Study about the Feasibility of Potential CDM Project in the Transport Sector

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1. Introduction

The Clean Development Mechanism (CDM) is one of three Kyoto mechanisms identified in the Kyoto Protocol that participating countries can use it to meet their Green House Gases (GHG) reduction target. The purpose of CDM is to benefit both investor and host countries by contributing to sustainable development in the host developing countries and by allowing investor countries to get the GHG reduction quotas at the lowest possible cost by taking advantage of the lower marginal cost of reducing GHG emission in developing countries.

This paper briefly describes feasibility of bus operation project being pilot CDM project in the transport sector with a case study of bus fleet fuel shifting project in Bangkok, Thailand.

2. CDM in Transport Sector

Projects of reducing GHG emissions from the transport sector are so diverse that the same goal can be reached using a variety of different policies and investment actions. However, not any projects can be CDM projects due to difficulty of validation and registration. The reason is technological problem concerning to project boundary certification, baseline setting and monitoring that are main criteria for validation of the CDM projects.

There are five general project categories to reduce GHG emission in the transport sector, that are 1) Changing fuel efficiency of vehicles; 2)Changing type of fuels that vehicle use; 3) Diverting transport mode that is less GHG intensive; 4) Reducing transport activities; 5) Increasing the load factor of vehicles. In the projects of changing the fuel efficiency with direct physical alteration of vehicles, baseline setting, boundary certifying and monitoring seem to be easy, but in indirect action for fuel efficiency such as fuel taxes, it becomes difficult to grasp the situation. For mode shifting projects such as shifting to railway, the forecasting of shifting amount is very difficult, and also it is difficult to make clear the project boundary. Projects of reducing transport activities, though very effective way, but it is often the most difficult to put into practice due to requiring individuals change their behavior. Vehicle load factor changing projects, like freight transport heavy trucks terminal planning seems to be feasible, because of clear boundary and orientated activities. In Kyoto Protocol, fuel shifting projects were on the list of eligible CDM projects, especially for the subsectors like bus or taxi operating with the current the least emission technologies such as Compressed Natural Gas (CNG) or Liquefied Petroleum Gas (LPG) shifting could be prompt start CDM projects.

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3. Priority of Bus Operation as a CDM Project

Bus fleet, as a main public transit mode in developing countries, is identified as major polluter. And combining bus fleet operating with GHG mitigation actions being the CDM projects may provide an economically viable way for bus fleet improvement. In addition, for baseline setting, boundary certification and monitoring, bus operation has advantages rather than other transport scenario due to more regularity of bus activity. So, we would say that developing Compressed Natural Gas (CNG) buses is one of the best options to promote environmental friendly urban passenger transportation for those countries where domestic natural gas resources are available.

4. Case Study

4.1 Basic Scenarios

Bangkok, the capital city of Thailand with the number of vehicles totals 6 million, at least 50% of inhabitants use buses for their commuting to work everyday. In 2002 14,662 buses are operated daily by Bangkok Mass Transport Authority (BMTA). Out of this number, 3,655 buses are operated by BMTA itself while the other 11,007are operated by contracted private companies who

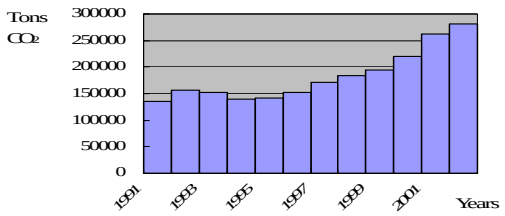

Fig.1 CO_2 Emissions from Private Buses

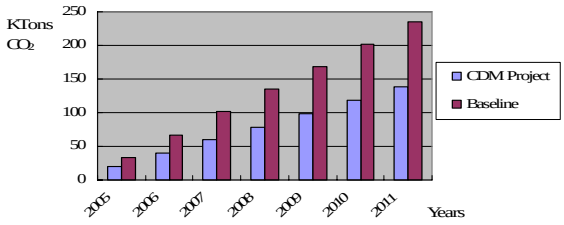

Fig.2 CO_2 Emissions Reduction

normally purchase out-of-operation buses from BMTA, these privately-operated buses are not usually in the good condition. In addition, political considerations have held the bus fare to low fare; most private bus companies face the difficulty in maintaining theirs buses in a good and clean operating condition.

4.2 Baseline Methodology

There are there acceptable methodologies that can be used to measure the baseline of a CDM project. Those are Status Quo Emissions, Market Conditions and Best Available Technology. This project applies Status Quo baseline—a baseline from a projection of historic and current trend. We use average performance of buses in year 2000-2002 to be the future performance. And base on the fuel consumption of buses, uses top-down calculation method.

$$C = \sum_{i=1}^{t} FC * VKT * EF \qquad (1)$$

Here,

C : Amount of emission (ton),

FC : Fuel Consumption (liter/km),

VKT : Vehicle Travel Time (km/time/vehicle),

EF : Emission Factor of Fuel (gram /liter or MJ).

In this project, as a scenario, have 250 CNG kits will retrofit to private large buses in Bangkok. According to Kyoto Protocol the project activities starting after January 1, 2000, are eligible but must be registered by December 31, 2005. The project's crediting period is from year2005 to year 2011 and as a small scale project, do not consider about leakages.

4.3 Emission Reduction Result

The Emission factors of buses that were used for emission calculation are from the Intergovernmental Panel on Climate Change (IPCC) guidance. As a result of compared the CO_2 emissions from 250 Diesel engine buses (baseline) to that of 250 CNG Kit buses (CDM project), the project has gotten 13.89 kt-CO_2 reductions annually and 97.23 kt-CO_2 reductions in crediting period (seven years). So, with the CDM project may reduce CO_2emissions from objective buses by 41%.

4.4 Cost Benefit Analysis

Certified Emission Reduction (CER) will be issued in the term of Credit (1 t-CO_2 one credit) after CDM project verified and certified; in the emission trade market CER can be commodity, base on the carbon prices on past transactions, the price of CER is $20/t-C; since, 97.23 kt-$CO_2$ (26.52 kt-C) from project will be $530.6 thousand dollars. The cost of technical transfer is total $5,000 thousand dollar (loan with 7% interest) for purchase CNG kits. The project can economize fuel cost of $1680 thousand dollars per year (the price differences between Diesel and CNG is 2.8 baht/km); assume 90% of fuel economize cost be yearly repayment fund, then within the project period, IRR will be 9%.

5. Conclusion and Discussion

CDM may change some financially distractive projects into attractive ones like the case study project in this paper where we used historical baseline which may leads to some uncertainties, therefore, emission calculation base on the driving pattern of vehicles is recommended, if data are available as much as possible. However, CDM in transport sector has been evolved; in addition unforeseeably of future events, even in bus fleet projects, baseline setting and monitoring still need further discussion.

References

1) A Layperson's Guide to the CDM, by Jon Rosales and Gao Pronove, July 2002.

2) MRT Annual Report (1991-2002);

3) A Study on Changes in Specifications For Gasoline and Diesel Fuels in Thailand Final Report prepared by National Energy Policy Office, March 2002.