Fiscal 2007 CDM / JI Feasibility Study

on

The Building Energy Saving Programmatic CDM Project for the Telecommunication Company in the Philippines

Final Report

Summary

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KAJIMA Corporation

1. Project Outlines

Project Background and Outlines

In most of ASEAN countries, including the Philippines, with a climate of high temperature and high humidity throughout the year, commercial buildings such as office buildings, shopping malls and restaurants are forced to use air conditioner all year around, consuming a vast amount of electricity. The electricity consumed at those buildings are mainly generated from fossil fuel, such as coal and oil, which emit greenhouse gases (GHG). Moreover, due to the recent high price in crude oil, price of those fuels is rising rapidly, which may strangle the company's business activity.

Even under this situation, it is still difficult for building owners to take actions for energy saving, such as replacement of old equipments to high-efficient type, and most of the building facilities are being used until those are broken down or considerably deteriorated. This may be due to the budgetary constrains of the companies' and lack of knowledge for energy audit and retrofitting.

This project aims to reduce electricity consumption at the buildings belonging to the telecommunication company by introducing the high energy efficient equipments including air conditioners and lighting systems, eventually to reduce the CO2 emission. Telecommunications were selected as a counterpart of this project for the following reasons:

- Their buildings function as office, as well as telecommunication bases equipped with necessary facilities which require strict temperature control. Those facilities consumes more energy than normal office equipments, therefore, it is expected to be very effective in reducing energy consumption, and generating CER.
- Energy efficiency improvement CDM project at a single building is often not economically attractive because only small CER can be created through the project activities. Therefore, it is desirable to have companies possess several buildings as a counterpart.
- By adopting the programmatic CDM approach wherein the same methodology and technology is applied to several sites, it is expected that the energy-efficiency improvement technology is disseminated and the project activities is expanded to the many buildings using CER as resource of fund.

Project Contribution to the Sustainable Development

The Department of Energy, Philippine (DOE) established a goal in the National Energy Plan 2005, to increase the energy self-sufficiency ratio in the Philippine up to 60 % by 2010. Positioned energy saving activities as a key strategy toward achieving the goal, DOE officially launched the National Energy Efficiency and Conservation Program (NEECP) aiming to save energy of 15.3 MMBFOE. As such, energy conservation is now a critical component for the improvement of the energy self-sufficiency

ratio in the Philippines.

Despite those efforts, country's total electricity sales in 2004 reached about 44,000 GWh, up 3% from the previous year. Total electricity sales of Manila Power Company's in 2005 was about 25,000 GWh, of which 9,000 GWh was used for commercial sector. The energy sources in the Luzon Grid consists of fossil-based source including oil and gas which comprises 66 % of the total, hydropower and geothermal which account for 15.5 % and 18.5 %, respectively. Based on these values, the emission factor for the Luzon Grid is calculated to be 0.548 tCO2 / MWh. In the absence of new energy resource, it is hoped that the energy efficiency improvement activity contributes not only to GHG emission reduction, but also to efficient utilization of resources to response the growing energy demand.

Energy Efficient Technologies Introduced

According to AMS-II.E, the category is applicable to the project where it is possible to directly measure and record the energy use, and the impact of the measures implemented by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity. Therefore, energy efficiency improvement measures should be chosen taking into account those conditions. It is also needed to determine the availability of the necessary equipments in or near the project site. With due consideration of those factors, the nine measures were identified as the energy efficiency improvement measures applicable to this PoA. Among the measures listed in the table below, one or a set of measures will be selected and applied in each CPA, taking into consideration the characteristics and the condition of each target building.

