Title of Feasibility Study (FS) ”Programmatic CDM Project Feasibility Study on Energy Efficiency Activities Using Idling Stop Equipments for Buses in Shandong Province, China”

Main Implementing Entity: Japan Weather Association

1. FS Partner(s):

Jinan public transport group company : The first CPA site
Almec Corporation : Experiment management
Climate Consulting, LLC : New methodology establishment
Ecomotion Corporation : Providing and installing idling stop equipment
GE Creation Tech, Inc. : Arrange and translation

2. Outline of the project:

(1) Description of Project Activity

1) Outline of PoA

The purpose of the PoA is to reduce CO_2 emissions from buses operating by public bus companies in Shandong Province, China. In each SSC-CPA, the CPA implementer, the public bus company, install the post-fit type idling stop devices to the buses resulting in saving of fuel consumption and reductions of CO_2 emissions while idling of the buses. The CPAs will be basically implemented city by city since each city has one public bus company. The post-fit type idling stop device was developed in Japan, and it is possible to ease driving operation to stop idling compare to manual operations of turning the engine off and on by the ignition key. The emission of air pollutant such as NOx and PM are also reduced. GE Creation Technologies, Inc. (hereinafter GECT) is the coordinating/managing entity of the PoA.

2) Outline of the first CPA

The first CPA is Jinan Public Transport Group Company (JPTGC) in Jinan City, Shandong Province in China. Their 1400 buses of their own, which are total 4,000 buses, will be installed in idling-stop devices. This is the first challenge in China. As the result, JPTGC will achieve the 2,450 tCO2/year emission reduction under this project. Starting date of crediting period in the first CPA is expected Jan. 2012.

(2) Methodology

AMS-III.APver.2

3. Method

(1) Issues of Study:

- Installation of idling-stop devices in buses and measures for effective adaptation of idling-stop
  - Installation of Idling-stop devices to buses and the adjustment
  - Training of bus driver and maintenance engineer
  - Idling-stop contest by drivers
- Confirmation of energy efficiency
  - Evaluation of the energy efficiency
  - Monitoring fuel consumption rate in idling period
- Evaluation of influence to vehicle and the planning the protection measure
  - Life of engine and turbo charger

- Battery and starter motor
- Air brake

➢ Approval of new methodology

- Response to UNFCC comments and making effort to get approval to SSC-NM052

➢ Evaluation of business plan

- Identify the objective vehicles to install the idling-stop device assuring the most effective business output
- Estimation of cost for purchasing and installation of the device and the operation

Establish the business scheme

(2) Study Contents:

Issues	Results
Installation of idling-stop devices in buses and measures for effective adaptation of idling-stop	From 14th to 20th Sep. 2010 Ecomotion Ltd. assigned two technicians to bus depots of Jinan Bus and installed the devices to ten numbers of vehicles. They lectured technician of Jinan Bus the method how to install the device to bus in order to prepare the commencement of CPA in future. In second onsite study, Study team confirmed that the installation was finished in success and the devices operated normally. In the duration of verification test started from October 2010, GECT contacted to Jinan Bus periodically to response quick against the trouble due to the idling-stop operation. The Eco-drive workshop for bus driver has held by the lecturer from Energy Conservation centre Japan. The driver's knowledge and skills of the idling-stop were improved by the workshop. From October to December, we carried out IS contest for 11 buses installed IS devices. IS rate was 8% (average) to 13% (max). From a hearing to drivers, we find out that the high- achieving drivers recognized significance of IS.
Confirmation of energy efficiency	Study team measured fuel consumption rate at JPTGC bus terminal, and confirmed detailed data of JPTGC buses. After IS contest, we found that there was the improvement of fuel consumption by 3.5 % among the No.35 buses, and some improvement among all buses by idling stop devices.
Evaluation of influence to vehicle and the planning the protection measure	At first, study team checked on the voltage and capacity of bus batteries, recorded operating time of cell motor. After IS contest, they carried on hearing to the drivers of JPTGC, and found that the idling stop devices worked normally, and no negative effect for buses during the IS contest.
New methodology approval (SSC-NM052)	The new methodology was submitted to CDM executive board in March 2010, evaluated "A" grade at small CDM-WG in October 2010, and approved properly at CDM executive board in November 2010. At 58th EB meeting, there was the instruction that parameter BIF1 default value (0.95) should be larger, so the ver.2 methodology was suggested at small CDM-WG. Here, annual escalation factor (0.98)

