



VALIDATION REPORT

Energy Absolute Public Company Limited

**Operation of e-buses on privately
owned, scheduled public bus
routes in the Bangkok Metropolitan
area by Energy Absolute
(Short Name: Bangkok E-Bus)**

Industries & Environment

SGS (Thailand) Limited
100 Nanglinchee Road, Chongnonsi, Yannawa,
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Thailand

Date of Issue: 29-09-2022		Project Number: 5005036	
Project Title: Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute (Short Name: Bangkok E-Bus)			
Organisation: SGS (Thailand) Limited		Client: Energy Absolute Public Company Limited	
Validation Period: First MADD Version and Date: Final MADD Version and Date:		19/08/2022 to 29/09/2022 V3.0 dated 19/08/2022 V5.2 dated 26/09/2022	
Summary:			
<p>Energy Absolute Public Company Limited has commissioned SGS (Thailand) Limited to perform the validation of the programme: Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute (Short Name: Bangkok e-bus Program). The applied methodologies and sector are as follows:</p> <p>Methodology Used: Thailand Voluntary Emission Reduction (T-VER) Approved Methodologies</p> <ul style="list-style-type: none"> - T-VER-METH-TM-05 Version 03: Use of Electric Vehicles in Public Transportation System and, - T-VER-METH-TM-06 Version 03: Modal Shift from Private Vehicles to Public Passenger Transportation with Electric Vehicles <p>The programme falls in the sector of Electromobility and Public Transport. In which, electric mobility is one of abroad eligible programme types in accordance with the communication 'Emission reduction and carbon sequestration projects and programmes', FOEN 2022. The scope of the validation is defined as an independent and objective review of the Mitigation Activity Design Document (MADD), the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against CO₂ Ordinance requirements, FOEN rules and applicable host country requirements.</p> <p>The report is based on the assessment of the MADD undertaken through application of standard auditing techniques including but not limited to document reviews, follow up actions (e.g. site visit, telephone or e-mail interviews) and also the review of the applicable approved T-VER methodology and underlying formulae and calculations.</p> <p>The report and the annexed validation describe a total of 4 findings which include:</p> <ul style="list-style-type: none"> • 03 Corrective Action Requests (CARs) • 01 Clarification Requests (CRs) • 00 Forward Action Requests (FARs) <p>All findings have been closed satisfactorily. The determination method of emission reductions is adequacy and accuracy to meet the reasonable assurance. The programme complies with the requirements in accordance with the CO₂ Ordinance and is recommended to the FOEN with a request for registration.</p>			
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Version Number: 01	Date: 29/09/2022	Number of Pages: 49	

Abbreviations

BA	Bilateral Agreement between Thailand and Switzerland
BAU	Business as Usual
CDM	Clean Development Mechanism
CHF	Swiss Francs
CO ₂	Carbon Dioxide
CO _{2eq}	Carbon Dioxide Equivalents
CAPEX	Capital Expenditures
CAR	Corrective Action Request
CCME	Carbon Coordinating and Managing Entity Co., Ltd. (CCME Co., Ltd.)
CPA	Component Project Activity
CR	Clarification Request
DLT	Department of Land Transportation
EA	Energy Absolute Public Company Limited
EC	The enforcement communication 'Emission Reduction and Carbon Storage Projects and Programmes
EF	Emission Factor
ER	Emission Reduction
EV	Electric Vehicle
FAR	Forward Action Request
FOEN	Federal Office for the Environment
GHG	Greenhouse Gas
GWPs	Global Warming Potentials
ICE	Internal Combusting Engine
IPCC	Intergovernmental Panel on Climate Change
ITMOs	Internationally Transferred Mitigation Outcomes
IRR	Internal Rate of Return
MA	Mitigation Activity
MADD	Mitigation Activity Design Document
MAIN	Mitigation Activity Idea Note
MIO	Measuring Instruments Ordinance
MOPA	Mitigation Outcome Purchase Agreement
NDC	Nationally Determined Contribution
NPV	Net Present Value
ONEP	Office of Natural Resources and Environmental Policy and Planning, Thailand
OTP	Office of Transport and Traffic Policy and Planning, Thailand
PA	Paris Agreement
PoA	Programmatic of Activities
SDG	Sustainable Development Goal
SFOE	Swiss Federal Office of Energy
SGS	SGS (Thailand) Limited
TC	Transferring Country
TCO	Total Cost of Ownership
TE	Technical Export
TGO	Thailand Greenhouse Gas Management Organization (Public Organization)
TSB	Thai Smile Bus Company Limited
T-VER	Thailand Voluntary Emission Reduction
UNFCCC	United Nations Framework Convention on Climate Change
VVs	Validators and Verifiers
VVB	Validation and Verification Body
WACC	Weighted Average Cost of Capital

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1. Validation Opinion

SGS (Thailand) Limited has been contracted by Energy Absolute Public Company Limited to perform a validation of the project: Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute.

The Validation was performed in accordance with the CO₂ Ordinance on the reduction of CO₂ emissions issued 30 November 2012, Validation and Verification of Domestic Projects and Programmes, FOEN 2022, the Emission Reduction and Carbon Storage Projects and Programmes, FOEN 2022, and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The programme is to introduce electric vehicles for privately-owned public transport in Thailand's capital Bangkok to reduce greenhouse gas emissions on a broader scale. Energy Absolute (EA) will enter into agreements with privately-owned operators of scheduled bus routes in the Bangkok Metropolitan Region with the objective to replace 100% of the existing internal combustion engine bus fleets. A charging station service network for these e-buses will be implemented. The programme falls in sector of Electromobility and Public Transport. Thus, the programme is also abroad eligible project and programmes type as it is electric mobility sector.

In our opinion, the programme meets, all relevant the Implementing Agreement, Swiss CO₂-Law, CO₂ Ordinance, FOEN criteria and all relevant host country criteria. The programme is eligible and correctly applies methodologies T-VER-METH-TM-05 Version 03 Use of Electric Vehicles in Public Transportation System and T-VER-METH-TM-06 Version 03 Modal Shift from Private Vehicles to Public Passenger Transportation with Electric Vehicles respectively. It is demonstrated that the programme is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be 656,720 tonnes of CO_{2e} over a 8 years and 3 months (8.25 years) crediting period, averaging 79,602 tonnes of CO_{2e} annually. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given the underlying assumptions do not change.

The programme is hence be recommended by SGS for registration with the FOEN.

Signed on Behalf of the Validation Body by Authorized Signatory

Signature:



Name: Nattarin Thunsiri

Date: 29/09/2022

2. Introduction

2.1 Objective

Energy Absolute Public Company Limited (hereinafter referred to as “EA”) has commissioned SGS (Thailand) Limited (hereinafter referred to as “SGS”) to perform the validation of the programme: Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute with regard to the relevant requirements of the CO₂ Ordinance (in particular Art. 5, and Art. 5a for programmes).

The purpose of a validation is to have an independent third party assess the programme description in the Mitigation Activity Design Document (MADD) and ensures compliance with the recommendations of the Compensation Office, in particular the Validation and Verification of Domestic Projects and Programmes, FOEN 2022, the enforcement communication 'Emission Reduction and Carbon Storage Projects and Programmes (the EC) and standard methods, baseline, the monitoring plan (MP) and in compliance with relevant Swiss CO₂-Law. For the host country criteria, the programme shall be registered with Thailand Voluntary Emission Reduction (T-VER) and conforms with relevant requirements and applies with the approved T-VER methodologies. Our objective is to confirm that the MADD is sound reasonable and meets the stated requirements and identified criteria.

2.2 Scope

The scope of the validation is defined as an independent and objective review of the MADD, the programme’s baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against the Implementing Agreement, Swiss CO₂-Law, CO₂ Ordinance, the Validation and Verification of Domestic Projects and Programmes, the EC and host country criteria, relevance rules and associated interpretations. SGS has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of mitigation outcomes. The validation approach comprises document review, and interviews to assess the conformity of the programme’s activity implementation and relevance objective evidence. The validation independently and decides at SGS’ own discretion whether the documents provided by the applicant are sufficient for carrying out the appraisal.