Table 1 Energy Efficiency Measures Introduced in the Typical CPA

Measures		HQ ABC
Type A Improvement of cooling sources and cooling towers	Measure 1: Replacement of chillers with high-efficient type	
	Mearure2: Replacement of cooling tower (CT) with high efficient type	○
Type B Improvement of air-conditioners	Measure 3: Replacement of PAC with high-efficient type	○
Type C Improvement of chilled water/air carrier systems	Measure 4: Replacement of chilled/cooled water pump with high-efficient type	○
	Measure 5: Installation of inverter control of pump and VWV	○
	Measure 6: Replacement of fan with high-efficient type	
	Measure 7: Installation of inverter control of fan and VAV to the duct	○
Type D Improvement of lighting systems	Measure 8: Replacement of ballast	○
	Measure 9: Replacement of lighting equipments	

2. Baseline

Methodology

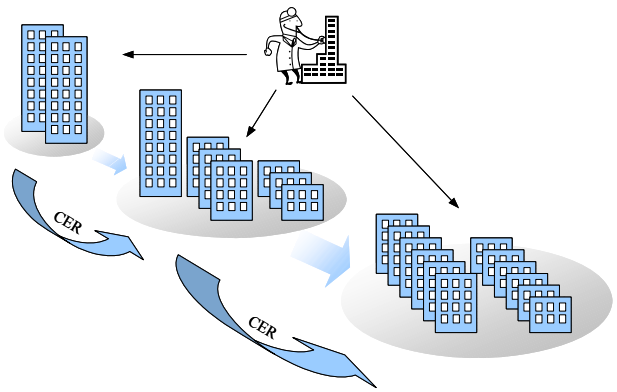
This project aims to improve the energy efficiency at the target buildings and the energy savings through the project activities is estimated to be below 60GWh/year, thus the methodologies for small-scale CDM is applicable to this project. This project applies the approved methodology for small-scale CDM project; AMS type II: Energy Efficiency Improvement Project, Category E: Energy efficiency and fuel switching measures for buildings (version 10). This methodology also refers to the latest version of the following methodologies and tools;

AMS-I.D "Grid connected renewable electricity generation", version 12
"Tool to calculate the emission factor for an electricity system"

Adoption of the Programmatic CDM

Although the target telecommunication company possess several buildings, the project activities will be implemented on a step-by-step base for financial reason. That is, the project activities is planned to be started with a few buildings, and eventually expanded to all the buildings belonging to the counterpart company in the end. In this case, the normal CDM procedure requires project-by-project approval process, which imposes heavy burden on the participants and may become an obstacle to the project implementation. To reduce a burden on project participants, as well as to take maximum advantages of the CDM scheme, this project applies the programmatic CDM wherein the approval process is aggregated into a broader program including many individual activities.

The aggregate energy saving of each CDM Project Activity (CPA) included in the proposed Project of Activities (PoA) is estimated to be below 60 GWh/year. Hence, the aforementioned approved small-scale CDM methodology, AMS-II.E, "Energy efficiency and fuel switching measures for buildings", can be applied to all the CPA included in the proposed PoA



Typical CPA

According to the "Small-Scale Programme of Activities Design Document Form (CDM-SSC-PoA-DD) Version 01" and "Clean Development Mechanism Program Activity Design Document Form (CDM CPA-DD) version 01", it is required to describe technology and calculation method of the GHG emission reduction in a PoA-DD, taking a typical CPA as an example. In line with this provision, this report explains the calculation and estimation method of project emission of the typical CPA.

As a typical CPA, this report takes up a project activity wherein the energy efficiency measures including replacement of equipments will be introduced at an office building with telecommunication facilities. As shown in Table 1, the PoA proposes nine (9) energy efficiency measures, of which six measures are applied in the typical CPA.

Baseline Scenario

The three possible baseline scenarios were identified as listed in the column below, and analyzed according to the barrier analysis provided in the "Tools for the demonstration and assessment of additionality", and Scenario 1 was identified as the most plausible baseline scenario. Amongst others, the investment barrier analysis resulted that the proposed project activity is not economically attractive, for following reasons;

The target company does not have enough budget for replacement of equipments, especially for energy efficiency improvement purposes, The pay-back time of the each energy efficiency improvement measure are calculated as higher than 2 years that is the threshold value in the normal business practice in the Philippines. Furthermore, the energy efficiency improvement activity do not directly contribute to the expansion of their business.

