saving.[1] Least-cost opportunities for retrofit efficiency investments are available

[1] Optimal Energy, Inc. 2007. *Part B: Pre-feasibility Study for Establishing An Efficiency Power Plant Demonstration Project In Guangdong Province.* Manila.

in areas such as motors and motor-drive systems; transformers; lighting; heating, ventilation, and air conditioning systems; and waste heat recovery.

6. The PRC has several options for developing an efficiency power plant (EPP): (i) fully integrate EPP in its power reform, whereby EPP-related costs are included in electricity prices, ideally in concert with specific price reforms designed to encourage energy efficiency; (ii) partially integrate EPP in its power reform, whereby EPP-related costs are paid with public benefit funds collected through a small uniform system benefits charge applied to electricity prices; (iii) consider the development of EPP to be a government function with a government agency or a public company designated for implementing energy efficiency subprojects that are bundled into an EPP; or (iv) the energy efficiency subprojects, investments, and loan repayments are aggregated with a government agency assuming the responsibility to implement the EPP, but participating consumers being responsible for their pro rata share of the costs. The first two options involve resetting electricity tariffs, which is not within the control of the provincial governments. The third option requires considerable budget resources although benefits will mostly accrue to the participating consumers. The Guangdong provincial government (GPG) has selected the fourth option with a complementary program to attract consumers to participate in the EPP.

7. PRC recently amended the Energy Conservation Law of 1997. The amendments include (a) expansion of sectors brought within the ambit of the law, such as, the transport sector; (b) requiring government at all levels to increase investment in public transportation, improve services, and encourage people to use public transportation; and (c) strengthening of administrative enforcement of energy conservation. Local energy saving standards are expected to be more stringent than those set by central government, and achievement of energy conservation targets are incorporated into the performance evaluation of the responsible government officials.

B. Energy Service Companies

8. Energy services are a young industry in Guangdong. At present only 13 energy service companies (ESCOs) are registered with the China Energy Management Companies Association. Most of them are small privately owned companies. ESCOs typically offer large energy users free energy audits to identify and recommend cost-effective energy-saving measures. Once the energy users agree, ESCOs develop and design detailed energy-saving proposals. To persuade energy users to implement recommended energy-saving proposals, ESCOs typically offer a shared savings or an energy performance contract. These contracts enable the ESCOs to finance the front-end cost of energy-saving equipment. The users use the savings from energy expenditure to pay for the ESCO investment, including a reasonable return on investment. ESCOs negotiate their share of energy savings (typically 50%—80%) with energy users so that the payback period is 3–8 years. After the payback period, energy users retain the full benefit of reduced energy consumption.

9. In this business model, the critical success factor is the availability of capital. The ESCOs need to borrow funds to implement energy savings for new energy users. This has been difficult because of the narrow asset base that they possess. The growth of ESCOs has been severely restricted by the lack of capital; numerous smaller ESCOs had to close within a year or two as they were unable to build the equity needed to sustain their business. Commercial banks have been reluctant to lend to ESCOs because of a lack of understanding of the technologies and production processes; and they were unable to properly evaluate the risk profile of this new business model, specially the use of shared savings and energy performance contracts. When commercial banks do lend for the sake of maintaining relationships, they generally require a

loan guarantee that considerably increases the cost of borrowing. The ESCOs interviewed during project preparation indicate that (i) the lack of finance limits their capacity to enter into shared savings contracts; (ii) the majority of industrial energy users prefer shared savings contracts because ESCOs share the technology and financial risks; and (iii) when such energy services were not available, energy users generally deferred retrofit projects and the opportunity to save energy (and fuel expenses) was lost.

10. In countries like Japan, the United Kingdom, and the United States, ,ESCOs have been playing an important role by helping energy users improve energy efficiency and reduce energy consumption. In Guangdong, the large industrial and commercial users that account for more than 73% of total electricity consumption are busy expanding their businesses; they either lack the capacity or are reluctant to divert their resources to energy efficiency improvement. GPG has announced an aggressive program to reduce energy consumption per unit of GDP by 16% during 2006–2010. To be able to realize the energy-saving potential, particularly by the medium-sized and smaller energy users, the ESCOs must be helped to overcome the financing barrier and thus be able to grow bigger and stronger.

C. Environmental Impact of the Energy Sector

11. Analysis of the power subsector indicates that projects focusing on retrofitting of energy-intensive facilities at existing industrial and commercial establishments are the most cost-effective areas for energy efficiency improvement. Opportunities for retrofit efficiency investments exist for motors, transformers, lighting, and air conditioning, etc. Improving the efficiency of energy consumption, as seen from international experience, has two significant benefits: (i) less primary energy supply will be needed for economic growth, which strengthens energy security; and (ii) less fossil fuel will be used, which will lower pollution and greenhouse gas emission. A MW of avoided power generation capacity reduces the investment in energy supply by over $2 million, and every MWh saving will avoid consumption of 330 kilogram (kg) of coal; and emissions of 780 kg of carbon dioxide, 9 kg of sulfur dioxide, 3.4 kg of total suspended particulates, and 2 kg of nitrogen oxide. Investment in energy efficiency allows a rapid reduction in energy demand, which is particularly important for provincial energy planning and management. An energy efficiency project can save energy in a shorter timeframe (a few months) than construction of equivalent capacity conventional power plants (typically 2–4 years). It, therefore, provides provincial energy planners a useful energy supply development alternative.

D. Electricity Tariffs

12. The PRC's power subsector went through major reform from 2002 to 2003 when generation was separated from distribution and transmission. This separation means that the benefits of energy efficiency get diluted as they are now divided between two entities. Generation companies have no interest in investing in or encouraging end-use energy efficiency. They have an incentive for lowering operating costs to improve supply-side margins, but have no interest in lowering demand or peak prices or improving energy efficiency among end users. At the same time, the current pricing method discourages grid company investment in end-use energy efficiency as revenue and profits are linked to electricity sales.

13. Investment in energy efficiency is influenced by both price levels and structure, but thus far, end-use energy efficiency has played an insignificant role. The PRC's electricity price and structure are not designed to encourage energy efficiency or address known market barriers to energy efficiency. Although the State Electricity Regulatory Commission was established in 2003, the National Development and Reform Commission (NDRC) still sets the electricity tariff

based on costs of power generation, transmission, and distribution, including a reasonable rate of return on investments. NDRC has been gradually reforming the electricity tariff structure in the past few years. The price of coal has been mostly deregulated to enable it to adjust to the supply-demand position; the price increase has been rapid. NDRC has linked power supply prices of coal-fired power plants to coal prices. Further, the recent retail pricing reform announced in NDRC's March 2005 pricing circular links prices for some large customers to their efficiency performance. The efficiency of several energy-intensive industries was reviewed and categorized by levels of energy efficiency. Price discounts have been abolished and surcharges increased for the least efficient. This pricing policy has been quite effective; in 2006, it is understood that about 1,200 high energy-consuming enterprises had shut down, suspended operations, invested in energy efficiency, or changed production processes.

14. The general tariff in Guangdong is comparable to international norms; however, its structure can be improved to give a stronger signal to all end users to improve efficiency of electricity consumption. Table A2.4 shows the representative electricity tariffs in Guangdong province. Across tariff classes, the cross-subsidies are substantial. The per unit price (CNY per kWh) for domestic class is typically higher than that of industrial and commercial classes due to load density and pattern of usage. However, in Guangdong, the current per unit prices of industrial and commercial consumers are higher than the domestic tariff. To provide an economic price signal, the current tariff should be gradually adjusted to more closely reflect the cost of providing electricity service for each class of end user. The time-of-use rates encourage consumers to reduce demand during peak load periods, thus increasing the utilization of installed generation capacity. In Guangdong, such rates currently apply only to industrial end users. The market penetration of air conditioning in commercial and residential sectors has been steadily increasing; severe power shortages in the summer peak period have occurred every year since 2002. Time-of-use rates can be set for large commercial and residential electricity users, and seasonal rates (summer and other seasons) can be considered to motivate end users to use electricity more efficiently. Another improvement is to establish unbundled power supply, transmission and distribution tariffs to improve accountability and efficiency in each category of electricity service business.

Table A2.4: Guangdong Representative Electricity Tariff in 2007

Item	Guangzhou	Donguan	Fashan	Jiangmen	Zhuhai	Average	Average $/KW
		CNY/KVA or CNY/KW per month					
Demand Charge (transformer size), o	15.38	18.00	18.00	18.00	18.00	17.48	2.33
Demand Charge (peak demand)	23.08	27.00	27.00	27.00	27.00	26.22	3.50
A. Primary Industry							
Electricity Charge			CNY/KWh per month				$/KWh
Peak Period							
1-10 kV	0.74	1.00	1.01	1.01	0.92	0.94	0.12
35-110 kV	0.73	0.98	0.99	1.00	0.90	0.92	0.12
220 kV	0.72	0.97	0.97	0.98	0.88	0.90	0.12
Off peak Period							
1-10 kV	0.24	0.32	0.32	0.32	0.29	0.30	0.04
35-110 kV	0.23	0.31	0.32	0.32	0.28	0.29	0.04
220 kV	0.23	0.31	0.31	0.31	0.28	0.29	0.04
Partial Peak Period							
1-10 kV	0.47	0.63	0.64	0.64	0.58	0.59	0.08
35-110 kV	0.46	0.62	0.62	0.63	0.57	0.58	0.08
220 kV	0.45	0.61	0.62	0.62	0.56	0.57	0.08
B. Secondary Industry							
Electricity Charge (CNY/KWh)							
Peak Period							
< 10 kV	1.01	1.19	1.24	1.20	1.22	1.17	0.16
1 - 10 kV	1.00	1.17	1.24	1.18	1.20	1.16	0.15
35 kV	0.99	1.15	1.22	1.17	1.19	1.14	0.15
Off peak Period							
< 10 kV	0.32	0.38	0.39	0.38	0.39	0.37	0.05
1 - 10 kV	0.32	0.37	0.39	0.38	0.38	0.37	0.05
35 kV	0.31	0.37	0.39	0.37	0.38	0.36	0.05
Partial Peak Period							
< 10 kV	0.64	0.75	0.78	0.76	0.77	0.74	0.10
1 - 10 kV	0.63	0.74	0.78	0.75	0.76	0.73	0.10
35 kV	0.06	0.73	0.77	0.75	0.75	0.72	0.10
C. Commercial							
< 10 kV	0.81	0.87	0.98	0.96	0.96	0.92	0.12
1 - 10 kV	0.80	0.86	0.97	0.95	0.95	0.91	0.12
35 kV	0.79	0.85	0.96	0.94	0.94	0.90	0.12
D. Domestic	0.50	0.59	0.60	0.60	0.61	0.58	0.08
E. Agricultural							
Pumping	0.29	0.36	0.34	0.33	0.35	0.33	0.04
F. Others	0.50	0.52	0.59	0.58	0.60	0.56	0.07

Typical Peak Period: 9:00–12:00 and 19:00–22:00 hours

Typical Off Peak Period: 0:00–8:00 hours

Typical Off Peak Period: 8:00–9:00, 12:00–19:00, and 22:00–24:00 hours

KW = kilowatt, KV = kilovolt, KVA = kilovolt-amps.

Source: Guangdong Provincial Power Grid Company.