2.3 Validation Process

The validation consists of the following four phases: A desk review of the programme design documents includes a review of the data and information, cross checks between information provided in the MADD and information from sources with all necessary means without limitations to the information provided by the programme operator. A site visit conducted for onsite interviewing with programme operators, and relevant parties who involve in the programme. Cross checking between information provided by interviewed personnel with all necessary means without limitations to the information provided by the project operator and project coordinator. Reference to available information relating to projects or technologies similar projects under validation and review based on the approved T-VER methodologies being applied for the appropriateness of formulae and accuracy of calculations. The resolution of outstanding issues and the issuance of the final validation report and opinion.

This report contains the findings and resolutions from the validation and a validation opinion on the proposed mitigation programme, thus confirming the programme design in the documents is sound and reasonable and meets the stated requirements and identified criteria.

2.4 Use of the Validation Protocol

The validation protocol used for the assessment is designed in accordance with the EC. It serves the following purposes:

- it organises, details and clarifies the requirements the project/programme is expected to meet; and
- it documents both how a particular requirement has been validated and the result of the validation (reporting).

The validation protocol consists of several tables. The different columns in these tables are described below.

checklist Point		n / A	True	Does not apply
List number of the checklist	The various requirements are linked to checklist questions the project and programme should meet.	If the requirement is not applicable, this should be marked with "na".	This is acceptable or agree based on evidence provided.	CAR/CR/FAR is raised. See details in Section 2.4 of this document.

The completed validation protocol for this project is attached as Annex 2 to this report.

2.5 Findings

As an outcome of the validation process, the team can raise different types of findings

A Clarification Request (CR) is raised if information is insufficient or not clear enough to determine whether the applicable FOEN requirements have been met.

Where a non-conformance arises the Assessor shall raise a **Corrective Action Request (CAR)**. A CAR is issued, where:

- I. The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- II. The FOEN requirements have not been met;
- III. There is a risk that emission reductions cannot be monitored or calculated.

The validation process may be halted until this information has been made available to the assessor's satisfaction. Failure to address a CR may result in a CAR. Information or clarifications provided as a result of an CR may also lead to a CAR.

A Forward Action Request (FAR) is raised during validation to the issues that cannot yet be definitively checked during validation or verification, usually to be clarified in the next verification.

Corrective Action Requests and Clarification Requests are raised in the validation protocol and detailed in a separate form (Annex A.3). In this form, the Project developer is given the opportunity to "close" outstanding CARs, CRs and respond to FARs.

2.6 Internal Quality Control

Following the completion of the assessment process and a recommendation by the Assessment team, all documentation will be forwarded to a Technical Reviewer (act as quality manager) who is responsible for compliance with the quality assurance processes within the Validation and Verification. The task of the Technical Reviewer is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer is independent and will either accept or reject the recommendation made by the assessment team. Findings can be raised at this stage and client must address them within agreed timeline.

2.7 The Names and Roles of the Validation Team Members

Name	Role
Mr.Pitipoom Tungsiriteekul	Lead Assessor and Approved Technical Expert Sectoral Scope Expert (Electromobility and Public Transport)

Technical Review Team:

Name	Role
Ms.Nattarin Thunsiri	Technical Review (act as Quality Manager) Sectoral Scope Expert (Electromobility and Public Transport)

2.8 Declaration of Independence

SGS (Thailand) Limited validates this program “Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute (Short Name: Bangkok E-Bus)” for Energy Absolute Public Company Limited that approved by the FOEN as a validation/verification body.

The company as well as the approved technical expert, the person responsible for quality and the overall person responsible for the validation/verification body (VVS) confirm that - apart from their services within the framework of the validation/verification - they are supported by the organizations concerned (in particular the customer of the validation/verification and the operators of the individual projects, if it is a program) and their consultants are independent.

In order to guarantee its independence, the VVS undertakes to:

- not to validate projects or programs or to verify monitoring reports that it has helped to develop;
- not to use in the validation or verification of a project or a program any subject matter expert, quality manager or overall manager who was in any way involved in the development of the same project or program;
- not to use a subject matter expert, quality manager or overall manager for the verification who has already been involved in any way in the validation of the project or program;
- not to use a subject matter expert, quality manager or overall manager for the validation who was in any way already involved in the last verification of the project or program;
- not to perform validations and verifications for clients for whom it has been involved in the development of the same type of project;
- not to validate or verify any projects or programs for clients for whom it has carried out advice or an audit in setting targets in the area of CO₂ tax exemption or for whom it has carried out advice within the framework of the SwissEnergy platform;
- not to advise the organizations concerned in the context of validation and verification, but to carry out an independent examination of the documents. In particular, the organizations concerned must not be advised in such a way that the amount of eligible emission reductions is systematically maximized.

SGS ensures that the technical expert commissioned, the person responsible for quality and the general manager as well as the external technical experts commissioned by them also meet the above requirements.

The technical expert, the person responsible for quality and the overall person responsible for the validation/–verification body confirm with their signature that they are independent of the customer of the validation/verification and his advisors – apart from their services in the context of the validation/verification. Declaration of independence are shown in Annex 4 of this report.

SGS confirm that the validation is independent and not meant to provide any consulting towards the Client in accordance with the requirements set out in the relevant sections of the EC. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the MADD.

3. General Information about the Project and Programme

3.1 Documents Used

Version and date of the project/program description	V5.2 Dated: 26/09/2022
List of tax-exempt companies used: a	Not Applicable

Other documents used, on which the validation is based, are listed in Annex A1 of the report.

3.2 Project Organization

Applicant (Programme Activity Operator)	Energy Absolute Public Company Limited 16th floor, AIA Capital Center Building 89 Ratchadaphisek Road, Dindaeng Bangkok 10400, Thailand
Contact	Mr. Charubutr Asavaroengchai, Business Development Manager - Battery Project Strategy Development and Investment Planning Department, Energy Absolute Plc. Tel: +66 (0) 81 988 5091 Email: charubutr.a@energyabsolute.co.th

Energy Absolute Public Company Limited is the project activity owner in this programme and is correctly listed under section 1.1 and 1.2.3 of the MADD.

Although, Thai Smile Bus (TSB) is an operator of e-buses (including other e-bus operator that operate under TSB or having contractual agreement with TSB), both parties agree that EA will be an investor and owner of the "Bangkok E-Bus Program". The carbon credits and deemed benefits will be solely managed by EA with consensus agreement. This has been validated against the Memorandum of Understanding (MoU) between EA and TSB dated 15/06/2022 and found consistent.

3.3 GHG Project and Programme Description

The programme is to introduce electric vehicles for privately-owned public transport in Thailand's capital Bangkok to reduce greenhouse gas emissions on a broader scale. EA will enter into agreements with privately-owned operators of scheduled bus routes in the Bangkok Metropolitan Region with the objective to replace 100% of the existing internal combustion engine bus fleets. A charging station service network for these e-buses will be implemented. The programme falls in sector of Electromobility and Public Transport. Thus, the programme is also abroad eligible project and programmes type as it is electric mobility sector.

4. Validation Findings

4.1 *Bilateral Agreement*

Under the Paris Agreement, partner states jointly develop mitigation activities to raise their ambition in the fight against climate change. The Joint Statement by the Office of Natural Resources and Environmental Policy and Planning of the Kingdom of Thailand and the Federal Officer for the Environment of the Swiss Confederation on Climate Change Cooperation has been made on 28/05/2021. Both parties intend to engage in enhancing their cooperation under Article 6 of the Paris Agreement in contributing to the implementation and achievement of their Nationally Determined Contributions (NDCs). As the results, the Implementing Agreement to Paris Agreement between the Swiss Confederation and the Kingdom of Thailand has been officially signed on 24/06/2022. The Implementing Agreement is envisaged under Article 6.2 of the Paris Agreement to establish the voluntary cooperation framework and state the requirements for recognition of the internationally transferred mitigation outcome (ITMOs) to achieve the climate targets.

Under the Implementing Agreement, the Ministry of Natural Resources and Environment, acting through Office of Natural Resources and Environmental Policy and Planning (ONEP), to act on its behalf in this implementing Agreement whereas the Thailand Greenhouse Gas Management Organization (Public Organization) serve as the administrator of the standard of Mitigation Activity and the Registry in Thailand. The Swiss Confederation has authorized the Federal Department of the Environment Transport, Energy and Communications, acting through the Federal Office for the Environment (FOEN), to act on its behalf in this Implementing Agreement.