Hence, it can be concluded that the project activity will not be implemented without additional income source such as CER revenue.

For the above-mentioned reasons, Scenario 2, 3 can be screed out, and Scenario 1 is identified to be the most appropriate baseline scenario.

Scenario 1：No energy efficiency measures will be implemented (Continuation of current situation)
Scenario 2：Alternative energy efficiency improvement measures will be implemented
Scenario 3：The planned energy efficiency improvement measures will be implemented without CDM

Boundary

In a programmatic CDM, it is necessary to identify the project boundary at both level of PoA and CPA.

Project Boundary of the PoA

AMS-II.E defines that the project boundary includes the physical and geological site of the target buildings. The proposed PoA intends to introduce the energy efficiency measures at the buildings belonging to the target telecommunication company, which locate throughout the Philippine. Thus, the

project boundary of the proposed PoA will be whole area of the Philippine.

Project Boundary of CPA

The CPA boundary is the physical and geological sites of the target building where the energy efficiency measures will e installed.

3. GHG Emission Reduction

GHG emission reduction is calculated basically by subtracting project GHG emissions and leakage from the baseline GHG emission. ($ER_y = BE_y – PE_y - L_y$)

Baseline and project emission are calculated by multiplying energy consumption by emission factor. The leakage in the project can be considered to be zero. ($BE_y = \sum_j E^B_{j,y} = \sum_j (Q^B_{j,y} * EF^B_{j,y})$)

The table below shows the estimated GHG emission reduction of the typical CPA.

Table 2 GHG Emission Reduction of the Typical CPA

Credit Year	Baseline Emission tCO_2/y	Project Emission tCO_2/y	Leakage tCO_2/y	Emission Reduction tCO_2/y
Year 1	5,414	4,103	0	1,312
Year 2	5,414	4,103	0	1,312
Year 3	5,414	4,103	0	1,312
Year 4	5,414	4,103	0	1,312
Year 5	5,414	4,103	0	1,312
Year 6	5,414	4,103	0	1,312
Year 7	5,414	4,103	0	1,312
			Total	9,181

4. Monitoring Plan

According to the monitoring methodology, monitoring mainly involves the measurement of energy consumption of the target equipments. The table below shows the data to be monitored regularly and continuously, after the commencement of the project activity. The monitoring of the equipments will be conducted by the building management staff under the supervision of the corporate facility management department.

Table 3 Data to be Monitored

Parameter	Data unit	Description	Source of data used	Measurement method and procedures to be applied
Data to be collected in order to monitor emissions from the project activity				
PE_y	tCO_2/y	Annual Project GHG Emission	Calculation	Calculated as follows; $PE_y = \Sigma_j EP_{j,y}$
$E^P_{j,y}$	tCO_2/y	Annual GHG emissions from target facility j in project scenario	Calculation	Calculated as follows; $E^P_{j,y} = Q^P_{j,y} * EF^P_{j,y}$
$Q^P_{j,y}$	MWh/y	Annual electricity consumption of facility j in project scenario	Calculation	Calculated as the sum of electricity consumption of target facilities in project scenario
EF^P	tCO_2/MWh	The weighted average emissions of the current generation mix in the Luzon grid in project scenario	Calculation	Calculated as follows; $EF^P=(\sum F_{i,w,y} * COEF_{i,w})/ \sum_t GEN_{t,y}$
GEN	MWh/year	Annual electricity generated by power plant connected to Luzon Grid	Calculation	To be updated annually using appropriate official documents.
Data to be monitored for each measure				
$Q^P_{j,h}$	MWh/hour	Hourly electricity consumption of target equipments j in project scenario	Calculation	Measured by WH monitor. Record data for at least two years after issuance of CDR

5. Environment Impact Assessment

CDM- SSC-PoA-DD (version 01) requires project participants to conduct environmental analysis at either PoA level or CPA level, and justify the choice of level at which the environmental analysis is undertaken. This project chooses the environmental analysis at CPA level, because the EIS system in the Philippines requires each project to prepare and submit necessary documents.