	was abolished, and it is decided that BIF will be used instead of BIFy. AMSⅢ-AP ver.2 was approved at 59th EB meeting in February 2011.
Evaluation of business plan	According to total profit, B/C, and IRR based on economic analysis of this project, this project has high potential as a profit-earning business. It is desirable financially to provide CERs to a consultant service fee for CDM implementation. Because the current project plan is made up both 1,400 buses and 10 % idling stop ratio, it can not be appropriated 50% of the fee from CER. Therefore it is essential to increase the emission reductions by increasing target buses or the idling ratio.
Establishment of project scheme	There is no approval for PoA in China. There is information that project participants can make a request for approval PoA as well as normal CDM. This project as well, therefore, it is expected that Chinese government approval could become an issue unlikely. GECT is responsible for selecting project participants such as public bus company, implementing the project, selecting investors to the projects, and developing new CPAs in Shandong Province. It is difficult that each CPA provides CERs as their CDM implementation cost, because emission reductions of each CPA are expected too small, or these are only 2,450 tonCO2/year. On the other hand, each CPA could save their fuel cost, which is approximately 8,600 million JPY/year, with the project. Therefore each CPA site will have to invest the CDM implementation cost in this project.

4. Result

(1) Baseline and project boundary setting:

Methodology

AMS III.AP ver.2 Transport energy efficiency activities using post - fit idling stop device

Technology/measure

1. This methodology comprises demand side activities associated with the installation of post-fit type Idling Stop devices in passenger vehicles used for public transport (e.g. buses), in order to reduce fossil fuel consumption and GHG emissions.

2. For the purpose of this methodology, the following definitions apply:

2.(a) Idling: Refers only to situations in which a vehicle engine continues running while the vehicle is stopped at traffic lights in traffic jams or at bus stops when passengers are boarding or alighting. Only vehicle stoppages up to a maximum of three minutes qualify under this definition and longer duration stoppages (e.g. at the depot, or fueling stops) are excluded. Under this methodology, Idling only includes stoppages that occur:

・When the vehicle is in-service for public transportation; and

・After a vehicle has already been in motion and following which the vehicle will recommence motion; in other words, the vehicle has to be in motion before the Idling Stop period starts and the vehicle has to be in motion after the Idling Stop period ends;

2.(b) Idling Stop: Refers to the action of turning off the vehicle engine and thus preventing Idling (as specifically defined above) and the associated fuel consumption that would otherwise have occurred while Idling, in absence of the project activity.

Applicability

3. The methodology is applicable to the following types of vehicles.

3.(a) Vehicles used for public transportation, such as buses that are centrally owned and managed by a single entity and are driven by contractors or employees of the central entity;

3.(b) Vehicles using gasoline or petrodiesel as fuel; and

3.(c) Vehicles in which it is possible to install post-fit Idling Stop device.

4. All project vehicles shall be equipped with electronic equipment that continuously measures and electronically records the data required for calculating Idling Stop events and their duration, e.g. vehicle motion status and engine on/off times. The electronic equipment shall also be able to identify and exclude data associated with engine stops that do not meet the definition of Idling Stops as indicated in paragraph 2.

5. This methodology is applicable only to:

5.(a) Installation of Idling Stop devices in in-service, operational vehicles; or

5.(b) Installation of Idling Stop devices in new vehicles only if it can be demonstrated that at the time of new vehicle acquisition there are no vehicles, of a type similar to those in the baseline or project activity, available for sale in the country of the project activity, that are sold with automatic Idling Stop devices installed as a standard feature.

6. This methodology is not applicable to vehicles using LPG or CNG as fuel, hybrid vehicles with electrical and internal combustion systems, electric vehicles, or vehicles using biofuel or blended biofuel, as methods to estimate emissions reduction in those cases are not currently included in this methodology.