The Joint Statement and Implementing Agreement between Switzerland and Thailand are publicly available on [Bilateral climate agreements \(admin.ch\)](#).

4.2 *Project and Programme Design Document including Description*

The programme mitigation activity title is “Operation of e-buses on privately owned, scheduled public bus routes in the Bangkok Metropolitan area by Energy Absolute” or short name “Bangkok e-bus Program”. The MADD has been prepared in accordance with the MADD Template Version 4, dated 12/04/02022 which provided by Klik foundation. Energy Absolute Public Company Limited (EA) is the Programme Activity Operator (owner) and Carbon Coordinating and Managing Entity Co., Ltd. (CCME, fully owned subsidiary of South Pole Group) is the Program Coordinating & Managing Entity (CME) or programme developer/promotor.

The geographical boundary of the programme activity is Bangkok Metropolitan Region, Thailand. The programme aims to introduce electric vehicles for privately-owned public transport in Thailand’s capital Bangkok to reduce greenhouse gas emissions on a broader scale. EA will enter into agreements with privately-owned operators of scheduled bus routes in the Bangkok Metropolitan Region with the objective to replace 100% of the existing internal combustion engine bus fleets. A charging station service network for these e-buses will be implemented. The programme will replace the use of conventional buses with e-buses (100% electrical energy from battery) on a substantial number of existing and new privately operated bus lines that provide a regular, scheduled service within the Bangkok Metropolitan Region. This will trigger a gradual phase-out of all Internal Combusting Engine (ICE) buses and reduce the combustion of fossil fuels. The program outline is consistent with the Mitigation Activity Idea Note (MAIN) in which fuel switch and modal shift are comprising as mitigation activities in the programme.

In addition to the NDC related policies and plans, a review of EV promotion policies in Thailand concludes that privately owned electric buses are not a priority towards Thailand’s EV promotion plans. There are no existing or planned policies in line with the NDC that either target or promote electrification of privately-operated public transport buses. Therefore, the Bangkok e-bus Programme will neither claim reductions that result from measures implemented to achieve the targets set in Thailand’s NDC for the transport sector nor that result from policies put in place for promotion of electric buses. The charging infrastructure is implemented separately and will operate independently from the bus line operators on a commercial basis.

The programme activity applies with the methodology T-VER-METH-TM-05 Version 03 and T-VER-METH-TM-06 Version 03 respectively and is categories under sector of electromobility and public transport. Thus, the programme is abroad eligible programmes type as it is electric mobility sector. The planned component activities

include in the programme have not used any public funding and was checked from the project financial source by project owner. The KliK-supported Mitigation Activity will provide valuable insights on digitalised MRV systems for carbon programs and support infrastructure creation. With carbon finance by the KliK Foundation, the purchase of up to 500,000 International Transferred Mitigation Outcomes (ITMOs) until 2030 shall be used to levelling the total cost of ownership (TCO) differential between baseline buses and the programme e-buses.

According to T-VER criteria, the Programmatic of Activities (PoA) limit the maximum emission reductions of each PoA not over than 60,000 tCO₂e/year. The clarification was requested to FOEN via email communication. In response, FOEN clarified that no volume restrictions of each planned component activities under Swiss law. Each T-VER PoA will include several planned component activities but stipulated the maximum allowance of 20,000 tCO₂ per year per Component Project Activities (CPA). The first CPA under each PoA will be registered at the time of T-VER registration. Additional CPA(s) with similar technology and demonstration in the selection criteria can be added at a later stage of the T-VER PoA registration. Thus, in this mitigation programme, the first investment batch comprising 154 e-buses will be registered as below CPAs:

Title of T-VER PoA under this programme	Title of CPA	No. of E-bus
PoA 1 ¹ : The Bangkok Metropolitan Area E-Bus Zone 1 and 2	CPA-01 BKK Metro Area E-Bus Zone 1 and 2	99
PoA 2: The Bangkok Metropolitan Area E-Bus Zone 3 and 4	CPA-01 BKK Metro Area E-Bus Zone 3 and 4	55

4.3 Eligible and Ineligible Project and Programme Types

According to Article 5 paragraph 1 letter a of the CO₂ Ordinance, only project and programme types not explicitly precluded in Annex 2a (for projects carried out abroad) and Annex 3 (for projects and programme carried out in Switzerland) of the CO₂ Ordinance can be the subject of a positive qualification decision.

By way of illustration, the list of eligible and ineligible project and programme types in according to [Annex L](#) has been examined. The programme improves the efficiency of passenger transport by replacing the use of conventional (diesel & natural gas) or internal combusting engine (ICE) buses with e-buses as electric vehicles on a substantial number of existing and new privately operated bus lines that provide a regular, scheduled service within the Bangkok Metropolitan Region. The programme also improves mobility from vehicle fleet management. The programme falls in sector of electromobility and public transport. Thus, the programme is abroad eligible programmes type as it is electric mobility sector. SGS confirm that no attestations of emission reductions achieved from programme through any of the list of abroad ineligible project and programme types.

4.4 Selection Criteria for Participant in the Programme

The eligibility criteria for planned component activities inclusion have been listed in the Section 1.2.5 and Table A2 of the MADD. The additionality for each planned component activities is ensured through the definition of eligibility criteria. Only planned component activities whose implementation has not yet begun before they are included in the programme (Art. 5a para. 1 let. d CO₂ Ordinance) are eligible. The demonstration of additionality of each planned component activities shall cover the economic feasibility and common practice. Details describe in Section 2.6 of MADD. This is in conformance with the requirements of the EC and MADD Template Version 4.

As previous describe in Section 4.2, the first planned component activities² of this programme comprising 154 e-buses comprising 8 routes (consist of two T-VER CPAs) is added. In the level of planned component activities,

¹ PoA1 includes bus routes S-xx

² This consist of 1) CPA-01 BKK Metro Area E-Bus Zone 1 and 2 and 2) CPA-01 BKK Metro Area E-Bus Zone 3 and 4. See details in Section 4.2 of this report.

the eligibility criteria have correctly applied and satisfactory demonstrated as shown in Table A2 of the MADD. These 154 e-buses have same technology as describe in the programme. The concession licenses from the Department of Land Transportation (DLT) have been substantiated with MoU between TSB and other bus operators to ensure that required data for the mitigation activities can be acquired and transferred to the project operator. All e-bus routes have origin and end or passes through the Bangkok Metropolitan area. These e-bus routes operate on a regular scheduled service basis in accordance with DLT operating licenses and demonstrate additionality and common practice as explained in detail in Section 4.8.1 of this report.

4.5 Start of Implementation and Crediting Period

Regarding to the MADD, the crediting period of this program is 01/10/2022 – 31/12/2030. The start date of the programme's implementation determines the date that the significant financial commitment (a first investment batch comprising 154 e-buses on 15/06/2022). These e-buses have been included as the first planned component activities of this programme and consider as the start of its implementation or point of no return.

Implementation of the programme must have started no earlier than three months before the application is submitted in accordance with Article 7 of the CO₂ Ordinance (Art. 5 para. 1 let. d CO₂ Ordinance). However, as this is abroad programme, the lead assessor has raised the concern whether the implementation of the abroad program can be earlier than 90 days before submission of the validated MADD or not. The FOEN has clarified that 90-day-deadline is not applicable for projects abroad if the validated MADD has been submitted before 30/09/2022 and if the implementation started after 01/01/2022. Hence, the start implementation date on 15/06/2022 is reasonable and suitable for the programme circumstance.

Proof of the implementation start date is examined as part of the validation. EA has substantiated the E-Bus purchase agreement between NexPoint Public Company Limited and Thai Smile Bus Company Limited dated 15/06/2022 as objective evidence of the first purchasing. The purchase agreement has been checked and found satisfactory.