EXTERNAL ASSISTANCE AND LESSONS

A. External Assistance

1. Since approving the first energy sector loan for the People's Republic of China (PRC) in 1987, the Asian Development Bank (ADB) has approved assistance for 30 projects for a total of $3.5 billion. The assistance is divided evenly between projects that increased energy supply ($1.6 billion) and that improved the environment ($1.9 billion). On the energy supply side, 47% was for hydropower, pumped-storage, and coal-mine methane projects; 20% for transmission lines; and 33% for thermal power. In 1994, ADB supported the implementation of one of the earlier combined heat and power plants in Heilongjiang, which is now internationally recognized as a low carbon approach to meeting energy demand in colder regions. Similarly, the pumped-storage power project loan approved in 1993 helped expand the capacity of the first such power plant in Guangdong province. It used new technology (reversible turbines) and was an economically efficient and cleaner way to meet peak power demand. The coal-mine methane project that started producing electricity in March 2008 is another innovation that addresses two major concerns: coal-mine safety and emission of greenhouse gases.

2. The environment projects helped reduced pollution in urban centers by (i) modernizing the district heat and domestic gas supply (37%), and (ii) retrofitting cleaner production processes in industries (63%). The industrial cleanup has since been a major thrust area for local governments; these projects were ADB's initial efforts to support energy end users. Recent ADB-financed energy projects have focused particularly on energy efficiency and environmental improvement. By improving efficiency, the projects directly reduce coal consumption and consequently reduce emission of pollutants, including greenhouse gases linked to global climate change.

3. ADB has also provided about 100 technical assistance (TA) projects for the energy sector, costing about $50 million, to help prepare projects, provide policy advice, and build institutional capabilities of utilities (power, district heat, and urban gas supply) that are the implementing agencies of ADB loans. ADB provided TA projects to help restructure the power subsector, formulate power pricing strategy, improve the power planning process, and establish the State Electricity Regulatory Commission. The TA projects also covered clean production, energy conservation, energy efficiency, and environmental management. ADB is currently conducting a comprehensive study jointly with the National Development and Reform Commission to analyze opportunities and challenges for promoting energy efficiency and renewable energy. It will make practical policy recommendations to overcome barriers, facilitate implementation of development strategies and industrial policies, explore innovative approaches to utilize external assistance, and identify key provinces and projects for piloting high impact clean energy projects.[1]

4. ADB has also extended two project loans (totaling $90 million) to the private sector for power generation. Its Private Sector Operations Department recently provided a partial credit risk guarantee program with an overall limit of CNY800 million to cover an agreed portion (about 48% of the overall portfolio) of principal repayment of loans extended by selected partner banks to finance energy efficiency projects, which are designed and implemented by an internationally reputable energy service company. This innovative mechanism ensures the most reliable

[1] ADB. 2007. *Technical Assistance for Supporting the Implementation of the Energy Efficiency Initiative in Developing Member Countries.* Manila. (TA 6392-REG, for $2,300,000, approved on 30 March).

technological arrangement for energy conservation undertakings, and can mobilize domestic banks to provide loans for energy efficiency projects by reducing performance uncertainties and sharing credit risks.

5. The World Bank is another source of external funding for the PRC's power subsector. Since the early 1990s, it has provided more than $6.2 billion to finance 25 projects, most of which are large-scale thermal and hydropower projects, and power transmission and distribution projects. In recent years, the World Bank provided loans to support the Government's urban environment improvement and development of renewable energy. Its projects also have a strong focus on environment energy efficiency and use of renewable energy. One notable project approved in 1998 supported three pilot companies in Beijing, Liaoning, and Shandong, which were among the first energy service companies (ESCOs) in the PRC.[2] The World Bank also provided TAs for power subsector restructuring and heating subsector reforms. In the interest of addressing finance-related barriers for implementing energy efficiency projects, the World Bank together with other organizations implemented a study covering Brazil, PRC, and India to establish banking windows, explore guarantee mechanisms, support ESCOs, and attract equity investment in energy efficiency projects. The World Bank is currently preparing a typical financial intermediation loan (FIL) in partnership with domestic banks for approval by June 2008, which will include capacity building support from the Global Environment Facility. Another FIL in the private sector will extend guarantees to loans extended by domestic partner banks to utility companies that help gas and district heating consumers reduce energy demand.

6. The United Nations Development Programme is providing assistance for studies regarding options for power sector restructuring and promotion of energy conservation. The ongoing China End-Use Energy Efficiency Project aims to promote energy efficiency in major energy-consuming sectors such as industries and building constructions.

7. The Japan Bank for International Cooperation is the largest source of external assistance for the PRC's power subsector. It has provided concessional loans totaling CNY438 billion for 14 power projects through its official development assistance window. It has also provided special credits to major cities to improve their environment by installing emission control devices and equipment in power plants and factories, and by building water treatment facilities. It is considering shifting its traditional focus of assistance in the power subsector from hydropower and thermal power generation to energy conservation and renewable energy, particularly in the western region. The European Investment Bank extended a Euro 500 million, multi-project, China Climate Change Framework Loan in November 2007 to assist implementation of projects that prevent or reduce greenhouse gas emissions. German development cooperation, through Kreditanstalt für Wiederaufbau, has approved approximately $400 million in mixed credits, mostly for power plants and turbine modernization projects. It also supported the Government in energy efficiency and renewable energy development. Other bilateral sources providing export credits or mixed credits in the energy sector include Australia, Canada, Denmark, France, Italy, Spain, United Kingdom, and United States.

8. ADB has established a working relationship with the World Bank in addressing policy issues and coordinating lending and TA operations; and exchanges views with bilateral sources and the private sector. Both ADB and the World Bank emphasize the importance of promoting energy efficiency projects, increasing provincial government involvement in clean energy projects, developing ESCOs and local banks to play a bigger role in clean energy financing, and

[2] World Bank. 1998. *Energy Conservation Project.* Washington, DC.

environmental protection. Annual aid coordination meetings are held in Beijing to share strategies; ADB hosted the 2007 meeting in its PRC Resident Mission in April 2007.

B. Lessons

9. ADB's overall experience with energy sector projects in the PRC has been positive. Projects are generally well designed and smoothly implemented, although front-end delays have occurred in some projects. Success is attributed to extensive preparation prior to ADB intervention, high sense of local ownership, effective leadership in project management offices, and timely policy and enterprise reforms. The front-end delays in loan signing and loan effectiveness did not lead to unsatisfactory performance. The Government has implemented reforms on investment regulations, which simplify approval procedures and delegate some approving authority to the provincial governments. ADB has been working closely with the Government to harmonize the two approval procedures to minimize project start-up and implementation delays.

10. Project completion and performance audit reports for ADB-financed projects in the PRC highlight the (i) need to improve financial reporting; (ii) need for more attention to environmental matters; (iii) advisability of using larger boiler-turbine units; and (iv) necessity for capacity building, not only for project preparation, but also for staff training in operations and management aspects. The overall implementation performance of the energy portfolio is satisfactory. The performance ratings are given in Table A3.1

Table A3.1: Postevaluation Performance Rating of Energy Projects

Loan	Project Title	Performance Rating
880	Fuel Conversion Project	Successful
1436	Second Industrial Energy Efficiency and Environment Improvement Project	Successful
1318	Hunan Lingjintan Hydropower Project	Successful

Source: Asian Development Bank.

11. The World Bank review of experience in energy efficiency has shown that projects should seek to test a variety of business models to achieve energy savings. In particular, access to appropriate project financing that supports ESCO transactions should be an integral aspect of project design. It also suggests that procurement and disbursement procedures should be simplified as these increase transaction costs and discourages energy efficiency.[3]

12. These lessons were taken into account when designing and preparing the Investment Program. During preparation, lessons of experiences were addressed by (i) thoroughly reviewing project readiness on key factors that may potentially delay the start-up; (ii) carefully assessing institutional capacity and strengthening measures to improve corporate governance; (iii) providing conservative estimates of the expected energy savings consistent with existing practices; and (iv) setting up project implementing units with autonomy for operations and for procurement decisions.

[3] World Bank. 2004. *World Bank Global Environment Facility Energy Efficiency Portfolio Review and Practitioners' Handbook.* Washington, DC.

ESTIMATED ENERGY SAVINGS FOR TRANCHE 1 SUBPROJECTS AND INVESTMENT PROGRAM

Table A4.1: Estimated Energy Savings

	Efficiency Power Subproject Retrofits	Energy/Yr (MWh/yr)	Capacity (MW)	Cost Savings ($1,000/yr)	Payback Period (years)
A.	**End Users**				
	1. Fenghua Advanced Technology Co.				
	Heating, ventilation, and air conditioning	2,475	.50	292	2.8
	Air compression system	1,190	.24	95	2.0
	Lighting	1,271	.25	102	2.4
	Industrial gas treatment	2,561	0.51	205	4.5
	Transformers/voltage balance	2,218	0.44	177	2.9
	Subtotal (A1)	**9,716**	**1.94**	**871**	**3.1**
	2. Guangzhou Iron and Steel Co.				
	Electric equipment	1,941	0.59	216	2.5
	Lighting	321	0.06	24	3.5
	Power factor improvement	954	0.19	70	2.8
	Industrial process	1,267	0.25	93	1.0
	Subtotal (A2)	**5,484**	**1.10**	**402**	**2.3**
	3. Huizhou S.E. Thermo-Electricity Co.				
	CHP boiler	1,411	0.28	607	2.6
	Lighting	79	0.02	7	2.3
	Electric equipment	1,077	0.22	93	4.3
	Subtotal (A3)	2,567	0.51	707	2.8
	Subtotal (A)	**17,767**	**3.55**	**1,981**	**2.8**
B.	**Middle Users (ESCOs/manufacturers)**				
	1. HongTai Trace Co.				
	Zhaoqing street lighting control system	1,908	0.38	204	2.9
	Donguan street lighting control system	1,590	.32	170	2.9
	China Mobile stations HVAC	6,623	1.32	706	2.4
	Subtotal (B1)	10,120	2.02	1,080	2.5
	2. Guangzhou Jinguan (G.K.) Co.				
	Commercial building HVAC	2,815	0.56	375	2.8
	Precision HVAC management system	1,280	.26	171	2.6
	Industrial motor-drive retrofit (LV)	4,000	.80	347	2.9
	Industrial motor drive retrofit (HV)	4,500	.90	390	2.1
	Subtotal (B2)	**12,595**	**2.52**	**1,283**	**2.6**
	3. Haihong Co.				
	Efficient transformer	**12,739**	**2.55**	**1,528**	**4.6**
	4. Guangzhou Zhiguang Electric Co.				
	Motor-drive system	**69,795**	**13.96**	**6,049**	**2.1**
	5. Laifu Electric Co.				
	Power factor correction equipment	**63,042**	**12.61**	**6,724**	**1.5**
	6. Zhuhai Secopower Transformer Co.				
	Plan for efficient transformer	2,397	0.48	208	6.9
	Subtotal (B)	**170,688**	**34.14**	**16,871**	**2.3**
	Total	**188,455**	**37.69**	**18,852**	**2.3**
	Scaled Up to $100 Million Loan	**532,767**	**107**	**42,621**	

CHP = combined heat and power; ESCO = energy service company; HV = high voltage; HVAC = heating, ventilation, and air conditioning; LV = low voltage; MW = megawatt; MWh/year = megawatt-hour/year.
Sources: Guangdong provincial government and Asian Development Bank estimates.

Table A4.2: Estimated Benefits of the Investment Program

Estimated Benefit	Tranche 1	Full Loan
Loan Amount ($000)	35,000	100,000
Avoided Coal Consumption (tons per year)	62,190	175,813
Avoided Air Emissions (tons per year)		
Total suspended particulates	631	1,785
Sulfur dioxide	1,696	4,795
Nitrogen oxide	377	1,066
Carbon dioxide	14,995	415,560
Annual Energy Savings (MWh/yr)	18,455	532,767
Equivalent EPP Capacity (MW)	38	107
Annual Savings in End Users' Electricity Bills ($ million/yr)	15	43

EPP = efficiency power plants, ESCO = energy service company, MW = megawatt, MWh = megawatt-hour, yr = year.
Sources: Guangdong provincial government and Asian Development Bank estimates.