7. This methodology is not applicable to:

7.(a) Private vehicles or taxis;

7.(b) Vehicles that have electronic push-button starters or automatic Idling Stop devices installed prior to the project activity;

7.(c) Project activities promoting manual Idling Stop, i.e. turning the ignition key off and on;

7.(d) Project activities in locations where there are government regulations in place that prohibit Idling of the type of vehicles involved in the project activity, or where the transport company involved has an existing anti-idling policy.

8. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually.

9. The project design document shall include documentation of procedures to eliminate any potential double counting of emission reductions from, for example, manufacturers, wholesale providers or others claiming credit for emission reductions from the project, or due to the same vehicles participating in other CDM projects or Programmes of Activities.

- Project boundary setting

Boundary

10. The project boundary is the physical, geographical location of the vehicles in which the Idling Stop

devices are installed. The spatial extent of the project boundary encompasses the geographical area of the trips of these project vehicles

The PoA covers Shandong province, China. The physical location of the first CPA will be implemented in Jinan city of Shandong province. The physical location of the proposed project is Jinan city of Shandong province covering roads where the buses installed with the idling stop device will be driven, bus terminal, intersections and bus stops etc.
Subsequent CPAs as well, the physical location of the proposed project is their city covering roads where the buses installed with the idling stop device will be driven, bus terminal, intersections and bus stops etc.

- Baseline setting

Baseline

11. The baseline scenario is the scenario where, in the absence of the project activity, the majority of project vehicles will continue Idling.

The baseline scenario is identified as "Continuation of current practice". The buses of JPTGC will continue idling at stoplights or other situations in the absence of the proposed project activity.

- Baseline emissions

12. Annual baseline emissions are the summation of the annual cumulative Idling Stop period times the baseline emission factor for each vehicle, multiplied by a Baseline Idling default Factor or BIF (the estimated percentage of vehicles that in the baseline would not manually turn off their engines, i.e. that would idle.)

$$BE_y = \sum_i \left(BEF_i \times CIP_{i,y} \times 10^{-6} \right) \times BIF_y \qquad (1)$$

Where:

BE_y Total baseline emissions in the year y (tCO2/year)

$CIP_{i,y}$ Cumulative Idling Stop period for all vehicles of type i in the year y (seconds/year) (see paragraph 17)

BIF Baseline Idling Factor (see paragraph 18)

BEF_i Baseline Emission Factor when Idling for vehicle type i (gCO2/second) (see paragraph 13)

13. The Baseline Emission Factor when Idling (BEF) for each type of project vehicle i is determined as:

$$BEF_i = FCR_i \times D_j \times NCV_j \times EF_{CO2,j} \times 10^3 \qquad (2)$$

Where:

j Fuel type for vehicle type i, determined from engine specifications

FCR_i Fuel Consumption Rate at Idling condition of baseline vehicle i (litres/second), determined as per

paragraph 14

D_j Density of fuel j (kg/litre), determined from national or international values

NCV_j Net Calorific Value of fuel j (MJ/t), determined from reliable local or national data shall be used. IPCC default values (lower value of 95% CI) shall be used only when country or project specific data are not available or demonstrably difficult to obtain. Values shall be updated if national values or IPCC values change

$EF_{CO2,j}$ CO2 emission factor of fuel j (tCO2/MJ), determined from reliable local or national data shall be used. IPCC default values (lower value of 95% CI) shall be used only when country or project specific data are not available or demonstrably difficult to obtain. Values shall be updated if national values or IPCC values change

14. The parameter Fuel Consumption Rate at Idling for vehicle category i (FCR) shall be determined by either of the two following options:

Option (1): Measurement of all project vehicles

Measure the actual fuel consumption rate of all vehicles in which the project devices are installed.

Option (2): Sample measurement

Measure the actual fuel consumption rate of a representative sample of vehicles, for each vehicle category in which the project device is installed. Vehicle categories shall be determined conservatively and be based on the fuel type used, the vehicle size, engine displacement, engine model year, auxiliary equipment (e.g. with and without air conditioners) and other relevant factors to distinguish vehicles with different fuel consumption rates. Sample vehicles shall be randomly chosen in accordance with the latest version of the General guidelines for sampling and surveys for small-scale CDM project activities using a 90% confidence interval and a +/- 10% error margin to determine the sample size. The lower bound of 95% confidence interval shall be used as the Fuel Consumption Rate. If Option 2 is chosen, then BEF and y BE shall be calculated for each vehicle category associated with the project activity.