Generally, the start date of the programme's implementation should determine the start date of its initial crediting period. Since all 154 e-buses are targeted for complete deployment by 01/10/2022, the project operator decided to start the crediting period on the same date of deployment completion (01/10/2022). The programme is expected to include the total of 122 bus routes with the minimum of 1,933 e-buses. The following batch will be later included as addition planned component activity under the programme. Since the programme applies after 01/01/2022, the crediting period lasts until 31/12/2030. Attestations for emission reductions obtained under a project or programme can only be issued during this period. This is consistent with the crediting period of this programme.

4.6 Applicability of Selected Methodology to the Project and Programme Activity

The programme is in Thailand as a host country and shall be registered under T-VER to conform with host country criteria. The approved T-VER methodologies shall be applied. However, the T-VER methodology does not be classified as Large Scale or Small Scale methodology and can be applied in any type of projects (i.e. Large Scale, Small Scale, and Micro Scale).

The programme involves replacing existing ICE bus with new e-bus on the existing or new operating routes and modal shift in transportation mode of each passenger on the existing routes. Thus, the programme is eligible and correctly applies methodologies T-VER-METH-TM-05 Version 03 Use of Electric Vehicles in Public Transportation System and T-VER-METH-TM-06 Version 03 Modal Shift from Private Vehicles to Public Passenger Transportation with Electric Vehicles respectively.

The following applicability criterions have been validated for T-VER-METH-TM-05 Version 03 and T-VER-METH-TM-06 Version 03:

Applicability conditions	Characteristics of the project activity	VV's Opinion
(a) The EV for public transit shall not be modified from the existing ICEV public transit	E-buses operated in the Bangkok e-bus program are newly manufactured.	Evidence showing that only newly manufacture EV-buses have been added to the program. It is not the modified from existing ICEV public transit. Also the methodology require that the replaced vehicles shall not be used within the project's boundary and other areas.
(b) EV must rely on 100% electrical energy from Battery Electric Vehicle (BEV)	E-buses operated in the Bangkok e-bus program rely on 100% electrical energy from Battery Electric Vehicle.	From the specification of EV-bus acquired in the first batch of decision making, it confirms that 100% Battery Electric Vehicles are deployed.
(c) Project owner must demonstrate the guideline for battery waste management for the damaged or expired battery	Guidelines for handling damaged or end-of-life electric vehicles are listed in the Co-Benefit whitepaper and includes evidence of government mandated handling for disposal at the end of its useful life.	The electronic waste management plan or contract of an agency appointed as a battery service facility and battery waste management have to be provided before adding to the program. In the first planned component activity, the MoU between Amita Technology (Thailand) Co.,Ltd. and bus operator has been provided to proof the guideline of battery waste management where the expired battery may use as Energy Storage System or recycle.

4.7 Programme Boundary

The geographical boundary of the programme activity is Bangkok Metropolitan Region, Thailand. The system boundary encompasses all direct and indirect emission sources are mentioned in Table 2 of the MADD. In this programme, the system boundary for each planned component activity is the same as well as project type. The system boundary as per applied T-VER methodologies includes:

T-VER-METH-TM-05 Version 03:

- Baseline emission: CO₂ emissions from fossil fuel consumption for operating of conventional ICE bus³ in the absence of the programme
- Project emission: CO₂ emissions from electricity consumption (Thai power grid) for e-bus charging

T-VER-METH-TM-06 Version 03

- Baseline emission: CO₂ emissions from mobile source emissions from different modes of road transport which the passengers of the e-bus would have taken in the absence of the programme
- Project emission: CO₂ emissions from electricity consumption (Thai power grid) for e-bus charging
- Leakage emission: CO₂ emissions from the change in load factor of passengers in the public transportation system⁴

This summarized that direct emission sources are correctly listed (1. CO₂ emissions from fossil fuel consumption for operating of conventional ICE bus in the absence of the programme, 2. CO₂ emissions from electricity consumption for e-bus charging and 3. CO₂ emissions from mobile source emissions from different modes of road transport which the passengers of the e-bus would have taken in the absence of the programme consequently). Whereas the indirect emission is listed as the associated avoided tailpipe emission reductions from ICE buses by implementing e-buses, and the avoided tailpipe emissions from passengers in other mode

³ The conventional ICE bus routes include both existing routes and new routes. Existing bus route defines as bus routes that have been operating with conventional ICE bus within Thailand, Bangkok Metropolitan Region prior to the reformation of bus system (approved by national cabinet resolution on 27 September 2016) to the present day. New bus route defines as additional bus routes that have been added into the bus system after the reformation, also including bus route that don't have capacity to operate prior to the reformation.

⁴ This includes the reduction of other public transport vehicle on the road, taxi, and road congestion as the consequence of modal shift from other mode of transportation to EV for transit.

of transportation that modal-shifted to e-buses. The leakage emission is CO₂ emissions from the change in load factor of passengers in the public transportation system.

The system boundary of first planned component activities is correctly identified with the direct emission and indirect sources and appropriate for the context of mitigation programme.

4.8 Baseline Selection and Additionality

As defined in the EC, the reference scenario is the most likely of the various plausible alternatives to the project scenario. The reference scenario and the project pursue the same objective. The baseline scenarios are correctly defined and reasonable as per applied T-VER methodologies:

T-VER-METH-TM-05 Version 03:

The baseline scenario is fossil fuel consumption of the existing vehicles in the existing designated public transportation routes. In the absence of the programme, the Internal Combustion Engine Vehicles (ICEV) in the public transportation system will be continuing used. This prevailing practice is in full compliance with the relevant legal requirements of the host country which complies with the law and regulation of DLT. There is no obligations or compulsion for the replacement or change or alter the prevailing practice at the time of validation. Although, the fossil fuel use of existing conventional bus is diesel and natural gas. Determination of baseline emission will consider natural gas as baseline for fuel switch mitigation activity for conservativeness.

T-VER-METH-TM-06 Version 03:

The baseline scenario is the different modes of road transport on the existing routes from conventional mode of transportation e.g. private vehicles, taxi, motorcycle, etc. which the passengers of the e-bus would have taken in the absence of the programme. There is no mandatory requirement or policy to replace ICEV at the time of validation.

This justification has been checked against existing/planned policies and NDC and found to be appropriate and realistic. From the explanation above, it has been determined that the project participant has correctly applied the selected baseline methodologies with references and sources has been assessed, also relevant national policies and application of approved baseline methodology has been appropriately considered while identifying the baseline scenario for the project activity.

4.8.1 Additionality

Additionality of the mitigation activity has been demonstrated in accordance with Art. 5 para. 1 let. b No 1 CO₂ Ordinance. In this mitigation programme, the financial additionality is demonstrated at the project level (a first investment batch comprising 154 e-buses) as the economic unfeasibility of each individual project within its programme ('project-specific demonstration of economic unfeasibility').

The economic feasibility analysis and common practice analysis are discussed in this section. Decision making date rely on TSB's board decision making date on purchasing of 154 e-bused (122 routes) on 23/05/2022. The minute of meeting has been substantiated as objective evidence.

4.8.2 Identification of Alternatives (if applicable)

Since the selected T-VER methodologies are T-VER-METH-TM-05 Version 03 and T-VER-METH-TM-06 Version 03, both applied methodologies prescribes the baseline scenario. Hence, this is not applicable as per the methodologies.

4.8.3 Economic Feasibility Analysis

Benchmark analysis is chosen and applied as the method for analyzing economic feasibility. All profit and receipts are taken into account. The completeness and accuracy of the economic feasibility calculation were checked and found correct. SGS confirm that benchmark analysis has been correctly chosen and properly

applied. The economic feasibility analysis base on appropriate and realistic assumptions and done conservatively.

Period of Project Assessment

According to CDM Methodology Tool27: Investment Analysis (EB112 Annex2) paragraph 6, project IRR shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime). The period of assessment of this project activity as shown in financial spreadsheet is 14 years. This is found appropriate and reflects the expected operational lifetime of the project activity as indicated in the MADD following the declaration from NexPoint Public Company Limited who is bus provider to the project.

Validator confirms that all Input values used in all investment analysis as described below are valid and applicable at the time of the investment decision taken by the project participant (the Tool27 Paragraph 10).