The major environmental impact that can be caused by the implementation of the proposed project is the disposal of waste equipments which contains HFC and waste oil. This impact can be mitigated by conducting appropriate collection and treatment.

According to the Department of Environmental and Natural Environment and Natural Resources (DENR) Administrative Order No. 30 Series of 2003 (DAO 03-30) entitled “Implementing Rules and Regulations of Presidential Decree No. 1586, Establishing the Philippine Environmental Impact Statement System”, EIS is not required for the proposed project which retrofits the energy efficient technologies in the existing commercial buildings. As indicated in the Administrative Order, the necessary actions for this project are preparation and submission of Environmental Performance Report and Management Plan (EPRMP).

6. Stakeholders' Comments

Stakeholders' comments were collected through the interview with corresponding stakeholders including Environment Management Board of the Department of Environment and Natural Resources (EMB-DENR), Department of Energy (DOE), Energy Efficiency Practitioners Association of the Philippines Inc. (ENPAP), person in charge of the building management and PR officer of the telecommunication company, Japanese government-affiliated agency in the Philippines (Embassy, JICA, JBIC).

In the Philippines, the government, especially DOE, has been conducting the several programmes including campaigns, energy audit, award system to promote energy efficiency activity. Amid this situation, the government gave no negative comments and expressed their intention in cooperating with the Japanese Government to disseminate the energy efficiency activity

The telecommunication company announced their interests to learn about the survey method and the relations between energy efficiency activity and GHG emission reduction, which implied their expectation of the increase in their publicity and improvement its corporate image through the environmental protection activity, as well as cost reduction through the project activity.

7. Project Implementation Plan

Overall Plan

The overall plan of the proposed programmatic CDM is roughly formulated in a stepwise fashion, as described below. However, further discussion is needed to make detailed arrangement.

Step 0 : Survey the current condition of the buildings belonging to the counterpart, establish the policy for energy efficiency measures to develop PoA, and take the procedures to register the PoA as programmatic CDM project.

Step 1 : Implement the energy audit at two or three large-scale buildings, formulate an improvement plan, and register the project as CPA included in the registered PoA, then implement the project activity.

Step 2 : Using CER revenue gained and part of spending cut back through the implementation of the registered CPA (Step1), formulate energy efficiency improvement plan for other large and medium scale buildings, and register as CPAs, then implement the plan.

Step 3 : Using CER revenue and savings gained through the Step 1 and 2, formulate plans for remained medium and small scale buildings, registered as CPAs, and conduct the plan.

Implementation Structure

The energy efficiency measures are planned and implemented in principle by the telecommunication company and Kajima Corporation provides necessary advice and trainings. All the CER created from the CPAs implementation are transferred to Kajima Corporation.

Financial Plan

The proposed project focuses on the energy efficiency improvement that brings benefits to the counterpart company, and can create relatively small CER revenue compared to the renovation cost. In this respect, it is desirable that the building owners implement the project under their own leadership, and bear the cost by utilizing the spending cut back through the implementation of the energy saving activity.

Although it has not yet confirmed about how much budget the counterpart telecommunication company prepare for the project, loans from banks or other financial institution can be considered as alternative method to prepare budget, as it is expected that the proposed project under the CDM scheme can receive the advantageous financing from the Development Bank of the Philippines. Moreover, there are several companies that provide ESCO services in the Philippines, utilization of ESCO can be another alternative for financing. However, this method should be carefully considered because this requires building owner to make agreement with the ESCO providers on the distribution of the reduction of electricity consumption and expenses through the energy efficiency improvement, which will interfere with project implementation under the programmatic CDM concept described in 8.1.