15. If the proposed project activity includes retrofitting of additional existing vehicles and/or new vehicles purchased subsequent to the beginning of the crediting period, fuel consumption rates of the affected vehicles shall be measured by applying Option 1 or Option 2 as described above, in order to take into account technological change of project activity vehicles.

16. Fuel Consumption Rate at Idling condition of baseline vehicle category i (FCR) shall be measured using direct measurements, e.g. using calibrated fuel flow meters. Fuel consumption rate shall be conservatively measured with engines running at normal operating temperatures and with any operational auxiliary equipment that increase fuel consumption rate, such as air conditioners, turned off.

17. Cumulative Idling Period (CIP) is determined for each vehicle, using data collected and recorded by the electronic data storage device installed in each vehicle. CIP only includes Idling Stop periods that prevent Idling, as defined in paragraph 2. CIP, is therefore determined as the annual sum of the CIP of all vehicles of vehicle type i.

18. The parameter “Baseline Idling Factor (BIF)” shall be determined as either:

(a) The default value 0.95; or

(b) A calculated value resulting from a third party survey conducted before the start of the crediting period of the project activity.

Once a value for BIF is established via option (a) or (b) it will remain fixed for the full crediting period.

The survey for determining BIF shall be conducted by an independent, third party survey organization. This survey shall be conducted once ex ante on a randomly selected representative sample of vehicles and drivers within the project transport system, e.g. the bus company. The sample size is determined so as to result in a value for BIF with a minimum 90% confidence interval and 10% error margin. The lower bound of the 95% confidence interval shall be chosen as a conservative estimate of BIF.

The survey shall be conducted during a conservative period of the year, i.e. a period in which drivers are most likely to manually turn off their engines (manual Idling Stop), for example, a mild season with minimal need for using the bus air conditioners or heaters (spring or autumn).

(2) Project emissions:

20. Project emissions are the emissions from fuel consumed in restarting the engine immediately after each Idling Stop.

$$PE_y = \sum_i \left(NT_{i,y} \times PEF_i \times 10^{-6} \right) \quad (3)$$

Where:

PE_y Total project emissions in the year y (tCO2/year)

$NT_{i,y}$ Total number of Idling Stops of all vehicles of type i in the year y (times/year)

PEF_i Project Emission Factor per Idling Stop for vehicle type i (gCO2/time), determined as per paragraph 21

21. Project Emission Factor per Idling Stop (PEFi) is calculated according to the equation below:

$$PEF_i = BEF_i \times ST_i \quad (4)$$

Where:

ST_i Start-up compensation time. Idling Stop period in seconds to compensate for fuel consumed in restarting the engine after each Idling Stop (seconds/Idling Stop). A default value of 10 seconds shall be used

22. The emission reduction achieved by the project activity shall be calculated as the below.

$$ER_y = BE_y - PE_y \quad (5)$$

Where:

ER_y Emission reductions in year y (tCO2e)

(3) Monitoring

23. Parameters monitored.

Table -1 Parameters monitored

Parameters	Item	Monitoring method	Frequency
$CIP_{i,y}$	Cumulative Idling Period of all vehicles of type i in year y	The electronic equipment in each vehicle collects data signals such as vehicle speed, and engine stops and engine starts to enable determination of vehicle status e.g. elapsed	Annually

		time of each stop and cumulative number of engine starts are recorded. By analyzing these data, each Idling Stop period will be calculated. Cumulative Idling Stop period is calculated by summing up all Idling Stop periods in a year y. Any Idling Stop not complying with the definitions in paragraph 2 are excluded	
$NT_{i,y}$	Total number of times of Idling Stop of vehicle i in the year y	Total number of times of Idling Stop is calculated by summing up the recorded cumulative number of Idling Stop periods that comply with the definitions in paragraph 2	Annually
Other	Information regarding the project vehicles installing the Idling Stop devices, i.e. fuel types, vehicle types, engine displacements, engine model year, with or without air conditioner	Necessary information shall be aggregated in an electronic database	Annually

24. QA/QC: The Idling Stop devices installed in the vehicles shall be subjected to regular maintenance and calibration as per the manufacturer's recommendation to ensure appropriate performance. After installing the Idling Stop devices, the devices should be subjected to an operational check, including a test drive, according to an appropriate check sheet to ensure proper operation. The driving data shall be recorded by a data logger and be protected such that it cannot be modified artificially. The logged data should be analyzed at least monthly to check for any irregular data by comparing it with previous data or data from other vehicles.