DETAILED COST ESTIMATES

Table A5.1: Detailed Cost Estimates ($ million)

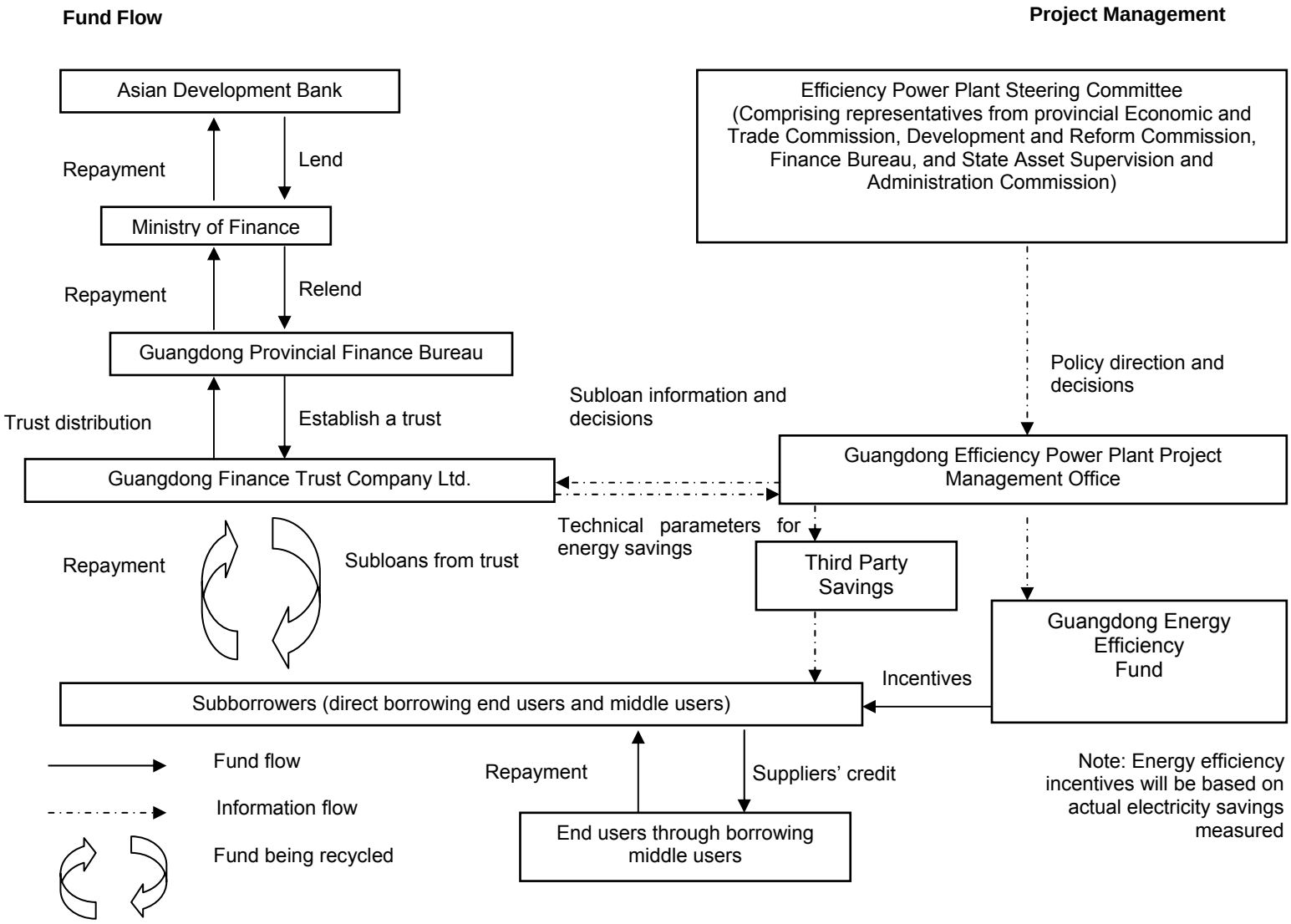
A. Tranche 1 Retrofits	Total Cost
1. End Users	
a. Fenghua Advanced Technology Co.	
Heating, ventilation, and air conditioning	0.82
Air compression system	0.19
Lighting	0.24
Industrial gas treatment	0.91
Transformers/voltage control	0.51
Subtotal (A1a)	**2.68**
b. Guangzhou Iron and Steel Co.	
Electric equipment	0.54
Lighting	0.08
Power factor improvement	0.20
Industrial process	0.09
Subtotal (A1b)	**0.91**
c. Huizhou S.E. Thermo-Electricity Co.	
CHP boiler	1.60
Lighting	0.02
Electric equipment	0.40
Subtotal (A1c)	**2.02**
Subtotal (1)	**5.60**
2. Middle Users (ESCOs/manufacturers)	
a. HongTai Trade Co.	
Zhaoqing street lighting control system	0.58
Donguan street lighting control system	0.50
China Mobile stations HVAC	1.67
Subtotal (A2a)	**2.75**
b. Guangzhou Jinguan (G.K.) Co.	
Commercial bldg HVAC	1.05
Precision HVAC management system	0.45
Industrial motor-drive (LV)	1.00
Industrial motor-drive (HV)	0.83
Subtotal (A2b)	**3.33**
c. Haihong Co.	
Efficient transformer retrofit	**8.33**
d. Guangzhou Zhiguang Electric Co.	
Motor-drive system retrofit	**12.53**
e. Laifu Electric Co.	
Power factor correction equipment	**10.00**
f. Zhuhai Secopower Transformer Co.	
Efficient transformer retrofits	**1.67**
Subtotal (2)	**38.62**
3. Implementation Cost	**5.78**
Tranche 1 Total (1 + 2 + 3)	**50.00**
B. Subsequent Tranches	**83.78**
C. Implementation Cost	**8.22**
Total	**142.00**

CHP = combined heat and power; Co = company; ESCO = energy service company; HV = high voltage; HVAC = heating, ventilation, and air conditioning; LV = low voltage.

Note: (i) On average, less than 5% contingencies and less than 2% interest during implementation are included in the total cost. (ii) Implementation costs, i.e., item 3, will be financed by Guangdong provincial government and the subborrowers. (iii) ADB will finance 100% of the amount claimed up to the maximum amount available under the loan.

Sources: Guangdong provincial government and Asian Development Bank estimates.

GUANGDONG EFFICIENCY POWER PLANT ONLENDING MODEL



Sources: Guangdong provincial government and Asian Development Bank.

FINANCIAL MANAGEMENT ASSESSMENT OF GUANGDONG FINANCE TRUST CO. LTD.

A. Background

1. Guangdong Finance Development Company, established in December 1984, served as the financing arm of Guangdong Provincial Finance Bureau. The company was later renamed Guangdong Finance Trust and Investment Company (GFTIC) in 1990. At that time, trust and investment companies did not have a proper regulatory framework and many were overleveraged, engaged in high-risk business, and went into insolvency following the Asian financial crisis. More than 100 trust and investment corporations nationwide were closed by the People's Bank of China, including 20 from Guangdong. GFTIC became the only provincial trust and investment corporation in Guangdong that survived the crisis. It was reorganized as a limited liability company, and People's Bank of China reregistered it in 2002. The reregistration sharply reduced the scope of GFTIC's business. For example, it is not allowed to take deposits or borrow against its balance sheet. Following the issuance of new regulations on Administrative Rules Governing Trust Companies and Administration Methods for Collective Fund Trust Plan and Trust Companies in 2007, GFTIC was again reregistered by the China Banking Regulatory Commission (CBRC) on 20 July 2007 and placed under its jurisdiction; it was renamed Guangdong Finance Trust Company Ltd (GFTC).

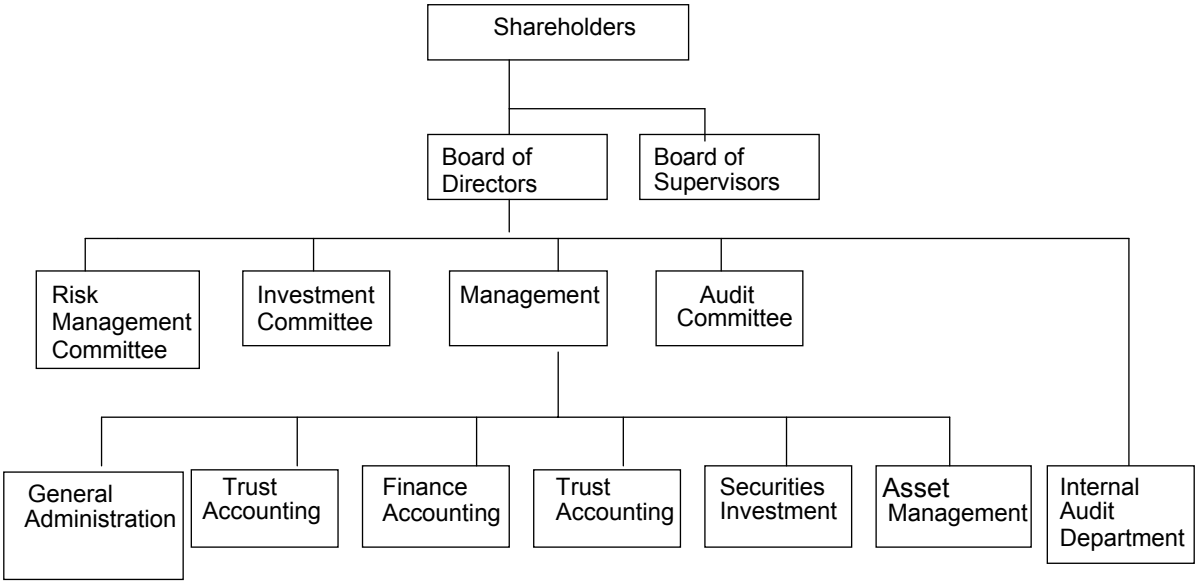
B. Ownership and Organization

2. GFTC has a registered capital of CNY565.5 million ($75 million), of which 98.14% is owned by Guangdong Finance Investment Holding Company and 1.86% by Guangdong Science Venture Investment Company. Both shareholders are government owned. The organization structure of the company (Figure A7) is stipulated in the Measures for Administering Trust Companies promulgated by CBRC in January 2007. It includes a board of directors, and a board of supervisors reporting to the shareholders. The board of directors has five members; four are from Guangdong Finance Investment Holding Company and one from Guangdong Science Venture Investment Company. GFTC plans to add two independent directors. The board of supervisors, comprising three members, has an oversight role. Three committees report to the board of directors: Risk Management Committee, Investment Committee, and Audit Committee. GFTC operations are managed by a general manager with the assistance of two deputy general managers, and conducted by six functional departments. The internal audit department reports directly to the board of directors.

C. Operations

3. The roles and responsibilities of shareholders, board of directors, board of supervisors, and management are clearly defined to ensure independence and effective checks and balances. Mechanisms to separate duties and internal controls are in place. The organizational setup and operating procedures are reported to CBRC, which has the right to examine the company at any time. Closer supervision of trust companies by CBRC is intended to ensure these companies act prudently in conducting their business. GFTC constantly reviews its operations for potential risks so that mitigating measures may be taken in a timely manner. It has clear procedures for the internal audit department, which operates independently from other departments and reports directly to the board of directors.

Figure A7: Organization Chart of Guangdong Finance Trust Company Ltd



Source: Guangdong Finance Trust Company Ltd.