The validation of input value used in the investment analysis:

S.No.	Parameter	Values	Validation Remarks	Related CL/CAR																	
1.	Investment Cost (CAPEX)	1,005,926 K THB	Comprise of 2 main components; 1.1 Buses 1.2 Bus Terminal Construction	CAR#02																	
1.1	Investment Cost (Buses)	998,200 K THB	Quotation from technology provider	CAR#02																	
	<p>Means of validation – Quotation from Nexpoint Public Company Limited No. QT22050021-1 dated 10/05/2022 has been provided to substantiate the cost of 154 battery electric buses (BEV-buses) which 150 buses is capable with battery 302.14 kWh and remaining 4 buses are 151.07 kWh.</p> <p>This figure includes VAT (value added tax) which found realistic with the actual payment and acceptable. Quotation was valid at the time of decision making on 15/06/2022. Validator has been cross checked and found the same figure is the officially agreed for buses purchasing agreement.</p>																				
1.2	Investment Cost (Bus Terminal Construction)	7,726 K THB	Bus construction quotation	CAR#02																	
	<p>Means of validation – Bus terminal construction are consists of 5 locations which are Bueng Kum, Pak Kret, Suthisan, Taling Chan and Phra Pradaeng. As the bus terminal have not been constructed for only 154 buses hence the cost used in the investment analysis has been allocated by the portion between planned bus and maximum capacity of the bus terminal. Summary of cost in each location are listed below,</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Quotation date</th> <th>Planned Buses</th> <th>Max. Capacity</th> <th>Quotation (K THB)</th> <th>Values used (K THB)</th> </tr> </thead> <tbody> <tr> <td>Bueng Kum</td> <td>22/04/2022</td> <td>86</td> <td>206</td> <td>5,850</td> <td>2,442</td> </tr> <tr> <td>Pak Kret</td> <td>22/04/2022</td> <td>13</td> <td>110</td> <td>6,100</td> <td>720</td> </tr> </tbody> </table>				Location	Quotation date	Planned Buses	Max. Capacity	Quotation (K THB)	Values used (K THB)	Bueng Kum	22/04/2022	86	206	5,850	2,442	Pak Kret	22/04/2022	13	110	6,100
Location	Quotation date	Planned Buses	Max. Capacity	Quotation (K THB)	Values used (K THB)																
Bueng Kum	22/04/2022	86	206	5,850	2,442																
Pak Kret	22/04/2022	13	110	6,100	720																

S.No.	Parameter	Values	Validation Remarks	Related CL/CAR		
	Suthisan	22/04/2022	15	45	5,703	1,901
	Talingchan	22/04/2022	20	57	6,242	2,190
	Phra Pradaeng	06/05/2022	20	124	2,923	471
All quotation issued by K.Builder Co.,Ltd. were valid at the time of decision making on 15/06/2022.						
2.	Operation Expense (OPEX, Annually)	125,244 K THB	Comprise of 3 main components; 2.1 Bus operation cost (Electricity) 2.2 Labour cost 2.3 Maintenance & Misc.Cost		CAR#02	
2.1	Bus operation cost (Electricity)	14,234 K THB	Quotation from technology provider		CAR#02	
<p>Means of validation – Bus operation cost considered the electricity cost for e-buses charging.</p> <ul style="list-style-type: none"> - The declaration letter of Nexpoint Public Company Limited (No. NEXP-054-2565) provide information of electricity consumption rate for 154 buses purchased is between 0.7 kWh/km. to 1.1 kWh/km. The electricity consumption has been using 0.7 kWh/km in the investment analysis as the lowest and most conservative. Also the electricity consumption rate has been cross reference to the https://www.researchgate.net/publication/352793138_The_State-of-the-Art_of_Battery_Electric_City_Buses. The research was published in June 2021 and showing the average electricity consumption rate at 1.3 kWh/km from all type of BECB (Battery Electric City Bus) included in their study. Hence it is reasonable and conservative to the figure used in the analysis. <div style="text-align: center;"> </div> <ul style="list-style-type: none"> - The electricity tariff (4.13 THB/kWh) is derived from 2 portions, <ul style="list-style-type: none"> 1. Base electricity cost – this is announced publicly by Metropolitan Electricity Authority (MEA), at the time of decision making the base electricity cost is 2.48 THB/kWh where combined 2.63 THB/KWh of electricity tariff with low priority and the Float time (Ft) at -0.15 THB/kWh. 2. Marginal cost for charging station – with reference to the MoU between Energy Mahanakorn Co.,Ltd (Charging Station Operator) and Thai Smile Bus Co.,Ltd. (Bus Operator) dated , the marginal at 1.65 THB/kWh will be added to base electricity cost. 						

S.No.	Parameter	Values	Validation Remarks	Related CL/CAR
	-	The accumulate traveling distance used is followed minimum trips per day in the concession license to all 8 routes which is 4,923,850 km/year		
2.2	Labour cost	81,749 K THB	Labour cost structure	CAR#02
	<p>Means of validation – Labour cost considered in the analysis has been considered for bus driver, bus stewards, terminal manager, station master and admin.</p> <p>Cost structure are based on the latest salary structure of Thai Smile Bus Co.,Ltd. at the time of decision making. Bus driver and bus stewards cost structure is reference on date 10/01/2022 and on 04/04/2022 is the announcement of cost structure change to employee working at the station. For conservative approach and appropriate only cost related to the project implementation, the cost for terminal manager, station master and admin has been allocated following the fraction of buses operated in each station comparing to the maximum capacity of the station.</p>			
2.3	Maintenance & Misc.Cost	29,260 K THB	Daily bus maintenance quotation, Land rental (bus terminal) and 3 rd parties insurance invoice	CAR#02
	<p>Means of validation – Quotation from Auto Bus Service Co.,Ltd. No. ATB-2022-05-04 dated 09/05/2022 has been provided to substantiate the daily bus maintenance cost at 400 THB/bus/day. Interviewing with the management of Thai Smile Bus Co.,Ltd. confirm that this activity is normal operation of the scheduled bus to confirm the compliance of bus condition before service in each day. Also the cost considering for e-bus already deducted to lower comparing to conventional ICE bus.</p> <p>Bus terminal has not been located on the land owned by the project developer, the evidence on rental fee of 5 bus terminals are provided as the agreement between Thai Smile Bus Co.,Ltd. and landlord. Yearly rental fee in the investment analysis is calculated with the fraction of buses operated and maximum capacity of bus terminal to be consistent with conservative manner.</p> <p>The 3rd parties' insurance schedule has been provided with details of the annual fee to be paid by the bus operator. Insurance covered only the damage to 3rd parties not the buses and asset owned by the bus operator, hence it is appropriate and reasonable cost to be included in the project implementation.</p>			
3.	Operation Expense (OPEX, only in year 7)	220,346 K THB	Battery Replacement at the end of year 7	CAR#02
	<p>Means of validation – Battery packs of the e-bus must be replaced at the end of years 7 following the confirmation from bus provider (Nexpoint Public Company Limited). The estimate cost of battery pack is referenced to the quotation from Mine Mobility Corporation Co.,Ltd. No.SQJ2100087-1 dated 06/01/2022 that 1,449 K THB need for the battery pack with battery capacity at 302.14 kWh. And half of the price at 725 K THB is require for 151.07 kWh battery replacement.</p>			