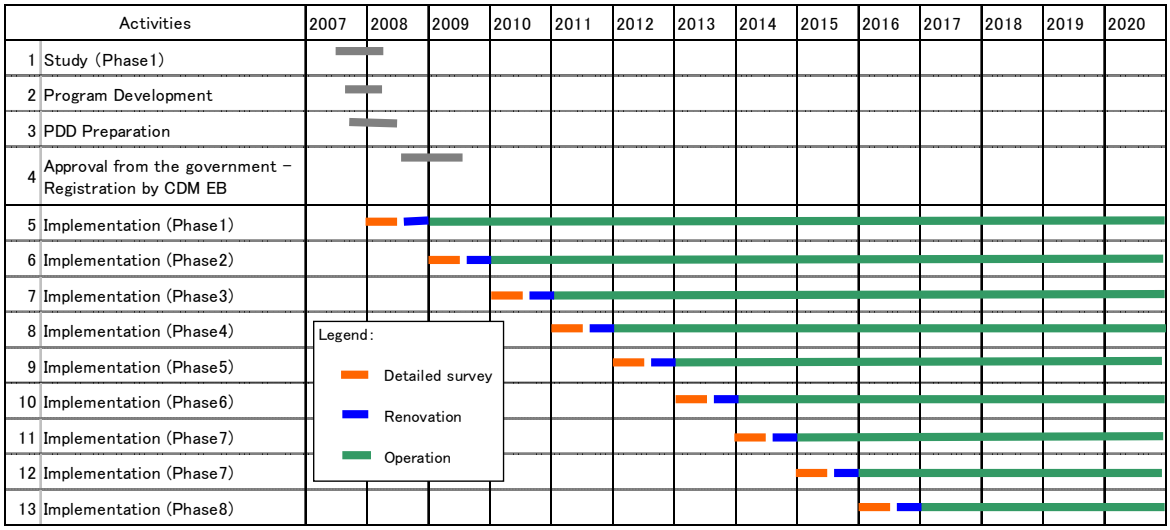
Project Durations/ Length of the Crediting Period

According to the "Procedures for Registration of a PoA as a Single CDM Project Activity and issuance of Certified Emission reductions for a PoA", it is defined that date and length of the PoA should not exceed 28 years. The proposed programmatic CDM intends to complete the energy efficiency improvement at all the target buildings within 10 years after the commencement of the PoA, there is still a possibility that it required much longer duration to complete all the activity. Therefore, the project duration of the proposed PoA is set to 28 years, taking into accounts the commencing time of the final CPA and the subsequent crediting period of at least 7 years, or 14 years. According to the CDM methodology, the length of the crediting period for each CPA should be confirmed based on the life-time and renewal time of the replaced equipments. However, because there are no regulations on the legal durable years for each equipment in the Philippines, it is difficult to determine the crediting period exactly. Due to this, the length of the crediting period of each CPA is set to 7 years, and to be updated if needed.

Implementation Schedule

It is planned to conduct detailed survey at the one or two buildings in 2008, as the first phase of the project, then implement retrofitting, and start operation in 2009. The project intends to expand this activity to several buildings year by year, eventually to all the buildings within 10 years after the commencement.

Table 4 Implementation Schedule



8. Profitability of the Project

Project Cost Estimation

Project cost for the typical CPA is estimated to be about 300 M JPY.

Project Income

Based on the assumption that CER sales price is CER1tCO2/year = 10 USD, currency exchange is 1USD = 110 JPY, 1PHP = 2.6 JPY, and the electricity tariff (for commercial building) is 1kWh = 7.3 PHP, CER revenue from the typical CPA is estimated as 1.44 M JPY/year and the savings of electricity charges is about 45.42 M JPY/year.

When the PoA is expanded to all the 50 buildings and energy consumption is reduced by 20 % in each building, total CER revenue from the PoA and savings of the electricity charges is estimated as 11 M JPY and 366 M JPY, respectively.