25. In order to ensure that the output values are reliable and not manipulated, the Idling Stop periods and Idling Stop frequencies recorded by the electronic devices shall be cross checked with another measurement method, such as manual on-board measurement. This cross check should be done once a year for a sample of project vehicles.

Project activity under a programme of activities

26. The methodology is applicable to programme of activities.

The following table shows the role of the coordinating/managing entity and the CPA implementers.

Table-2 Monitoring plan

	CPA level (The CPA implementers)	PoA level (The coordinating/managing entity)
Monitoring management	- Implement and manage monitoring of CPAs	- Operation and management of the PoA and supervision of each CPA - Develop the operation and monitoring manual for CPAs. - Develop and establish data collection and reporting system for parameters monitored in every CPAs.

Data collection and reporting	- Implement data collection of the CPA - Prepare daily and monthly report - Check data quality and collection procedures regularly	- Check data quality and collection procedures of each CPAs regularly - Prepare monthly and annual report
Data storage and management	- Collect memory cards. - Implement data management of CPA. - Store and maintain records.	- Develop database format of CPA. - Check the reported data from each CPAs. - Calculate emission reductions based on the data reported by each CPA implementer. - Implement data management of PoA. - Store and maintain records.
Quality assurance	- Undertake regular maintenance of the devices - Receive necessary training for operation of the system and quality assurance of monitoring data	- Request regular maintenance of the devices to each CPA implementer. - Implement training for operation of the system and quality assurance and quality control of monitoring data

(4) GHG emission reductions

Emission reductions at CPA-1 are as follow.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CPA-1(Jinan)	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t
Total	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t	2,450t

(5) Duration of the project activity/ crediting period

Starting date of the PoA validation: Apr. 2011

Starting date of the PoA: Jan. 2012

Crediting period of the PoA: 28 years

Starting date of CPA-1: Dec. 2011

Starting date of crediting period (CPA-1): Jan. 2012

Crediting period (CPA-1): 10 years

(6) Environmental impacts

As no construction works are accompanied, this project is not a subject of environment impact assessment analysis. The system can contribute to improve the air pollutants in the project area by reducing the emission of NOx and PM, and there is no negative environmental effect by installation of the idling stop device.

(7) Stakeholders' comments

The Study team collected stakeholders' comments. Expected stakeholders are as follows:

- Jinan Public Transport Group Company
- Zhongtong Bus
- CDM Project Center of Shandong Province
- Bus passengers

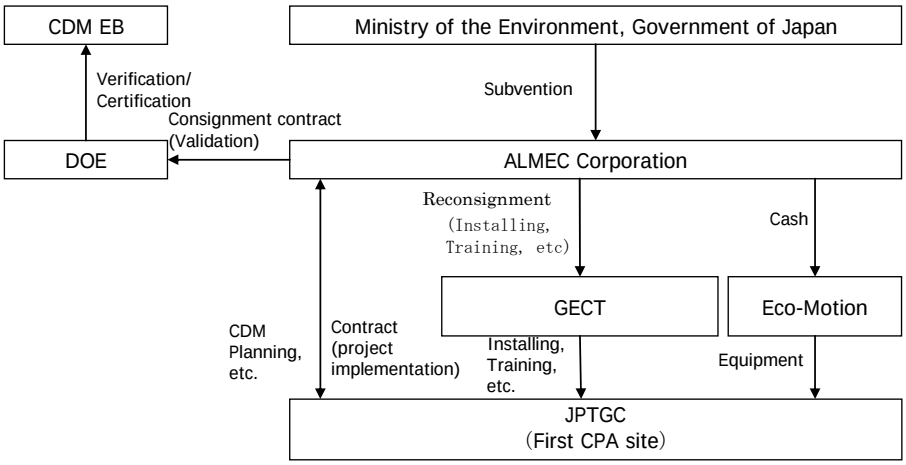
(8) Project Formulation:

- Coordinating/managing entity of the PoA: GECT

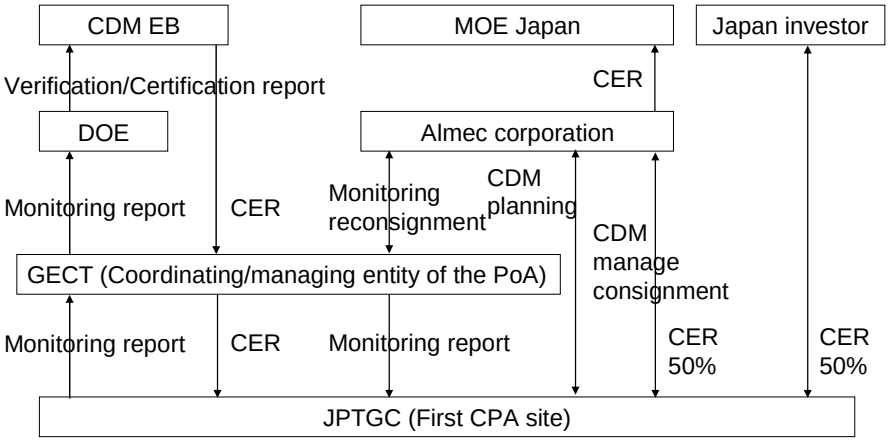
GECT is responsible for selecting project participants such as public bus company, implementing the project, selecting investors to the projects, and developing new CPAs in Shandong Province.

It is difficult that each CPA provides CERs as their CDM implementation cost, because emission reductions of each CPA are expected too small, or these are only 2,450 tonCO2/year. On the other hand, each CPA could save their fuel cost, which is approximately 8,600 million JPY/year, with the project. Therefore each CPA site will have to invest the CDM implementation cost in this project.

1) Implementation structure



2) Management structure



3) Project participants

JPTGC: First project site, project investor

Almec co. Ltd: Project developer

(9) Financial plan:

This project has a high potential for energy saving such as fuel saving, therefore each CPA has to invest in their project from their own fund or raise some funds.

【Project expenditure】

About 100 million JPY are required as initial project cost. Therefore study team expect that the co-benefit CDM subvention from MOE Japan will be applied to the first CPA in order to promote a pilot project in China. the profit with the credit transfer will be treated in accordance with the provisions of Interim Measures on Management of CDM Project Activities of China

【Project profit】

CDM project case

Item	Figure	Unit	Unit value (000JPY)	Income (000JPY)	Note
Cost based on saved fuel	942	kL/year	100	94,200	
Credit value	2,450	tCO2/year	1.3	3,185	
Total				97,385	Total income(10 years): 973,850,000 JPY

Energy saving project case(without CDM)

Item	Figure	Unit	Unit value (000JPY)	Income (000JPY)	Note
Cost based on saved fuel	942	kL/year	100	94,200	
Total				94,200	Total income(10 years): 942,000,000 JPY

(10) Economic analysis

1) Cost-benefit analysis

Table -4 Economic analysis

Project scheme	NPV	B/C	IRR
CPA under PoA	708,707,000 JPY	4.9	115%
Normal CDM	709,827,000 JPY	5.0	110%
Energy saving project (without CDM)	734,187,000 JPY	7.0	141%

2) Financial analysis

It is desirable financially to provide CERs to a consultant service fee for CDM implementation. Because the current project plan is made up both 1,400 buses and 10 % idling stop ratio, it can not be appropriated 50% of the fee from CER. Therefore it is essential to increase the emission reductions by increasing target buses or the idling ratio.

(11) Additionality

- PoA-DD

(i) The proposed PoA is a voluntary coordinated action;

The PoA is not enforced or mandated by laws or ordinances or national programs, but is a voluntary coordinated action aiming to contribute to realize energy conservation in the public transportation in Shandong province, China.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;
Each CPA under the PoA can not be realized without the CER revenue and technical supports and trainings, and the PoA will also be operated and managed utilizing these revenue. It would not be implemented in the absence of the PoA.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;
Not applicable.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.
Not applicable.