S.No.	Parameter	Values	Validation Remarks	Related CL/CAR
	This figure includes VAT (value added tax) which found realistic with the actual payment and acceptable.			
4.	Revenue	212,622 K THB	Comprise of 2 main components; 4.1 Ticket sold 4.2 Advertisement	CAR#02
4.1	Ticket sold	201,188 K THB	Assumption on the number of ticket sale during bus operation	CAR#02
	<p>Means of validation – No. of ticket sold has been calculated from the 3 factors;</p> <p>1. Ticket price – following the type of e-bus, ticket scheme can be 15, 20, 25 THB/ticket. The average 20 THB/ticket has been used to investment analysis.</p> <p>2. Average trip/bus/day – considered total 154 buses following the minimum trip of the concession license of all 8 bus routes (i.e. 530 trips/day)</p> <p>3. No. ticket per trip – The average at 52 tickets per trip is derived from the historical record of the No. ticket sold per trip of Thai Smile Bus Co.,Ltd.</p> <p>Validator confirm on the appropriateness of values used and availability at the time of decision making.</p>			
4.2	Advertisement	11,434 K THB	Advertisement quotation	CAR#02
	<p>Means of validation – Quotation from Thai Smile Bus Co.,Ltd. to their client on 18/02/2022 (No.QT6502002) has been provided as example. It is the quote of advertisement for 10 buses over 8 months period. Hence the monthly revenue from advertisement is resulted as 12,375 THB/bus/month.</p> <p>In the investment analysis applied the assumption that half of the buses in operation will be advertised. This is found reasonable for the actual implementation from the view of validator.</p>			
4.3	Carbon Revenue	43,158 K THB	Proposal from EA submitted to Klik foundation	CAR#02
	<p>Means of validation – Communication evidence between Energy Absolute Public Company Limited and Klik Foundation on the carbon finance support along with the analysis sheet to the Total Cost of Ownership (TCO) dated 11/05/2022 has been provided.</p> <p>ITMOs price is adopted from the TCO analysis sheet which the carbon revenue will treat as the key factor to close TGO gap to make project investment feasible.</p> <p>However, the expected carbon revenue has been calculated from the No. of Emission Reduction from the ex-ante calculation of first batch of CPAs at 24,640 tCO₂e/year.</p>			

S.No.	Parameter	Values	Validation Remarks	Related CL/CAR
5.	Fair (Salvage) Values of CAPEX	52,767 K THB	Comprise of 2 main components; 4.1 Bus 4.2 Battery Pack	CAR#02
	Reference to CDM Methodology tool27 : Investment Analysis (EB112 Annex2) paragraph 7; The fair value of any project activity assets at the end of the assessment period shall be included as a cash inflow in the final year.			
5.1	Bus	8,470 K THB	Historical purchase agreement on end of life bus	CAR#02
	Means of validation – Following the agreement between Thai Smile Bus Co.,Ltd. and the private entity dated 16/09/2022, salvage values for the buses after the end of life operation is 55,000 THB/bus.			
5.2	Battery Pack	44,297 K THB	Public available information on Website	CAR#02
	Means of validation – On the website (https://www.futurebridge.com/blog/end-of-life-ev-batteries-emerging-value-pool/) showing the study on the end of life values of the battery pack. It is considered as 32 USD/kWh and the exchange rate at 30.156 THB/USD are applied in the investment analysis. In addition, the fair values of battery pack also applied in the end of years 7 to consistent with the battery replacement schedule.			

Benchmark

In reference to the CDM Methodology Tool 27: Investment Analysis (EB112 Annex2) paragraph 9 and 15, benchmark of the project has been determined by applying the weighted average costs of capital (WACC) for project IRR.

The formula use for WACC calculation is

$$WACC = re \times We + rd \times Wd \times (1 - Tc)$$

Where:

Parameter	=	Value	Description
re	=	11.04%	Cost of equity (-) <u>Reference:</u> Tool27 Paragraph19, annex 1 Group 2 (Transport) for Thailand
We	=	30%	Percentage of financing that is equity (-) <u>Reference:</u> Equity portion that specified by EA in the TCO investment sheet submitted to Klik Foundation
rd	=	3.44%	Cost of debt (-)

			<u>Reference:</u> EA corporate interest rate when applying the loan for local commercial bank
W_d	=	70%	Percentage of financing that is debt (-) <u>Reference:</u> Debt portion that specified by EA in the TCO investment sheet submitted to Klik Foundation
T_c	=	20%	Corporate tax rate (-) <u>Reference:</u> Thailand regulation, Revenue department

From the above reference of the data sources, it can conclude that WACC of this project is 5.24% and appropriate to be used as benchmark to the project IRR of project activity.

Project IRR with the revenue from carbon (ITMOs) results at 9.30% is also justified in the investment analysis. This confirm that the project is deemed economically unfeasible because the project IRR is below the benchmark. Without the incentive provided by the revenue from the sale of attestations, the project has a less favorable financial indicator than the selected benchmark and will therefore not be implemented without revenue from attestations.

In addition, project developer provide the sensitivity analysis to cover the total cost, O&M and No. of ticket sold with variation at +- 10% which inline to the Tool27 paragraph 27 “Variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented and be reproducible in the associated spreadsheets”.

Variables	Project IRR @ 14 years	
	Base Project IRR is 1.33 %	
	Increasing variable by 10%	Decreasing variable by 10%
Investment cost	-0.08 %	3.00%
O&M Cost	-1.36 %	3.90 %
No. of ticket sold (Revenue)	5.14 %	-2.78 %
Benchmark – WACC	5.24%	

4.8.4 Barrier analysis (if applicable)

In the first planned component activity, the economic unfeasibility is demonstrated in above section. Hence, the barrier analysis is not required.

4.8.5 Common practice analysis

The common practice has been carried out to proof that project would not implementing without attestations even though it is economically feasible. Analysis is developed by showing number of buses with different fuel type registered with Department of Land Transport where available on website. As of 31/05/2022, the total 8,831 buses are registered in Bangkok Metropolitan area and only 115 are electricity buses. This is about 1.3% contribution (less than 20%), hence it can be confirmed that the electricity buses is not the common practice of implementation and ICE buses still be the majority of buses operated. By the way, the inclusion criteria of the programs already mentioned the additionality demonstration via investment feasibility and common practice analysis have to be carried out individually in each project before adding to the program.

4.9 Calculation of Expected Emission Reductions

The equation and parameters used for emission reduction calculation comply with the requirement of the baseline methodology T-VER-METH-TM-05 Version 03 and T-VER-METH-TM-06 Version 03 respectively. Based on validation, the external default value and fixed data used to calculate the emission reduction as per the applied methodology are as below:

1. $FC_{BL,i,x}$ - Quantity of fossil fuel consumption type 'x' used in ICEV in the transportation system on route 'i' in the baseline scenario
Calculated by multiplying the specific fuel consumption (unit fuel/ distance) of the monitoring data for at least 3 months continuously and dated back for at most 2 years after replacement with EV, with the number of existing vehicles and average total travelling distance per year per vehicle.

The specific fuel consumption (0.6125 kg.NGV/km) is developed with the historical record from Thai Smile Bus Co.,Ltd. when using NGV as the fuel to ICE buses in 37 bus routes. And the average total traveling distance has been adopted from the bus concession license that give the minimum trips per day and traveling distance per trip.
2. $N_{BL,i}$ - Number of ICEV on route 'i' in the baseline
For exiting route, the Summary report or document on the public transportation route have to be provided and for new route applied the value equal to " $N_{PJ,i,y}$ ". With the implementation of project scenario, $N_{BL,i}$ is equal $N_{PJ,i,y}$ in all case. Then the " $ADJ_{i,y}$ " is
3. $L_{BL,i}$ - Annual distance (round trip) on route 'i' in the baseline
For exiting route, the Summary report or document on the public transportation route have to be provided and for new route applied the value equal to " $L_{PJ,i,y}$ ". With the implementation of project scenario, $P_{BL,i}$ is equal $P_{PJ,i,y}$ in all case.
4. NCV_{NGV} - Net calorific value of fossil fuel type Natural Gas for Vehicle (NGV).
Applied the energy statistic report form the Department of Alternative Energy Development and Efficiency, Ministry of Energy (36.67 MJ/kg.)
5. $EF_{CO_2,NGV}$ - Emission factor from the combustion of Natural Gas for Vehicle (NGV)
The value at 56,100 kg.CO₂/TJ is reference to table 1.4 of 2006 IPCC Guidelines for National GHG Inventories
6. $EF_{PKM,x}$ - Emission factor of the passenger travelled with vehicle 'x'
This is default factor mentioned in the methodology T-VER-METH-TM06 version 03 which calculated to the reference data from Department of Highways (2008), Office of Transport Policy and Planning (OTP, 2020) and Department of Land Transport (2021).

Emissions Factor of Vehicle Type	Values (gCO ₂ /passenger-km)
Motorbike	43.06
Personal car	127.1
Taxi	155.94
Three wheels taxi	105.53
Minibus	22.55
Public van	41.11

7. LE (Leakage emission) in Methodology T-VER-METH-TM06 version 03, CO₂ emission from the change in load factor of passenger in the public transportation system.
Default value at 2.64% of baseline emission (i.e. emission only from TM06) is applied consistent to the monitoring methodology.
8. IR_i – Technology improvement factor for vehicle category i per year
The default technology improvement factor is 0.99 for all vehicle categories, by applying the value in the first year (i.e. 2022) as 0.99. Then the later year is calculated as 0.99 raised to the power of years. E.g. year 2024 is the year 3 of the crediting period, so the technology improvement factor is equal to $(0.99)^3 = 0.970299$.