4. GFTC's scope of business, as approved by CBRC, includes management of trust funds with lending services if defined in trust agreements. It can also provide guarantees provided these are not more than 50% of its net assets. Although CBRC's new regulation has curtailed some of its activities, some existing market conditions are favorable for GFTC, including (i) continued rapid economic development and income growth requiring diversified financial services; (ii) rapid capital market development following the successful reform of nontradable shares, introduction of qualified foreign institutional investors, and a regulatory framework that allows trust companies to develop new financial services; (iii) new regulations that aim to develop the trust industry; and (iv) good reputation of GFTC among its clients. The challenges that GFTC faces include (i) trust companies are not understood by the general public; (ii) tendency to be overly conservative due to historical problems of the sector; (iii) other financial institutions are increasingly venturing into trust operations, intensifying market competition; and (iv) financial market supervisors tend to overregulate and supervise.

D. Risk Management

5. GFTC's risk management policies are provided by the board of directors with advice from the Risk Management Committee, Investment Committee, and Audit Committee. Operations risks are managed by a set of clearly defined operating procedures, segregating duties, and taking a scientific approach in decision making. It also conducts internal audit of its operations and postevaluation of its portfolio performance. Its risk management system aims to strike a balance among research, decision-making, execution, and audit and evaluation functions. For the Investment Program, GFTC will undertake due diligence of the subproject applicants, identify risks, and take necessary mitigation measures to control these risks.

E. Financial Performance

6. For the 3 years up to the end of 2006, GFTC reorganized its finances by clearing out nonperforming assets and disposing of loans that no longer comply with current trust company regulations. By the end of 2006, GFTC had resolved the nonperforming assets in its own proprietary books and virtually eliminated loan financing from the balance sheet. As required by

CBRC's Administrative Rules Governing Trust Companies, GFTC is also making provisions in its reserves for potential breaches of trust. The trust compensation reserve stood at CNY1.28 million at the end of 2006, and is growing at 5% of annual after-tax profits.

7. GFTC has facilitated the successful restructuring of the balance sheet by using its capital to earn good returns in the buoyant economic conditions that prevailed during 2006. Revenues virtually doubled to reach CNY118 million ($15 million), while operating profits grew from CNY20 million in 2005 to reach CNY96 million in 2006—an almost five-fold increase. These returns were sufficient to cover the write-off (CNY60 million) of remaining nonperforming loans and provide for an after-tax profit of CNY12 million. Fee income from managing trusts made a relatively minor CNY5.6 million (5%) contribution to revenue, but enabled GFTC to leverage its professional capabilities and take advantage of its ability to do business in a field that offers a relatively more stable income stream than its other activities.

8. The financial and regulatory developments over the last 3 years have resulted in GFTC consolidating its operations and establishing sound finances with no debt, high liquidity, and a mixed portfolio of tradable securities and longer term investments in unlisted financial services companies. GFTC therefore plans to take advantage of its strong financial structure and unique position in Guangdong to develop its trust management business. Increased trust management activities will reduce its degree of dependence on the speculative and volatile securities trading business, and thereby help stabilize returns from one year to the next. GFTC managed more than 40 trusts in 2006 with a total amount under trust management of CNY995 million ($133 million) at the end of 2006. Trust activities are split into two categories: entrusted investments and entrusted loans, with one client accounting for all of the entrusted loan business. Although trust accounts under GFTC management declined from CNY1.2 billion at the beginning of 2006, (because of declining loan balances in the entrusted loans category), they are projected to grow from around 5% of revenues in 2006 to reach 25% by 2012 and thereby ensure GFTC achieves steady financial returns over this period. Management of the Investment Program's energy efficiency trust will greatly help GFTC to achieve this target. The overall profit forecasts to 2012 anticipate that the 26% after-tax operating return on capital employed achieved in 2006 is likely unsustainable; and while potential returns from stocks may be volatile from year to year, the trend rate will align more closely with the overall national economic growth rate. Growth in the trust management portfolio will entail a concurrent shift to higher administrative and general staff costs, with the overall result being more stable and steady returns on capital employed.

F. Trust Management

9. The energy efficiency trust to be established under the Investment Program is protected by CBRC's rules, as each trust is a separate account and cannot be commingled with other trust accounts or the proprietary investments of GFTC. GFTC will establish an energy efficiency trust management unit with separate functions for (i) assessing financial viability of the subprojects; (ii) disbursing funds; (iii) managing the subloan portfolio, collaterals and guarantees, and nonperforming loans; and (iv) preparing the relevant financial statements. The unit will have its own director, supported by three deputies for the functional areas of administration, financial accounting, and legal matters. The administrative section will establish procedures, monitor subborrowers' performance, and maintain the database of subloans. The financial section will manage the financial and accounting systems for the trust. The legal section will be responsible for preparation and custody of legal documents and for initiating any legal proceedings that may prove necessary. GFTC currently has about 40 staff; this is deemed sufficient for tranche 1 subborrowers. It has indicated that more staff will be added, if necessary, as the number of subloans increase.

Table A7: Guangdong Finance Trust Company Ltd.
Summary Financial Projections (CNY 000)

	Actual				Projected				
Item	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Profit and Loss Statement									
Operating Revenues	42,573	64,660	118,740	81,950	86,224	96,284	107,496	118,787	129,832
Operating Expenses	28,914	39,430	22,054	26,700	35,141	39,414	44,956	50,769	55,247
Net Financing Expense	3,343	4,976	596						
Net Income	**10,316**	**20,254**	**96,089**	**55,250**	**51,083**	**56,870**	**62,540**	**68,018**	**74,585**
Balance Sheet									
Equity and Reserves	607,951	619,699	612,277	649,295	683,520	721,623	763,525	809,097	859,069
Represented by:									
Current Assets	2,897,545	390,249	377,187	489,841	466,558	494,567	521,690	550,913	583,304
Non-current Assets	264,970	265,953	263,145	160,883	220,503	234,029	248,921	265,364	283,465
Total Assets	**3,162,515**	**656,202**	**640,332**	**650,724**	**687,061**	**728,596**	**770,611**	**816,277**	**866,769**
Current Liabilities	2,381,915	36,503	28,055	1,429	3,541	6,973	7,087	7,180	7,700
Non-current Liabilities	172,649								
Total Liabilities	2,554,564	36,503	28,055	1,429	3,541	6,973	7,087	7,180	7,700
Net Assets	607,951	619,699	612,277	649,295	683,520	721,623	763,525	809,097	859,069
Statement of Cash Flows									
Net Cash Flows, Operating Activities	58,111	(679,701)	(292,162)	224,362	65,963	28,688	27,602	29,573	32,548
Net Cash Flows, Investing Activities	37,473	(48,201)	46,075	99,425	(49,740)	(1,082)	(929)	(794)	(576)
Net Cash Flows, Financing Activities		(129,778)	(18,670)	19,350					
Cash Increase/(decrease) for Year	95,584	(857,680)	(264,758)	343,136	16,224	27,606	26,673	28,779	31,972
Closing Balance	1,166,567	308,887	44,129	387,265	403,489	431,095	457,768	486,547	518,519
Key Performance Indicators									
Operating Ratio	0.68	0.61	0.19	0.33	0.41	0.41	0.42	0.43	0.43
Current Ratio	1.22	10.69	13.44	343	132	71	74	77	76
Return on Capital Employed		6.1%	24.4%	11.7%	10.3%	10.8%	11.3%	11.6%	12.0%
Debt: Equity	22:78	0:100	0:100	0:100	0:100	0:100	0:100	0:100	0:100

( ) = negative.
Source: Asian Development Bank estimates.

INVESTMENT PROGRAM IMPLEMENTATION ARRANGEMENTS

A. Financial Intermediary

1. The Guangdong provincial government (GPG) will entrust Guangdong Finance Trust Company (GFTC) to be the financial intermediary for the Guangdong Energy Efficiency and Environment Improvement Investment Program (Investment Program) through a trust agreement to be signed by Guangdong Finance Bureau, representing GPG and GFTC. GFTC will establish a separate energy efficiency trust account for the Asian Development Bank (ADB) loan proceeds, and onlend to subborrowers approved by the Efficiency Power Plant Steering Committee. It will be responsible for assessing financial viability of the subborrowers, disbursing funds and administering the subloan portfolio, managing the trust account, subloan collaterals and guarantees, taking necessary action against nonperforming loans, and ensuring that the trust account and subloan portfolio are audited annually. Fees to GFTC for administering the trust will be paid according to the terms of the trust agreement.

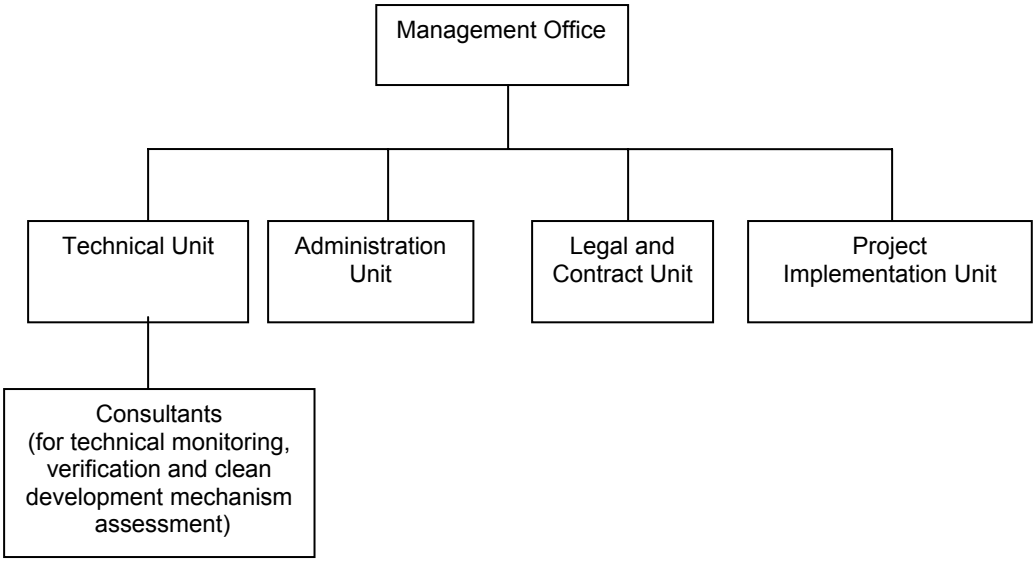
2. The loans to be extended to subborrowers will be based on the draft subloan agreement template agreed to with ADB. Periodic subloan repayments will replenish the trust account and GFTC will continue to onlend subsequent batches of subloans adopting the same procedures as for the first batch. From the same trust account, GFTC will make available to Guangdong Finance Bureau amounts sufficient to ensure timely loan principal repayment, interest and other charges related to the ADB loans.

3. GFTC will set up a computer system to monitor subproject activities and to support Guangdong Finance Bureau and the Efficiency Power Plant Project Management Office (EPP-PMO) in preparing relevant reports. It will provide detailed monthly reports on the Investment Program to the EPP-PMO and steering committee. If GFTC and the EPP-PMO have different opinions on the qualification of subloan applications, the final decision will rest with the steering committee. GFTC's capacity and financial performance is assessed in Appendix 7.

B. Project Management Office

4. GPG has established the EPP-PMO that will be responsible for overall implementation of the subprojects and the technical aspects of the Investment Program. The organization chart of the EPP-PMO is in Figure A8. The EPP-PMO will have at least 16 full-time staff for tranche 1, increasing this as required depending on workload. Its responsibilities include (i) marketing and promoting efficiency power plants (EPPs), (ii) reviewing and assessing EPP subproject applications based on the selection criteria and approval process for subprojects, (iii) overseeing implementation of subprojects, (iv) measuring and verifying energy savings of implemented projects, and (v) providing overall monitoring, managing, and reporting for the Investment Program.

Figure A8: Organization Chart of Efficiency Power Plant Project Management Office



Source: Guangdong provincial government.