- PoA-generic-CPA-DD

To identify the baseline scenario and demonstrate additionality of each SSC-CPA, the following steps have been applied;

Step 1. Identification of alternative scenarios including consistency with mandatory applicable laws and regulations
Step 2. Barrier analysis
Step 3. Evaluation of alternative scenarios

- CPA-DD

In line with E.5.1 of the SSC-PoA-DD, the additionality of the CPA is demonstrated as follows.

Step 1. Identification of alternative scenarios:

There are four (4) plausible alternative scenarios for the proposed project. These scenarios all comply with mandatory and regulations of China and Shandong province and the public bus companies.

Scenario 1: Continuation of current practice
Scenario 2: Implementation of manual idling stop by behavioural changes not using the post-fit type device
Scenario 3: Introduction of new buses with pre-installed idling stop device
Scenario 4: Implementation of the proposed project without CDM

Step 2. Barrier analysis:

Among four (4) barriers in the Attachment A to Appendix B of "The simplified modalities and procedures for small-scale CDM project activities", the proposed project faces the following barriers

Technological barriers:

The post-fit type idling stop device was invented by ECO-MOTION, Ltd of Japan, and is considered to be state-of-the-art technologies based upon the experience and know-how obtained from more than ten years use in Japan. Since the device are connected to vehicle electronic control unit (ECU), very high and sensitive skills and knowledge are required to keep vehicle operation safely and smoothly. The post-fit type idling stop device has not been introduced in China, and this is the first project to introduce the device in China. In installing the device to accommodate buses in China, not only reading the installation manual but special skills and know how are required. JPTGC(Jinan Public Transport Group Company) has no local staff with enough knowledge and experience to properly install the device. In the operation phase, training of the driver is also needed to understand the skills how to drive safely preventing any influences or damages on buses. These local staff training and education programs for them will be implemented in the project activity by Japanese side. Before implementing the proposed project, not only JPTGC, but also JPTGC Institute of science and technology and the bus company who provides buses to JPTGC are also participate to install the devices to the buses, and find out problems and issues in the installation and operation phase, and also analyze the effect such as reduction of fuel consumptions and impact to the engine or battery. These tests have been implemented with the technical support by Japanese side including ECO-MOTION, Ltd.

From above reasons, without the technology transfer from the Japanese side, it is impossible to implement the proposed project.

Barrier due to prevailing practice:

Currently, JPTGC has no plan to stop idling manually or automatically in their current practice. They have no plan to introduce new type of buses with pre-installed idling stop system. As for post-fit type idling stop device, it is first time for JPTGC to access and test the device, and this was realized by the proposal from Japanese side for this CDM project. Moreover, this type of equipment is first of its kind in China. There is no regulation or mandatory of Chinese government or Shandong province or Jinan city to stop idling for vehicles driving in cities. In addition, JPTGC had been misunderstood that the post-fit type idling stop devices can not apply to Chinese buses and had a negative perception to introduce the devices.

Therefore, the buses of JPTGC will continue idling at stoplights or other situations in the absence of the proposed project activity.

From above considerations, there exist technological barrier and barrier due to prevailing practice.

Step 3. Evaluation of alternative scenarios

Each scenario identified in Step 1 was assessed as follows.

Scenario 1: Continuation of current practice

The scenario do not install any devices, therefore it requires minimal investment and operational costs. It is

no need to establish training programs for drivers, and there is no additional skills required for drivers.

Scenario 2: Implementation of manual idling stop by behavioural changes not using the post-fit type device
There is no regulation or mandatory in China or Shandong province or Jinan city for motor vehicles to stop idling manually at stoplights or other situations. There is also no measures or plans to promote stop idling in JPTGC. It is said that manual idling stop may not be spread widely, because it needs engine on and off by turning ignition key manually. These manual operations may have potential to cause operation mistakes and delay of start moving, and may also affect smooth and safe drive. Therefore, his scenario can not be the baseline scenario.

Scenario 3: Introduction of new buses with pre-installed idling stop device
JPTGC has no plan to introduce new type of buses with pre-installed idling stop system. Moreover, bus manufacturers who provide buses to JPTGC do not have any plan to produce buses with pre-installed idling stop system. Therefore, this scenario can not be the baseline scenario.