All the above parameters were validated and can be conformed that the value applies in the MADD and emission reduction spreadsheet are sufficiently accurate and complete as per requirement.

The monitoring methodology is consistent in the context of all the parameters to be monitored and all parameters and data are available at validation were consistent with the applied methodology T-VER-METH-TM05 version 03 and T-VER-METH-TM06 version 03. The parameters to be monitored as required by methodologies are:

1. $N_{PJ,i,y}$ - Number of Electric Vehicles in route i year y (unit)
This will be monitored from the total traveling distance (round trip) on annual basis. For ex-ante, the number of buses is adopted consistent with the minimum number of buses under the concession license.
2. $L_{PJ,i,y}$ - Average annual distance of Electric Vehicles route i year y (km.)

This will be monitored from the total traveling distance (round trip) on annual basis. For ex-ante, the number of buses is adopted consistent with the minimum trips per day under the concession license multiply with the traveling distance per trip.

3. $EC_{PJ,ij,y}$ - Annual electricity consumption for charging Electric Vehicle number j on route i in year y (kWh)

This will be monitored from the electricity consumption for Electric Vehicle charging which shall be reported on monthly basis. During the validation, the electricity consumption is estimated at 0.9 kWh/km. following the declaration received from bus provider multiply with the total distance travelled as per minimum trips in the concession license.

4. $EF_{EC,y}$ - Grid Emission Factor (tCO₂/MWh)

This parameter will be monitored and check the compliance of grid emission factor with the monitoring period. In case the emission factor is not available hence the latest emission shall be applied. The latest Thailand grid emission factor for the electricity consumer published by TGO was on 24/01/2022 result at 0.4771 tCO₂/MWh has been used for ex-ante estimation.

5. $PKM_{PJ,ij,y}$ – Traveling distance of passengers riding on Electric Vehicle number j on route i in year y (passenger-km.)

There are 2 options to monitor this parameter. 1. Monthly record of the travelling distance and number of passengers from bus ticket machine or electronic tickets or 2. in case of the ticket fee is increasing as per the travelling distance, collect the evidence of tickets sold and calculate travelling distance from the shortest distance on specific price range on monthly basis. For the validation, the initial survey report for Thai Smile Bus Co.,Ltd. conducted during October 2021 – April 2022 were used.

6. $BSP_{x,y}$ – Mode of transportation ratio of vehicle type x of passenger who shift to EV for public transit in year y (%)

Survey of the passengers who use the EV for public transit shall be conducted in year 1 and every 4 year to justify the shift of transportation mode. For ex-ante, the initial survey report for Thai Smile Bus Co.,Ltd. conducted during October 2021 – April 2022 were used. This report also recognized and approved by TGO to use in the project activity, TGO confirmation letter No.TGO2565.04/994 dated 23/09/2022 has been provided as reference.

Refer to explanation above, this is concluded that the monitoring plan and monitoring parameters are in compliance of the monitoring plan as per the requirement of methodologies. The PP will be able to implement the monitoring plan and the emission reduction in the project activity will be achieved based on ex-post monitoring and verified data.

Ex-ante estimation in the Emission Reduction in the program level covered crediting period (01/10/2022-31/12/2030) are summarized as below table,

Year	Vintage Year	TM-05 : Fuel Switching		TM-06 : Modal shift		Emission Reduction (tCO ₂)
		Baseline Emission (tCO ₂)	Project Emission (tCO ₂)	Baseline Emission (tCO ₂)	Leakage Emission (tCO ₂)	
1	10/2022-12/2022	12,873	4,387	2,081	55	10,513
2	2023	77,240	26,319	12,443	329	63,036
3	2024	102,987	35,092	16,315	431	83,779
4	2025	102,987	35,092	16,151	426	83,620
5	2026	102,987	35,092	15,990	422	83,463
6	2027	102,987	35,092	15,830	418	83,307
7	2028	102,987	35,092	15,672	414	83,153
8	2029	102,987	35,092	15,515	410	83,000
9	2030	102,987	35,092	15,360	406	82,849
8.25 Years	TOTAL	811,025	276,352	125,357	3,309	656,720
	AVERAGE	98,306	33,497	15,195	401	79,602

4.10 Promoting Sustainable Development and Good Governance

Regarding to NDC ambitions, Thailand identified six key sectors: 1) Water resources management; 2) Agriculture and food security; 3) Tourism; 4) Public health; 5) Natural resources management and 6) Human settlements and security. Nonetheless, Thailand has integrated all 17 SDGs into the 20-Year National Strategy. The programme activity contributes to SDG 8: Decent work and economic growth in job creation in the Bangkok Metropolitan area, SDG 11 – Sustainable cities and communities and SDG 13 – climate action.

The mitigation programme does not create any adverse environmental effects and complies with environmental and social requirements in accordance with Environmental and Social Management Framework (ESMF) as well as human right safeguard as regulated by Labour Protection Act. No evidence of violation of human rights or of national legislation in the implementation of the mitigation activity has been raised during the validation. For the avoidance of corruption and bad governance, the “Good Corporate Governance” set by the Stock Exchange of Thailand has been implemented and reported annually in order to enable effective and transparent management, ensuring trust and confidence among shareholders, investors, stakeholders, and all related parties. The information is clearly described in the MADD and reliable.

4.11 Stakeholder/Beneficiary Engagement

The stakeholder has been identified in Section 2.4.7 of the MADD. The stakeholders include bus operators (management and conductors), charging station operators, bus users / passengers, the communities along the bus routes and government sectors. The stakeholder identification covers the parties who affected by the implementation of the activity. The stakeholder’s comments were invited via stakeholder meetings, survey, interview and communication channel. There was no objection or negative opinion on the programme developing. Furthermore, the stakeholders can also submit their comments, complaint, appeal or grievance via communications channels (call center and website). A designated team by bus operator will monitor comments. The investigation, correction and preventive action will be filing and recorded. This is found conformance with the MADD template.

5. List of Persons Interviewed

Site visit conducted for the validation of the programme on 22/0/2022. In addition, the lead assessor carried out remote interviews (through Microsoft Team) in order to assess the information included in the MADD and the first planned component activities included in programmes. During the desk review, the relevant records in consistent with the MADD were checked, comparing the relevant evidence and interview with the EA, TSB, CCME representative through remote interviews. Validation team based on the above justification confirms that the validation based on desk review are sufficient for the purpose of validation.

Date	Name	Position	Short Description of Subject Discussed
22/08/2022	Charubutr Asavaroengchai	Business Development Manager - Battery Project Strategy Development and Investment Planning Department, Energy Absolute Public Company Limited	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Ladaporn Khunikakorn	Director, Sustainable Technologies, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Wiriya Rattanasuwan	Project Supervisor, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Waroot Saengnark	Manager, Projects Development, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Apirat Witthayanukool	Senior Project Coordinator, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Panchanit Ittisaksakul	Junior Project Coordinator, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
22/08/2022	Ittipat Chinangulpiwat	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
22/08/2022	Weerawee Khamdee	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
22/08/2022	Vivat Khositsakul	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, MOPA, Number of Passenger and Portion of passenger shifting towards e-bus from different modes of transportation
22/08/2022	Jetsada Falert	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, MOPA, and Number of Passenger and Portion of passenger shifting towards e-bus from different modes of transportation

Date	Name	Position	Short Description of Subject Discussed
26/08/2022	Charubutr Asavaroengchai	Business Development Manager - Battery Project Strategy Development and Investment Planning Department, Energy Absolute Public Company Limited	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
26/08/2022	Ladaporn Khunikakorn	Director, Sustainable Technologies, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
26/08/2022	Wiriya Rattanasuwan	Project Supervisor, CCME	Baseline emission calculation Project emission calculation