5. The EPP-PMO will comprise the following units:

(i) **Management office.** The office will have one director and one deputy director who will be responsible for overall operations of the EPP-PMO.
(ii) **Technical unit.** The unit will comprise four staff responsible for dissemination of EPP technologies; technical assessment of EPP project applications; cost and energy/demand savings analysis; subproject financial and economic analyses; emission reductions analysis; measurement, verification, and evaluation of EPP energy and demand savings; and coordination of clean development mechanism (CDM) support to subprojects.
(iii) **Administration unit.** The unit will comprise three staff specializing in interpretation, accounting, database management, information technology support, secretarial support, reporting, and administrative functions.
(iv) **Legal and contract unit.** The unit will comprise two staff experienced in contracts, contract management/enforcement, legal matters, and dispute resolution of the technical part of the contract with subborrowers. These two positions may be outsourced to reduce costs.
(v) **Project implementation unit.** The unit will comprise five staff who will be responsible for EPP project implementation; monitoring and reporting; procurement; marketing and recruiting EPP project applications; and liaison with trade allies, schools, and government agencies on EPP information dissemination.
(vi) **Consultants**. The EPP-PMO will contract consultants, as needed, to perform (a) independent measurement and evaluation of EPP energy savings, (b) assistance with project implementation, and (c) CDM document preparation and verification activities.

C. Steering Committee

6. GPG has established the EPP Steering Committee comprising senior officials or managers from four GPG departments responsible for the Investment Program: Guangdong

Province Economic and Trade Commission, Development and Reform Commission, Finance Bureau, and State Assets Supervision and Administration Commission. The steering committee will approve subloans and provide guidelines and instructions regarding the overall operation of the Investment Program. Guangdong Province Economic and Trade Commission will serve as the secretariat.

D. Guangdong Energy Efficiency Fund

7. GPG will establish the Guangdong energy efficiency fund in 2008 to provide support for the Investment Program. The fund will provide support for (i) direct financial incentives for energy efficiency projects based on actual energy savings, (ii) capacity building and information dissemination activities; (iii) promotion of clean development mechanism; (iv) related expenses for EPP-PMO and GFTC to implement the Investment Program; and (v) other activities designed to promote energy conservation. This fund will be financed by several sources including GPG, donor contributions, and other sources.

E. Procurement and Disbursement

8. Under the guidance of the steering committee and with the assistance of the EPP-PMO, where applicable, subborrowers will be required to follow the relevant procurement rules in ADB's *Procurement Guidelines* (2007, as amended from time to time) for financial intermediaries, and adopt appropriate procedures including (i) payment of reasonable prices; and (ii) fair canvassing when selecting suppliers. Procurement must be from ADB member countries. Subborrowers will be encouraged to procure goods through competitive bidding or shopping when such procedures are most appropriate in the interest of economy and efficiency. In case of noncompliance, GFTC will exercise the right to recall the subloan. Procurement procedures will be in accordance with the procurement manual prepared by GPG, acceptable in form and substance to ADB, and approved by the steering committee.

9. The loan proceeds under each PFR will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time). The loan proceeds will be paid through GFB to a trust account that will be set up upon loan effectiveness of the first loan at a commercial bank acceptable to ADB. The transfer of such loan proceeds from GFB to the trust account should take place promptly within 5 working days from approval by the State Administration of Foreign Exchange Guangdong Branch. The trust account will be managed by GFTC and will be used to finance eligible subprojects. The withdrawal request for any subloan will be supported by a withdrawal application, and certification from GFB that the subloan and subproject agreements for the subproject have been executed between GFTC, EPP-PMO, and the related subborrower, respectively, and include terms and conditions specified in related legal agreements with ADB, and are legally binding upon the parties. This certification will be a condition for loan disbursement. Additionally, each withdrawal request needs to be supported by the simultaneous application for subloan approval and withdrawal for subloans not exceeding the free limit of $10,000,000.00. For subloans in excess of the free limit, copies of the subloan and subproject agreements will be submitted together with the subloan approval and withdrawal statement. The disbursements under each subloan may be in several installments based on the readiness of the subproject.

F. Performance Monitoring

10. The EPP-PMO and GFTC will ensure that within 6 months of the effective date of the first loan agreement under the multitranche financing facility (MFF) an investment program performance and monitoring system is established. The system will be in a form and substance

acceptable to ADB in accordance with the investment program performance indicators, and should include a detailed plan for measuring and verifying actual energy savings of the implemented subprojects. The EPP-PMO and GFTC will undertake periodic project performance review under each subloan, in accordance with the monitoring system to evaluate the scope, implementation arrangements, progress, achievements of the claimed energy savings, and other benefits of the subprojects and the overall Investment Program. The EPP-PMO and GFTC will ensure that all subprojects financed under the Investment Program comply fully with applicable ADB guidelines and policies. ADB will monitor adherence to these guidelines and policies through periodic review missions.

G. Accounting, Auditing and Reporting

11. GFB, the EPP-PMO, GFTC, and each EPP subborrower will ensure that proper accounts and records are maintained and audited (or certified if appropriate) in a timely manner to adequately identify the use of loan proceeds in such manner and detail as may be specified under each related legal agreement. GFTC will prepare and submit to ADB quarterly financial reports on each subproject, including expenditures to date, subborrower repayment performance, loan defaults (if any), and other relevant data required by ADB. The reports will be submitted to ADB within 45 days from the end of each quarter. GFTC will submit to ADB its audited annual financial statements within 6 months after the fiscal year-end.

12. The EPP-PMO, in cooperation with GFTC, will prepare and provide ADB with quarterly progress reports on implementation of the Investment Program. The reports will include progress made during the review period, changes in implementation schedule, problems encountered and remedial actions taken, energy savings achieved, and work to be undertaken in the coming period. The reports should be submitted to ADB within 45 days from the end of each quarter.

13. The EPP-PMO, in cooperation with GFTC, will submit to ADB a project completion report within 6 months of physical completion of all the first batch of subprojects financed under each financing tranche, and an MFF completion report within 6 months from physical completion of all subprojects under the MFF, i.e., after all the ADB loans extended under the MFF are completed. These reports will cover a detailed evaluation of each subproject, including the design, costs, contractors' and consultants' performance, economic rate of return, verified energy savings, environmental and economic impact, and other details relating to each subproject.

H. Investment Program Review

14. ADB, GPG, EPP-PMO, and GFTC will meet regularly as required to review the progress of the individual loan portfolios and any changes to implementation arrangements or remedial measures required to be undertaken to achieve the objectives of the Investment Program. These reviews will be held until the loans are fully disbursed. GPG will develop a monitoring plan and ensure that periodic progress and financial reports are regularly submitted to ADB.

SUBPROJECT SELECTION CRITERIA AND PERIODIC FINANCING APPLICATION PROCEDURE FOR GUANGDONG

A. Subproject Selection Criteria

1. The following criteria will apply to efficiency power plant (EPP) subprojects that are financed in various batches under the Guangdong Energy Efficiency and Environment Improvement Investment Program (Investment Program):

2. **Technical Criteria.** The criteria include the following:

   (i) The EPP subproject must use proven high efficiency technologies with reliable, measurable, and verifiable energy savings that will contribute to the achievement of the energy conservation goals set forth in Guangdong's Mid- and Long-Term Energy Conservation Plan, and the 11th Five-Year Plan of the People's Republic of China.
   (ii) The estimated EPP subproject cost and energy saving are reasonable and consistent with the energy savings claimed by the equipment manufacturers and/or general engineering principles.
   (iii) The simple payback period (total investment cost by annual savings in electricity bill) is less than 5 years in the case of end-users.

3. **Subproject Economic and Financial Criteria.** The criteria include the following:

   (i) The total economic benefits must exceed the total economic costs of the proposed subproject.
   (ii) The economic internal rate of return of the EPP subproject must be greater than the discount rate of 12%.
   (iii) The economic internal rates of return are viable under adverse sensitivity scenarios.
   (iv) Savings in electricity bills are adequate to cover the loan repayments in the case of end-users.
   (v) The financial internal rate of return will be greater than the weighted average cost of capital.
   (vi) The financial internal rates of return are viable under various sensitivity scenarios.

4. **Subborrower Financial Criteria.** The criteria include the following:

   (i) The subborrower does not have a bad credit record, based on the People's Bank of China credit history database.
   (ii) The subborrower should meet the following financial performance indicators: (a) total debt/equity ratio: less than 75%, (b) debt service ratio: greater than 1.2, and (c) current ratio: at least 1.2. In the event a subborrower does not meet these indicators but the projected energy savings are considerably higher than average, it should provide acceptable collateral and/or loan guarantee for the amount of the subloan or as agreed with GFTC.
   (iii) The subborrower must contribute a minimum of 20% of the total EPP subproject investment cost as counterpart financing.

5. **Subproject Social and Environmental Criteria.** The criteria include the following:

(i) The proposed subprojects will be energy efficiency projects located within Guangdong province.
(ii) The subprojects do not involve land acquisition, or involuntary resettlement or have adverse impacts on indigenous people.
(iii) The subprojects will not be located in any designated environmental protection zone.
(iv) Each subproject must be designed, constructed, and operated in accordance with relevant national and provincial social and environmental laws and regulations.

6. In the event that a subproject has good energy savings potential, but does not meet some of these criteria, then such subproject will be submitted to the EPP Steering Committee for consideration.

B. Periodic Financing Application Procedures for Guangdong

7. Approval of EPP subprojects intended for financing under the Investment Program will follow the applicable provincial and national procedures. Subproject applicants should complete the EPP application forms provided by the EPP-PMO.

8. The EPP subprojects of the first tranche under the Investment Program have been assessed and prepared under ADB project preparatory technical assistance.[1] They are included in the first periodic financing request submission. For subprojects to be included in the subsequent financing tranches and for subsequent batches of subloans, the procedures will be as follows:

(i) GFTC and the EPP-PMO will review the subproject applications and assess project feasibility against established criteria. GFTC and the EPP-PMO will be responsible for the financial and technical assessment of the subprojects, respectively.
(ii) GFTC and the EPP-PMO will submit an appraisal report on the subprojects to the steering committee for review.
(iii) The EPP-PMO will submit information on individual subprojects that exceed $10 million to ADB for review and prior approval.
(iv) Upon review of the subprojects by the steering committee, the EPP-PMO will prepare and submit the necessary documents and information to the Guangdong Development and Reform Commission (GDRC) for approval.
(v) The GDRC will submit the foreign capital utilization report to the National Development and Reform Commission for approval.
(vi) GPG, through the Ministry of Finance, will formally submit the periodic financing request to ADB.

[1] ADB. 2006. *Technical Assistance to the People's Republic of China for Preparing Energy Conservation and Resource Management Project,* Manila (TA 4819-PRC, for $300,000, approved on 19 July).

PROCUREMENT PLAN

Table A10.1: Investment Program Information

Investment Program Information	The Investment Program is to finance an efficiency power plant (EPP) in Guangdong province, equivalent to 107 megawatts (MW), using the financial intermediation loan (FIL) modality. Nine subprojects have been selected for tranche 1. Subprojects for subsequent tranches have not yet been identified. The energy savings will result from retrofitting existing equipment with more efficient equipment, which in aggregate, will reduce the need to construct and operate a conventional coal-fired power plant. It will consider only retrofits of proven energy efficiency technologies in the following areas: (i) motors and motor-drive systems; (ii) transformers and reactive power compensators; (iii) lighting; (iv) ventilation, heating, and air conditioning; (v) air compressors and pumping systems; (vi) recovery of waste energy from industry; (vii) industrial boilers and industrial cogeneration; and (viii) other related energy efficiency improvement projects.
Country	People's Republic of China
Name of Borrower	People's Republic of China
Investment Program Name	Guangdong Energy Efficiency and Environment Improvement Investment Program
Loan or TA Reference	TBD
Date of Effectiveness	TBD
Amount $:	Tranche 1: $35 million
Of which Committed, $	20% has been requested to be eligible for retroactive financing
Executing Agency:	Guangdong provincial government
Approval Date of Original Procurement Plan	
Approval of Most Recent Procurement Plan	
Publication for Local Advertisements	Procurement notices in China Daily (ICB), and China bidding website (NCB and shopping)
Period Covered by this Plan	18 months from loan effectiveness

A. Centralized Procurement

1. For centralized procurement by the EPP Project Management Office, the following thresholds outlined in Table A10.2 and Table A10.3 will apply.