Scenario 4: Implementation of the proposed project without CDM
As elaborated in Step 2, the proposed project faces technological barrier and barrier due to prevailing practice. Therefore, this scenario can not be the baseline scenario.

From the above analysis, the baseline scenario is identified as Scenario 1, continuation of current practice. As elaborated in Step 2, the proposed project faces technological barrier and barrier due to prevailing practice. Therefore, the proposed project is considered as additional.

(12) Vision to CDM:

1) Possibility of PoA in China

There is no approval for PoA in China. There is information that project participants can make a request for approval PoA as well as normal CDM. This project as well, therefore, it is expected that Chinese government approval could become an issue unlikely.

2) Evaluation of the project plan by JPTGC

JPTGC expressed their evaluations on the project plan, these are as follows;
- Risk on their internal cost increasing than the project plan
- Crediting period such as 10 years is too long for a life of their buses
- Difficulty of implementing the CDM project with their investment

Study team answered to their evaluations as follows;
- If target buses will be decreased during crediting period, project participants will have to identify a baseline of each CPA again and the project will have no feasibility business. As a result, it is essential to further study for PoA.
- Study team has no other CDM plans without their investment. Therefore study team has to accept their

decisions.

5. EX-ANTE CALCULATION OF CO-BENEFIT

(1) Evaluation item

- Air pollutants (NOx)

(2) Baseline/Project scenario

1) Baseline scenario

In the absence of the project activity, idling will be continued at stoplights or other situations without post-fit type idling stop equipment.

2) Project scenario

In the presence of the project activity, idling will be stopped at stoplights or other situations with post-fit type idling stop equipment

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(3) Procedures of baseline evaluation and monitoring plan

Data and parameters for co-benefit evaluations of the project are as follows;

Table 5 Data and parameters for co-benefit evaluations

	Items	Monitoring method
Data and parameters for baseline scenario emissions	Stop-idling period in operating	Record on the idling stop equipment
	Emission factor of air pollutants with idling	Monitored or Literature
Data and parameters for project scenario emissions	The number of stop-idling times during bus operating	Record on the idling stop equipment
	Effective time: Stop-idling period which compensates air pollutant emission in restarting the engine right after each stop-idling.	Monitored or Literature

(4) Ex-ante calculation of co-benefit

Expected co-benefit of the project is calculated by the following formula.

1) Baseline emission

$$BE_{k,y}=\Sigma(BEF_i \times T_{i,k,y} \times 10^{-6})$$

Where,

$BE_{k,y}$: Total baseline emissions of k in the year y (t/year)

$BEF_{i,k}$: Baseline emission factor of k per second for the baseline vehicle i (g/sec)

$T_{i,k,y}$: Cumulative idling period of vehicle i in the year y (sec/year)

Table 6 Baseline emission of NOx

$BE_{NOx,y}$	8.71	Calculated
$BEF_{i,NOx}$	0.0075	Literature
$T_{i,k,y}$	1,161,216,000（for 1,400 buses）	Estimated

2) Project emission

$$PE_{k,y} = \Sigma(N_{i,y} \times BEF_{i,k} \times ST_{i,k} \times 10^{-6})$$

Where,

PE_y : Total project emissions of k in the year y (t/year)

$N_{i,y}$: Total times of stop-idling of vehicle i in the year y (times/year)

$BEF_{i,k}$: Baseline emission factor of k per second for the baseline vehicle i (g/sec)

$ST_{i,k}$: Effective time : Stop-idling period which compensates air pollutant emission in restarting the engine right after each idling stop (sec)

Table 7 Project emission of NOx

$PE_{NOx,y}$	3.18	Calculated
$BEF_{,i,NOx}$	0.0075	Literature
$N_{i,y}$	20,160,000（for 1,400 buses）	Estimated
$ST_{i,,NOx}$	21	Literature

Calculated co-benefit of first CPA and all CPAs are shown below.

Table 8 Ex-ante calculation of co-benefit

Year	NOx emission reduction (tNOx/year)	
	First CPA	All CPAs
2012	5.53	59.3
2013	5.53	59.3
2014	5.53	59.3
2015	5.53	59.3
2016	5.53	59.3
2017	5.53	59.3
2018	5.53	59.3
2019	5.53	59.3
2020	5.53	59.3
2021	5.53	59.3