Pay-Back Time

Pay-back time for each energy efficiency measure applied to the typical CPA was calculated as shown in Table 5. In tandem with the pay-back time analysis, Internal Rate of Return was calculated as shown in

Table 6. Since the only income source of the typical CPA is CER revenue, Economic Internal Rate of Return (EIRR) is adopted as an indicator to evaluate the economic attractiveness of the project, instead of Financial Internal Rate of Return (FIRR).

Table 5 Pay-back time for Typical CPA

No.	Measures	Pay-back time
1	Measure 2 A+ Measure 7	6.9
2	Measure 3	3.5
3	Measure 4 + Measure 5	6.2
4	Measure 2B	7.9
5	Measure 8	6.7

Table 6 Economic Internal Rate of Return（EIRR） for the Typical CPA

EIRR	With CER	Without CER
EIRR 7yr	1.1%	1.7%
EIRR 10yr	8.0%	8.6%
EIRR 14yr	11.7%	12.3%

9. Perspectives and Tasks for the Project Implementation

The findings obtained through the survey and the discussions with counterparts are summarised as follows;

- Counterpart who is a leading telecommunication company in the Philippines has high awareness on the importance and necessity of the energy efficiency improvement activity. They also fully recognize the significance of the carbon business, and thus they have an intention in implementing the energy efficiency improvement activities as a CDM project.
- They have already conducted some activities such as replacement of incandescent lamp to fluorescent lamp even without CDM incentives, as long as the pay-back time of the activity complies with their normal business practices.
- It is difficult for them to allocate sufficient budget for the building maintenance, most of equipments are being used until it is broken down or considerably deteriorated.
- By replacing existing equipments to high-efficient type or introducing the inverter, VAV or VWV, the electricity consumption at the building is expected to be reduced by 10~20 %.
- As for the building where the site survey was conducted, initial cost for each energy-efficient improvement measure is estimated to be from 14 M JPY to 180 M JPY, and the payback time for

each measure is calculated as 3.5 ~ 7.9 year. EIRR calculated taking into account the energy savings through the project activities are 1.1 % (1.7 % with CER) for seven-year implementation, and 11.7 % (12.3 % with CER) for fourteen year.

The tasks to be determined for the implementation of the project can be summarised as follows;

(Decision making process)

- As the payback time for each measures applied in the proposed project are longer than 2 years, it is anticipated to be difficult for counterpart to make decision for project implementation, given the current attitude of the company's to energy savings and investment climate. Therefore, it is necessary to determine the possible financing plan including the utilization of low-interest loans or ESCO.
- Since Counterpart is a leading and large-scale enterprise in the Philippines, it would be unavoidable to require substantial time for internal negotiation. It is desirable to establish a organizational structure within the company, under which the decision is made in rapid, top-down style.

(Detailed survey at the each building)

- As stated in Chapter 2, the survey team often faced difficulties in grasping the current situation, due to the missing of the detailed drawings and renovation record, and lack of measuring equipments, which can rarely seen in Japan. For these reasons, the estimation on the energy efficient effect obtained from the study may not be accurate enough. Further investigation on the target building is necessary to make up for lack of data.
- This study was not able to conduct a survey to identify the points need to break the walls for replacement of equipments, or places where will be obstacles for renovation work. Those work s could raise the initial cost of the project activity, thus additional survey should be conducted to fill in the gap between the actual situation and estimation, and to formulate a renovation plan which does not interfere with the telecommunication business of the counterpart'

(Study to establish detailed plan for PoA)

- To establish the project activity using a programmatic CDM scheme, it is necessary to conduct site survey on the other medium and small- scale buildings, grasp the characteristics and the current situation of the buildings, and formulate a more explicit overall plan.

(Capacity building for the counterparts)

- The active involvement of the counterpart company is essential for development and implementation of the energy efficient improvement activity as a programmatic CDM project. Furthermore, it is preferable that the counterpart fully understands the energy-efficient improvement technology recommended by the Japanese side, and develops energy saving project on their small-scale buildings by themselves. The counterparts also need to fully understand the significance and technical know-how of the monitoring method, and conduct by themselves. In this respect, some training for their capacity building should be conducted.