Table A10.2: Procurement Thresholds, Goods and Related Services, Works, and Supply and Installation

Procurement Method	Amount ($)
ICB Works	≥10,000,000
ICB Goods	≥1,000,000
NCB Works	≥100,000
NCB Goods	≥100,000
Shopping Works	<100,000
Shopping Goods	<100,000

ICB = international competitive bidding, NCB = national competitive bidding.

Table A10.3: Procurement Thresholds, Consulting Services

Procurement Method	Amount ($)
QCBS	>200,000
CQS	≤200,000
LCS	≤100,000

CQS = consultants qualifications selection, LCS = least-cost selection, QCBS = quality- and cost-based selection.

B. Procurement by Subborrowers

2. All procurement must be from ADB member countries.

3. For procurement of goods, works, and services by subborrowers that are state-owned enterprises, procedures applicable to state-owned enterprises will be followed.

4. For subborrowers that are from the private sector, goods, works, and services will be procured according to appropriate procedures, including

(i) reasonable prices being paid, and
(ii) fair canvassing when selecting suppliers.

5. Procurement procedures will be in accordance with the procurement manual prepared by GPG, acceptable in form and substance to ADB, and approved by the EPP Steering Committee.

TERMS OF REFERENCE FOR CAPACITY BUILDING GRANT FOR ENERGY EFFICIENCY IMPLEMENTATION

A. Module 1: Information Sharing, Training of Trainers, and Development of Tools

1. Design training programs for the following:

   (i) **Direct end-user subborrowers.** These will focus on requirements for applying for subloans, procedures for application appraisal and approval by the Efficiency Power Plant Steering Committee, procurement and disbursement procedures, reporting of subproject implementation, supervision of implementation, evaluation of energy savings, reporting of energy savings until the subloan is fully repaid, postevaluation of outcomes.

   (ii) **Energy service companies (ESCOs).** Needs to include energy audit, new technologies and resulting energy savings, suitable contractual arrangements with end-users, sourcing capital for expansion, and management of risks.

   (iii) **Project Management Office (EPP-PMO) and Guangdong Finance Trust Company Ltd (GFTC) staff.** Training will include procedures for application appraisal and approval by the EPP-PMO and GFTC; Asian Development Bank (ADB) loan covenant and quarterly reports, auditing energy savings by subborrowers, estimation of efficiency power plant (EPP) potential, new energy efficiency technologies, financial performance of subborrowers, and risks and assumptions for successful EPP.

   (iv) **Staff of related government departments** (Finance Bureau, Development and Reform Commission, Economic Operation, Energy Conservation Center, State Assets Supervision and Administration Commission). Training will include international experience in energy efficiency, impacts of energy conservation, rationale for government support for energy conservation, and fiscal measures to support energy conservation.

2. Design and establish internet website for EPP, which should contain the following:

   (i) links to international websites related to EPP, analytical papers, technologies, service, and efficient equipment providers;

   (ii) government policies and measures to support energy conservation;

   (iii) procedures and forms for subloan applications, disbursement of funds, subloan repayments, monitoring and evaluation, and reporting; and

   (iv) questions and answers, feedback, and relationship management with subborrowers.

3. Prepare templates and tools, including

   (i) subloan applications, template for reports for implementation, energy savings, and postevaluation of impacts;

(ii) computer worksheet models for technical and financial appraisal of subloan applications, implementation progress, and evaluation of energy savings; and

(iii) templates for monthly/quarterly reporting from GFTC and the EPP-PMO.

4. Coordinate with other development partners to solicit support for EPP implementation. For example, the Government of Japan has a program to train engineers from East Asia Summit member countries, and the United States Environmental Protection Agency has sought opportunities to extend the services of its experts to assist the People's Republic of China in achieving its energy conservation target.

B. Module 2: Appraisal of EPP Applications, Monitoring of Implementation, and Evaluation of Energy Savings

5. Provide the following inputs:

(i) **Assistance for appraisal.** Review completeness of information, review and verify information, assess energy savings, review cost estimates of equipment, determine economic and financial internal rate of returns based on the reduction of energy costs, review implementation schedule, identify implementation risks and mitigation, and recommend subloan approvals and terms of subloans (related to payback period and projected cash flow from energy savings).

(ii) **Assistance for subproject implementation.** Undertake site visits, measure power savings, and assess energy savings based on annual operating hours.

(iii) **Evaluation of energy savings.** Review reports from subborrowers, prepare summary reports for various types of subprojects and comparative benefits, recommend targeting high impact subproject opportunities, and improve the EPP design.

C. Module 3: Evaluation of EPP Potential, Barriers, New Technologies, Estimation and Projection of Energy Savings

6. Provide the following inputs:

(i) **EPP potential.** Review energy use in Guangdong by various segments (e.g., industry and commercial sectors), review available technologies, tabulate the names and addresses of providers of energy efficient equipment and systems, obtain budgetary estimates of the costs of subprojects, undertake surveys to estimate how much of the energy conservation potential will be captured by enterprises.

(ii) Assess the environmental and economic impacts of energy conservation in Guangdong.

(iii) Examine other options for implementation of EPP projects, e.g., leasing of energy conservation equipment, implementation by power distribution companies, barriers faced by ESCOs, improvements needed in the enforcement of contracts (subloans and shared benefits under ESCOs), collateral for subloans, and reducing cost of collection of subloan repayments.

D. Resource Inputs

7. The total estimated effort for the three modules of capacity building is 159 person-months (24 person-months international and 135 person-months national experts), and the resources will be extended in two phases (Table A11.1). The cost estimate and financing plan is in Table A11.2.

Table A11.1: Division of Consulting Service Inputs in Phases 1 and 2

Specialist	Phase 1 Activities	Phase 1 p-m Int'l	Phase 1 p-m Nat'l	Phase 2 Activities	Phase 2 p-m Int'l	Phase 2 p-m Nat'l
A. Module 1. Information Sharing, Training, Developing Tools						
Training	Develop training programs,	2	6	Implement training for	2	6
Efficiency	prepare templates	1	6	trainers programs,	1	6
Media and Events				prepare templates,	1	3
Website				Establish EPP website	1	12
	Subtotal (A)	**3**	**12**		**5**	**27**
B. Module 2. Appraisal, Monitoring, and Evaluation of EPP Subprojects						
Energy	Help with appraisal,	3	12	Help with appraisal,	2	24
ESCO	implementation, and	3	12	implementation, and	2	24
	evaluation (first 6 months)			evaluation (next 6 months)		
	Subtotal (B)	**6**	**24**		**4**	**48**
C. Module 3. EPP Potential, Barriers, Technologies, and Estimation of Energy Savings						
Energy Economist	Identify EPP potential,	1	4	Identify barriers and	1	2
Efficiency	technologies	1	8	estimation of energy	1	4
Statistician		1	4	savings	1	2
	Subtotal (C)	**3**	**16**		**3**	**8**
	Total	**12**	**52**		**12**	**83**

EPP = efficiency power plant, ESCO = energy service company, Int'l = International, Nat'l = national, p-m = person-months.
Source: Guangdong Finance Bureau and Asian Development Bank estimates.

Table A11.2: Cost Estimates and Financing Plan
($'000)

	Item	Phase 1 Cost	Phase 2 Cost	Total Cost
A.	**Clean Energy Fund under the Clean Energy Financing Partnership Facility**[a]			
1.	Consultants			
	a. Remuneration and Per Diem			
	i. International Consultants	299.0	299.0	598.0
	ii. National Consultants	208.0	332.0	540.0
	b. International and Local Travel	36.0	83.0	119.0
	c. Documentation for Information, Training Materials	18.0	17.0	35.0
2.	Office Equipment [b]	15.0	15.0	30.0
3.	Survey and Consultations	20.0	20.0	40.0
4.	Workshops, Training, and Study Tours	112.0	166.0	278.0
5.	Secretarial Service and Administration	30.0	30.0	60.0
6.	Contingencies	62.0	238.0	300.0
	Subtotal (A)	**800.0**	**1,200.0**	**2,000.0**

	Item	Phase 1 Cost	Phase 2 Cost	Total Cost
B.	**Government Financing**			
1.	Consultants	368.0	368.0	736.0
2.	Workshops, Training, and Study Tours	50.0	50.0	100.0
3.	Office Accommodation and Transport	20.0	40.0	60.0
4.	Remuneration and Per Diem of PMO staff	200.0	205.0	405.0
5.	Repots and Communications	10.0	10.0	20.0
6.	Translation Services, Secretariat, and Office Supplier	30.0	45.0	75.0
7.	Contingencies	40.0	57.0	97.0
	Subtotal (B)	**718.0**	**775.0**	**1,493.0**
	Total	**1,518.0**	**1,975.0**	**3,493.0**

PMO = project management office.
[a] Contributor: Government of Australia. Administered by ADB.
[b] Computers, printers, photocopiers, binding, other office equipment.
Sources: Guangdong Finance Bureau and Asian Development Bank estimates.

ENVIRONMENTAL ASSESSMENT AND REVIEW FRAMEWORK

1. This environmental assessment and review framework was prepared for the proposed Guangdong Energy Efficiency and Environment Improvement Investment Program (the Investment Program) in Guangdong Province, People's Republic of China (PRC). The Investment Program proposes utilizing the multitranche financing facility (MFF) of the Asian Development Bank (ADB). The Investment Program will improve energy efficiency in the Guangdong economy and mitigate against environmental impacts from coal-fired power generation by developing energy efficiency power plants (EPPs) in Guangdong. This environmental assessment and review framework is to guide the Guangdong Provincial Government (GPG), the executing agency, in the environmental assessment of subprojects included under the MFF to ensure compliance with the environmental safeguard requirements of ADB.

A. Type of Schemes to Be Assessed

2. The Investment Program will include energy efficiency subprojects located within Guangdong. The subprojects may include retrofits of

(i) motors and motor-drive systems;
(ii) transformers and reactive power compensators;
(iii) lighting;
(iv) air conditioning, ventilation, refrigeration, and heating;
(v) air compressors and pumping systems;
(vi) recovery of waste energy from industry;
(vii) industrial boilers and industrial cogeneration; and
(viii) other related energy efficiency improvement projects.

3. The Investment Program will also provide support for capacity development and information dissemination.

B. Environmental Assessment Procedure

1. Responsibilities and Procedure for Environmental Assessment of Subprojects

4. **Responsibilities and Authority**. The Investment Program will be implemented in accordance with Guangdong's Road Map and Investment Program for energy efficiency. GPG will be responsible for implementation of the Road Map and Investment Program. The EPP-Project Management Office (EPP-PMO) will have overall responsibility for ensuring that all applicable PRC and ADB environmental standards and procedures are followed.

5. **Environmental Assessment**. The Investment Program is classified as environmental category FI, which involves lending through a financial intermediary. Tranche 1 has been assessed and is classified as environmental category C, as all subprojects will have insignificant impacts, in accordance with the ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003).

6. During preparation of subsequent tranches, the EPP-PMO will assess the potential environmental impacts from the tranche subprojects. Based on the assessment, the EPP-PMO will categorize the subprojects into one of the following:

(i) batches of subprojects requiring an environmental management system, including environmental assessment and review procedures for subprojects; and
(ii) batches of subprojects that will only have insignificant impacts, which will require a review of environmental implications.

7. During assessment of the potential environmental impacts from the tranche subprojects, the EPP-PMO will categorize the subprojects into either category A, B, or C, in accordance with ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003). Based on the categorization, the subproject owner will submit to ADB the following reports: category A, a summary environmental impact assessment; category B, a summary initial environmental examination; and category C, a review of environmental implications. The EPP-PMO will ensure that the environmental review documents comply with ADB environmental safeguard requirements.

8. The EPP-PMO will submit to ADB the proposed classification of (i) the tranche; and (ii) the subprojects for review and approval prior to submission of the periodic financing requirement (PFR). The PFR for subsequent tranches will include a safeguard compliance status report for subprojects under all ongoing tranches. In case any major noncompliance is identified, a corrective action plan will be prepared and submitted together with the PFR. GPG will be responsible for ensuring that all PRC and ADB environmental safeguard requirements are being achieved and will maintain a centralized database of all environmental reports that will be made available during ADB review missions.

2. Environmental Criteria for Subproject Selection

9. The following environmental criteria will be utilized when screening selection of subprojects for subsequent tranches:

(i) The proposed subprojects will be energy efficiency projects located within Guangdong province.
(ii) The subprojects will not be located in any designated environmental protection zone.
(iii) Each subproject must be designed, constructed, and operated in accordance with relevant national environmental laws and regulations.

SUBPROJECT ECONOMIC ANALYSIS

A. Estimation of Economic Costs

1. This appendix describes the economic analysis for each subproject included in tranche 1 and the overall result for all the nine subprojects. The analysis was prepared in accordance with the *Guidelines for the Economic Analysis of Projects* (1997) of the Asian Development Bank (ADB). The input data and assumptions were reviewed and found appropriate. Economic costs, expressed in mid-2007 constant values, were used. These include the economic costs of subprojects' capital, operation, and maintenance. Tradable commodities were valued at border prices at the prevailing exchange rate. Nontradable commodities are valued by applying a standard conversion factor of 0.987 and the following specific conversion factors: 1.0 for equipment, 1.0 for skilled labor, and 0.67 for unskilled labor. The capital costs are net of allowances for price inflation, interest during construction, and taxes.

B. Estimation of Economic Benefits

2. For the economic internal rate of return (EIRR) calculations, the cost savings were generally valued at the avoided generation, transmission, and distribution costs of electricity supply arising from the energy efficiency improvement projects. In the case of the boiler retrofit for Huizhou Southeast Thermo-Electricity Co., the electricity savings from power plant efficiency improvement are supplemented by savings in coal consumption. The economic value of electricity cost savings were quantified on the basis of the avoided marginal costs for electricity generated by a conventional coal-fired power plant and the associated marginal transmission and distribution costs.[1]

3. The energy efficiency improvement subprojects will reduce emissions from coal-fired power plants. Major air pollutants from coal-fired power plants include total suspended particulate, sulfur dioxide, nitrogen oxide, and carbon dioxide.[2] The subproject economic analysis therefore includes allowances for the economic benefits of reduced air pollution emissions. The economic evaluation of the environmental impact is based on the benefits transfer method described in ADB's *Workbook on Economic Evaluation of Environmental Impacts* (1996). The evaluation of the damage caused by greenhouse gas emissions utilized data from the latest carbon credit evaluation in Guangdong province under the clean development mechanism.

C. Estimation of the Economic Internal Rate of Return

4. The projected EIRRs are high but regarded as conservative, as they take into account only the main benefits of different components, and include all project-related costs. The EIRRs for the nine subprojects range from 16.4% to 34.8% without the environmental benefits and 20.9% to 44.7% with the benefits (Supplementary Appendix B, Detailed Economic, Financial, and Environmental Analyses of Tranche 1 Subprojects). The overall result for the first set of nine subprojects is 23.3% without environmental benefits and 28.9% with. Table 13.1 summarizes the EIRRs and net present values of economic benefits for all subprojects. The

[1] The marginal cost for electricity generated by conventional coal-fired power plant is CNY0.36/kWh. A benchmark figure of CNY0.16/kWh was used for the incremental transmission and distribution cost. The final result of CNY0.52/kWh was used for all economic benefit calculations.

[2] The estimated average emissions factors from a typical coal-fired power plant is 0.78 kg/kWh for CO_2, 0.009 kg/kWh for SO_2, 0.002 kg/kWh for NO_X, and 0.0035 kg/kWh for TSP.

economic net present value of the nine subprojects included in tranche 1 is $21.8 million when environmental benefits are included.

Table A13.1: Economic Internal Rate of Return and Economic Net Present Value

Subcomponent	Without Environmental Benefits		With Environmental Benefits	
	EIRR (%)	ENPV ($000)	EIRR (%)	ENPV ($000)
Fenghua Advanced Technology Co.	23.5	1,164	30.7	1,865
Guangzhou Iron and Steel Co.	33.0	669	41.8	1,007
Huizhou South Thermo-Electricity Co.	34.0	1,976	44.7	2,928
Hongtai Trade Co.	24.8	1,386	31.7	2,118
Jinguan Energy Services Co.	23.3	1,200	28.8	1,992
Haihong Co.	16.4	275	28.8	660
Zhiguan Electric Co.	17.3	2,694	20.9	5,302
Laifu Electric Co.	34.8	1,121	22.8	14,899
Zhuhai Secopower Transformer Co.	31.2	423	39.5	586
Total for Tranche 1	**23.3**	**14,083**	**36.5**	**21,850**

EIRR = economic internal rate of return, ENPV = economic net present value.
Source: Asian Development Bank estimates.

D. Sensitivity and Risk Analysis

5. Sensitivity analysis showed that the EIRR would decrease to (i) 22.7% if all the subprojects experience a cost overrun of 20%; (ii) 20.7%, if the benefits are reduced by 20%; (iii) 24.1%, if the first set of subprojects experiences a commissioning delay of 1 year; and (iv) 18.5%, if (i), (ii), and (iii) all happen (Table A13.2). Even under the unlikely case of (iv) the EIRR is still significantly higher than 12%.

6. To complement this analysis, risk analysis was performed using a probabilistic approach to the perceived risk factors that affect the viability of the whole project. The selected risk variables include capital cost, avoided marginal cost for electricity, electricity savings, commissioning year, foreign exchange rate, and environmental benefit. A total of 1,000 simulations were made. Based on the weighted average of all simulated combinations, the expected EIRR of the whole project is 25.9% with a standard deviation of 3.8%. This is 3 percentage points lower than the base value without consideration of project risks.

Table A13.2: Sensitivity Analysis of the Economic Internal Rate of Return

Case			Change	EIRR (%)	SI	SV
A.	Base Case			28.9		
B.	Sensitivity Cases					
	(i)	Capital Cost Overrun	20%	22.7	2.0	45.6
	(ii)	Lower Benefits	20%	20.7	3.0	33.3
	(iii)	Implementation Delay	1 Year	24.1		
	(iv)	Combination of (i), (ii), and (iii)		18.5		

EIRR = economic internal rate of return, SI = sensitivity indicator, SV = switching value.
Note: Sensitivity indicator is the ratio of percentage change in the EIRR divided by the percentage change in the given parameter. Switching value is the percentage change in a parameter for the project decision to change, that is, for the net present value to become zero or the EIRR to fall to the cut-off rate.
Source: Asian Development Bank estimates.

SUBPROJECT FINANCIAL ANALYSIS

1. This appendix describes the input data and assumptions used in the subproject financial analysis. The analysis was performed in accordance with the Asian Development Bank (ADB) guidelines in *Financial Management and Analysis of Projects* (2005). The analysis focuses on the nine subprojects identified for funding under tranche 1. All costs and prices are in constant 2007 currency values. For subprojects to be funded by subsequent tranches, similar financial analysis will be conducted.

A. Capital Cost, Benefits, and Operation and Maintenance Costs

2. Capital costs are based on projected estimates of investment for the nine subprojects, including labor, equipment, and materials. Much of the equipment can be purchased off the shelf and therefore a 5% allowance for labor to cover installation is considered realistic. Likewise a 5% allowance for physical contingencies is provided. The exception is the boiler retrofit for Huizhou Southeast Thermo-Electricity Company, for which a 30% labor allowance is provided.

3. Financial benefits for all the nine subprojects are the reductions in electricity bills resulting from each subproject's electricity savings, valued at the current applicable electricity tariff. Benefits in the case of the boiler retrofit for Huizhou Southeast Thermo-Electricity Company include coal-fuel savings as well as electricity savings from power plant efficiency improvements. The analysis excludes any potential income from the clean development mechanism program for certified emission reductions.

4. Operation and maintenance costs are assumed to be about 3% of gross fixed assets. Net cash flows from the subprojects were determined after allowing for income taxes at 25% of incremental pretax profit.

B. Financial Internal Rate of Return and Financial Net Present Value

5. Table A14.1 provides a summary of the financial internal rate of return (FIRR) and the financial net present value (FNPV) of each of the nine subprojects, and the overall result for all subprojects. Detailed computations of FIRRs and FNPVs are in Table 14.2. All the FIRRs are higher than the weighted average cost of capital estimated at 7.5% (para. 6). The FNPV for each subproject is calculated using the estimated weighted average cost of capital. The subprojects are potentially financially attractive. The financial viability of the entire tranche 1 was subjected to sensitivity analysis under various adverse conditions (Table 14.3). The sensitivity analysis indicates that the entire tranche of nine subprojects remain stable and robust under various adverse scenarios.

C. Weighted Average Cost of Capital

6. The weighted average cost of capital was calculated after tax, in real terms using actual capital mix and costs of funds. The result is 7.5%. Actual interest rates of local loans were used and for the ADB loan the interest rate is based on the current London interbank offered rate on 5-year fixed-interest swap (currently at 4.9%) plus the ADB loan spread of 0.6%. The cost of equity was assumed to be 25.0%, based on the current financial performances of the nine subborrowers, which generally have returns on capital employed of this magnitude or better.[1]

[1] These subprojects will be implemented by energy consumers that are subject to market-based pricing, unlike the usual ADB-funded projects for the supply side that have administered pricing and the government expects none or little return on equity. The high cost of equity has, therefore, led to a higher weighted average cost of capital than the usual ADB projects.

The income tax rate is 25.0%, and the average domestic inflation rate is assumed to be 2.5% per year.

Table A14.1: Financial Internal Rates of Return and Financial Net Present Value

Subprojects	**FIRR** (%)	**FNPV** ($000)
Fenghua Advanced Technology Co.	16.5	1,231
Guangzhou Iron and Steel Co.	24.3	689
Huizhou South Thermo-Electricity Co.	22.5	1,771
Hongtai Trade Co.	18.4	1,487
Jinguan Energy Services Co.	16.4	1,235
Haihong Co. Ltd.	11.5	344
Zhiguan Electric Co.	13.2	3,633
Laifu Electric Co.	26.4	12,140
Zhuhai Secopower Transformer Co.	23.1	446
Total for Tranche 1	**16.6**	**21,271**

FIRR = financial internal rate of return; FNPV = financial net present value.
Source: Asian Development Bank estimates.

Table A14.2: Financial Internal Rate of Return (FIRR)

(CNY'000)

Item	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
A. Fenghua Advance Technology Co																
Cash Inflows		76	583	583	583	507	507	504	504	504	504	433	433	433	433	433
Cash Outflows																
Capital Costs		2,007														
Operating Costs		60	60	60	60	55	55	55	55	55	55	50	50	50	50	50
After Tax Net Cash Flow		(1,990)	446	437	428	356	350	344	340	336	332	280	276	273	269	265
After tax FIRR (%)		16.5%														
B. Guangzhou Iron and Steel Company																
Cash Inflows		19	308	308	308	289	289	287	287	287	287	76	76	76	76	76
Cash Outflows																
Capital Costs		680														
Operating Costs		129	129	129	129	109	109	109	109	109	109	10	10	10	10	10
After Tax Net Cash Flow		(715)	212	209	205	187	184	181	179	176	174	48	48	47	46	46
After tax FIRR (%)		24.3%														
C. Huizhou Southeast Thermo-Electricity Co.																
Cash Inflows		5	524	524	524	519	519	519	519	519	519	519	519	519	519	519
Cash Outflows																
Capital Costs		1,512														
Operating Costs		45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
After Tax Net Cash Flow		(1,553)	394	387	379	368	362	358	355	351	347	343	338	334	330	325
After tax FIRR (%)		22.5%														
D. Hong Tai Trade Company																
Cash Inflows		0	342	475	607	607	607	607	607	607	607	607	607	607	607	607
Cash Outflows																
Capital Costs		1,229	417	417												
Operating Costs		0	49	62	62	62	62	62	62	62	62	62	62	62	62	62
After Tax Net Cash Flow		(1,229)	(154)	(63)	442	432	424	418	413	408	404	399	394	389	384	379
After tax FIRR (%)		18.4%														
E. Jinguan Energy Services Company																
Cash Inflows		76	583	583	583	507	507	504	504	504	504	433	433	433	433	433
Cash Outflows																
Capital Costs		1,732	769													
Operating Costs		0	38	75	75	75	75	75	75	75	75	34	34	34	34	34
After Tax Net Cash Flow		(1,732)	(462)	571	560	547	538	528	522	516	511	159	157	154	152	150
After tax FIRR (%)		16.4%														
F. Hai Hong Co., Ltd. (Transformer Manufacturing)																
Cash Inflows			111	222	336	336	336	336	336	336	336	336	336	336	336	336
Cash Outflows																
Capital Costs		509	509	509												
Operating Costs			31	46	46	46	46	46	46	46	46	46	46	46	46	46
After Tax Net Cash Flow		(509)	(428)	(340)	247	240	234	230	227	224	221	219	216	213	210	208
After tax FIRR (%)		11.5%														

Item	2,007	2,008	2,009	2,010	2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019	2,020	2,021	2,022
G. Zhi Guang Electric Co.																
Cash Inflows		0	0	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284	2,284
Cash Outflows																
Capital Costs		4,700	4,700													
Operating Costs		0	0	282	282	282	282	282	282	282	282	282	282	282	282	282
After Tax Net Cash Flow		(4,700)	(4,700)	1,789	1,745	1,700	1,662	1,639	1,622	1,605	1,587	1,569	1,551	1,532	1,513	1,493
After tax FIRR (%)		13.2%														
H. Lai Fu Electric Co. Ltd.																
Cash Inflows				0	3,783	3,783	3,783	3,783	3,783	3,783	3,783	3,783	3,783	3,783	3,783	3,783
Cash Outflows																
Capital Costs		2,500	2,500	2,500												
Operating Costs					225	225	225	225	225	225	225	225	225	225	225	225
After Tax Net Cash Flow		(2,500)	(2,500)	(2,550)	2,831	2,782	2,736	2,697	2,666	2,638	2,608	2,579	2,548	2,517	2,485	2,452
After tax FIRR (%)		16.4%														
I. Zhu Hai Hua Li Tong Transformer Co.																
Cash Inflows		0	0	144	144	144	144	144	144	144	144	144	144	144	144	144
Cash Outflows																
Capital Costs		186	186													
Operating Costs		0	0	0	11	11	11	11	11	11	11	11	11	11	11	11
After Tax Net Cash Flow		(186)	(186)	115	105	103	101	100	98	97	96	95	94	93	92	90
After tax FIRR (%)		23.1%														
J. The whole project																
Cash Inflows		100	2,865	5,945	9,974	9,874	9,874	9,865	9,865	9,865	9,865	9,075	9,075	9,075	9,075	9,075
Cash Outflows																
Capital Costs		15,759	9,635	3,980	554	554	0									
Operating Costs		455	572	920	1,156	1,142	1,142	1,142	1,142	1,142	1,142	1,052	1,052	1,052	1,052	1,052
After Tax Net Cash Flow		(15,768)	(8,033)	(59)	6,273	6,057	6,488	6,393	6,321	6,252	6,181	5,590	5,522	5,252	5,380	5,307
After tax FIRR (%)		16.6%														

Co = company, FIRR = financial internal rate of return, ( ) = negative.
Source: Asian Development Bank estimates.

Table A14.3: Sensitivity Analysis of Financial Internal Rates of Return

Case			Change	FIRR (%)	SI	SV
A.	Base Case			16.6		
B.	Sensitivity Cases					
	1.	Capital Cost Overrun	20%	12.8	1.7	59.4
	2.	Lower Benefits	20%	11.3	2.6	34.3
	3.	Implementation Delay	1 Year	14.4		
	4.	Combination of (i),(ii) and (iii)		4.3		

FIRR = financial internal rate of return, SI = sensitivity indicator, SV = switching value.
Note: Sensitivity indicator is the ratio of percentage change in the FIRR divided by the percentage change in the given parameter. Switching value is the percentage change in a parameter for the project decision to change, that is, for the net present value to become zero or the FIRR to fall to the cut-off rate.
Source: Asian Development Bank estimates.

SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

Country/Project Title:	People's Republic of China: Guangdong Energy Efficiency and Environment Improvement Investment Program

Lending/Financing Modality:	Financial Intermediation Loan	Department/ Division:	East Asia Department/ Energy Division

I. POVERTY ANALYSIS AND STRATEGY

A. Linkages to the National Poverty Reduction Strategy and Country Partnership Strategy

The Guangdong Energy Efficiency and Environment Improvement Investment Program (Investment Program) involves investments to improve energy efficiency in the industry, commercial, and other high energy consuming sectors in Guangdong Province. By providing economically and environmentally superior substitutes for conventional electricity generation, the aggregate savings from such investments can be thought of as an efficiency power plant (EPP). The strategy for assistance and operations in the 2007–2008 country strategy and program update[1] is based on four development objectives of the People's Republic of China: (i) promoting equitable and inclusive growth, (ii) making markets work better, (iii) improving the environment, and (iv) promoting regional cooperation. Promoting equitable and inclusive growth is the main strategic focus for reducing poverty and income disparity. Despite the Government's ongoing efforts to control air pollution, environmental degradation continues to be a problem that counteracts economic progress. Rapid growth has outpaced environmental protection and many cities are still polluted. The Government recognizes the strong correlation between poverty and the environment. It has asked for the continued support of the Asian Development Bank in protecting and improving the environment. This Investment Program will reduce energy demand in Guangdong, leading to stabilized current power generation.

B1. Poverty Analysis **Poverty Classification:** General intervention

Energy efficiency investments lead to the following socioeconomic and environment benefits in addition to reduced energy costs and emissions.

1. Reduce Environmental Impacts. By the end of the Investment Program, carbon dioxide emissions will be reduced by 415,560 tons/year, sulfur dioxide emissions by 4,795 tons/yr, nitrogen oxide emissions by 1,066 tons/year, and total suspended particulates emissions by 1,785 tons/year. This will result in socioeconomic and environmental benefits to local communities. Improved air quality will reduce the morbidity and mortality rate of air-related diseases and associated medical costs, and loss of healthy working days in Guangdong. The poor, elderly, children, and women, who have less coping resources and are more vulnerable, will benefit greatly from the reduction of air emissions.

2. Improve Environment of Private and Public Institutions. An improved environment for employees and users of facilities is a significant positive benefit of energy efficiency investments. Improvements in industrial and nonindustrial (public schools and hospitals) lighting, noise, and temperature and air quality conditions have all been found to result from efficiency retrofits. Improved lighting in schools has been found to result in improved test scores.

3. **Develop the Energy Service Company (ESCO) Business Model.** The Investment Program will demonstrate energy-saving benefits from EPP subprojects and extend finance to ESCOs for developing the business model for middle users. Considering the large opportunity for energy savings, Guangdong could have about 20 medium-sized ESCOs with about 100 employees each, most in the skilled workers category.

II. SOCIAL ANALYSIS AND STRATEGY

A. Findings of Social Analysis

The average electricity rate in Guangdong is much higher than the national average in recent years. For example, in 2001, the average rate was CNY0.68 per kilowatt hour, compared with a national average of CNY0.51. For industrial users, the rates in 2001 were higher than all other developed countries except Japan. The province suffered from substantial power shortages in 2004 and 2005, requiring it to purchase power from other provinces in the southwest of the country, including the Hong Kong Special Administrative Region. Implementation of the Investment Program would help avoid large electricity price increases by reducing the amount of electricity purchased from other provinces.

[1] ADB. 2006. *People's Republic of China: Country Strategy and Program Update*. Manila.

B. Consultation and Participation

1. Provide a summary of the consultation and participation process during project preparation.

Interviews and site visits have been held with a number of large electricity end users and middle users (e.g., energy service companies and high-efficiency equipment manufacturers) on the development of EPP. The National Development and Reform Commission; Ministry of Finance; and Guangdong Provincial Economic and Trade Commission, Development and Reform Commission, Finance Bureau, State Assets Supervision and Administration Commission, and Energy Conservation and Monitoring Center have been consulted. Guangdong provincial government will be the Executing Agency for the Investment Program. Guangdong Finance Trust Company Ltd., which is owned by Guangdong provincial government, is responsible for the financial activities such as fund management, loan disbursement, and collection. The Efficiency Power Plant Project Management Office is responsible for the nonfinancial and technical aspects of the Investment Program.

2. What level of consultation and participation (C&P) is envisaged during the project implementation and monitoring?
☒ Information sharing ☒ Consultation ☐ Collaboration ☐ Empowerment

3. Was a C&P plan prepared? ☐ Yes ☒ No If a C&P plan was prepared, describe key features and resources provided to implement the plan (including budget, consultant input, etc.). If no, explain why.

The consultation activity is an ongoing process that will continue during investment program implementation.

C. Gender and Development

1. Key Issues. Not relevant.

2. Key Actions. Measures included in the design to promote equality between men's and women's/girls' access to and use of relevant services, resources, assets, or opportunities:
☐ Gender plan ☐ Other actions/measures ☒ No action/measure

III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
Involuntary Resettlement	**No Impact.** Land acquisition is not required for any tranches of the Investment Program.		☐ Full Plan ☐ Short Plan ☐ Resettlement Framework ☒ No Action
Indigenous Peoples	**No Impact**. None of the tranches of the Investment Program will have an adverse impact.		☐ Plan ☐ Other Action ☐ Indigenous Peoples Framework ☒ No Action
Labor ☒Employment opportunities ☐Labor retrenchment ☐Core labor standards	**Limited.** The manufacturing, maintenance, and operation of energy efficient equipment will directly generate approximately 1,400 full-time jobs during implementation of the Investment Program. Development of the ESCO business model will create additional employment for about 2,000 skilled workers.		☐ Plan ☒ Other Action ☐ No Action
Affordability	**No Impact.**		☐ Action ☒ No Action
Other Risks and/or Vulnerabilities ☐HIV/AIDS ☐Human trafficking ☐Others, pls. specify	**No Impact.**		☐ Plan ☐ Other Action ☒ No Action

IV. MONITORING AND EVALUATION

Are social indicators included in the design and monitoring framework to facilitate monitoring of social development activities and/or social impacts during project/program implementation? ☐ Yes ☒□ No