26/08/2022	Waroot Saengnark	Manager, Projects Development, CCME	Additionality, Monitoring Plan Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
26/08/2022	Panchanit Ittisaksakul	Junior Project Coordinator, CCME	Baseline emission calculation Project emission calculation Additionality Monitoring Plan
26/08/2022	Karolien Casaer	Director, Climate Policy, Finance and Carbon Markets Asia, CCME	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
26/08/2022	Roxanne Tan	Managing Consultant, Climate Policy, Finance and Carbon Markets, CCME	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
26/08/2022	Ittipat Chinangukpiwat	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
26/08/2022	Weerawee Khamdee	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
26/08/2022	Vivat Khositsakul	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, Operation Plan, MOPA, Benchmark and Baseline Survey
26/08/2022	Jetsada Falert	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, Operation Plan, MOPA, Benchmark and Baseline Survey

Date	Name	Position	Short Description of Subject Discussed
30/08/2022	Chatrapon Sripratun	Vice President, Strategy Development and Investment Planning Department, Energy Absolute Public Company Limited	Programme Description, Technology, Implementation Plan, Benchmark
30/08/2022	Charubutr Asavaroengchai	Business Development Manager - Battery Project Strategy Development and Investment Planning Department, Energy Absolute Plc.	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
30/08/2022	Ladaporn Khunikakorn	Director, Sustainable Technologies, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
30/08/2022	Wiriya Rattanasuwan	Project Supervisor, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
30/08/2022	Waroot Saengnark	Manager, Projects Development, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
30/08/2022	Apirat Witthayanukool	Senior Project Coordinator, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan
30/08/2022	Panchanit Ittisaksakul	Junior Project Coordinator, CCME	Baseline emission calculation Project emission calculation Additionality, Monitoring Plan

Date	Name	Position	Short Description of Subject Discussed
30/08/2022	Chatrapon Sripratum	Vice President, Strategy Development and Investment Planning Department, Energy Absolute Public Company Limited	Programme Description, Technology, Implementation Plan, Benchmark
30/08/2022	Karolien Casaer	Director, Climate Policy, Finance and Carbon Markets Asia, CCME	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
30/08/2022	Roxanne Tan	Managing Consultant, Climate Policy, Finance and Carbon Markets, CCME	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
30/08/2022	Ittipat Chinangulpiwat	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
30/08/2022	Weerawee Khamdee	Thai Smile Bus	Baseline activity, Environmental Impact and Local Stakeholders' Consultation
30/08/2022	Vivat Khositsakul	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, Operation Plan, MOPA, Benchmark and Baseline Survey
30/08/2022	Jetsada Falert	Advance Energy Plus (EA Consultant)	Implementation Date, Investment Analysis, Operation Plan, MOPA, Benchmark and Baseline Survey

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A.1 Annex 1: Document References

Category 1 Mitigation Activity Design Documents and applied methodologies – all versions of MADD submitted for validation:

- /1/ MADD version V3.0 dated 19 August 2022 (First version submitted for validation)
- /2/ MADD version V4.0 dated 2 September 2022 (Intermediate version)
- /3/ MADD version V5.0 dated 6 September 2022 (Intermediate version)
- /4/ MADD version V5.1 dated 20 September 2022 (Intermediate version)
- /5/ MADD version V5.2 dated 26 September 2022 (Final version along with validation report)
- /6/ Emission Reductions Calculation Spread Sheet
- /7/ Financial Analysis Spread Sheet
- /8/ T-VER-METH-TM-05 Version 03 Use of Electric Vehicles in Public Transportation System
- /9/ T-VER-METH-TM-06 Version 03 Modal Shift from Private Vehicles to Public Passenger Transportation with Electric Vehicles

Category 2 Documents (background documents used to check project assumptions and confirm the validity of information given in the Category 1 documents and in validation interviews):

- /10/ Joint Statement by the Office of Natural Resources and Environmental Policy and Planning of the Kingdom of Thailand and the Federal Officer for the Environment of the Swiss Confederation on Climate Change Cooperation dated 28/05/2021
- /11/ Implementing Agreement to Paris Agreement between the Swiss Confederation and the Kingdom of Thailand has been officially signed on 24/06/2022
- /12/ MoU between Energy Absolute Public Company Limited and Thai Smile Bus Company Limited for GHG emission reduction project dated 15/06/2022
- /13/ E-Bus purchase agreement between NexPoint Public Company Limited and Thai Smile Bus Company Limited dated 15/06/2022
- /14/ Minute of meeting – TSB's board decision making date on purchasing of 154 e-bused (122 routes) dated 23/05/2022
- /15/ EV Bus Specification & quotation by NexPoint Public Company Limited dated 10/05/2022
- /16/ Manufacturer confirmation on the maximum power and rated power of e-buses
- /17/ MoU between Energy Mahanakorn Company Limited and Thai Smile Bus Company Limited dated 23/11/2021
- /18/ MoU between Raja Road Company Limited and Thai Smile Bus Company Limited dated 30/11/2021
- /19/ Concession license route 1 – 37, 2 – 38, 2 – 45, 4 – 15, 4 – 41, 1- 39, 2 – 15, and S4
- /20/ Quotation of battery pack replacement dated 06/01/2022
- /21/ Quotation of bus terminal depot construction dated 22/04/2022 and 06/05/2022
- /22/ Quotation of bus maintenance dated 09/05/2022 and 13/05/2022
- /23/ Bus terminal lease contract (Taling Chan, Beung Kum, Phrapadaeng, and Pak Kred)
- /24/ Determination of bus terminal rental and park capacity
- /25/ Bus insurance invoice dated 14/10/2021 (historical information from another private bus operation – Ace Incorporation Company Limited)
- /26/ TSB operation data during 01/05/2022 – 07/07/2022
- /27/ MEA electricity price performance and Ft
- /28/ DLT registered vehicle – May 2022
- /29/ EA corporate interest rate – Example of loan agreement between Energy Absolute Public Company Limited and Industrial and Commercial Bank of China (Thai) Public Company Limited date 01/06/2021
- /30/ Email clarification on number of battery pack from Mine mobility Corporation Company Limited dated 21/09/2022
- /31/ Savage price of battery MMC – Futurebridge
- /32/ Estimation on advertisement revenue based on BMTA information
- /33/ Sutisan bus terminal survey report
- /34/ Email communication between SGS and FOEN dated 22/06/2022, 08/08/2022 and 07/09/2022
- /35/ MoU between Amita Technology (Thailand) Co.,Ltd. and bus operator dated 29/11/2021

A.2 Annex 2: Validation Checklist

Table 1: Assessment of application documents

checklist Point		n / A	True	Does not apply
1.1	The application is based on the fundamentals relevant to the project/program (legal basis, notice of implementation and supplementary documents).		X	
1.2	The cover sheet is filled out completely and correctly.		X	
1.3	The project/program description and supporting documents are complete and consistent. They comply with the requirements of Art. 6 CO ₂ Ordinance.		X	CAR4 (2), (3)
1.4	The applicant is correctly identified		X	CAR4 (1)

Table 2: Project/program summary, type and form of implementation, location

checklist Point		n / A	True	Does not apply
2.1	The summary (section 1.1 of the project/program description) is consistent with the other information in the report.		X	
2.2	The project type does not correspond to an excluded project type (cf. Appendix 3 CO ₂ Ordinance).		X	

Table 3: Project/program description: Initial situation, goal and technology

checklist Point		n / A	True	Does not apply
3.1	The description of the initial situation (actual situation without project/program) is understandable, accurate and comprehensible.		X	CAR4 (9)
3.2	The description of the project/program is understandable and comprehensible and it is clear whether it is a project or a program.		X	
3.3	The technology used corresponds to the current state of the art. (In a multi-technology program, the point applies to all applied technologies.)		X	
3.4	The project type specified in the project/program description (Appendix L) has been selected correctly.		X	
3.5	The project/program description clearly shows to what extent the project/program complies with the legal provisions.		X	

Table 4: Program Specific Aspects

checklist Point		n / A	True	Does not apply
4.1	Do the projects have a common purpose (besides emission reduction), even if they differ at most in terms of technology? (Art. 5a Para. 1 CO ₂ Ordinance)		X	
4.2	Each technology is described using a (possibly fictitious) example. The description of the example also includes the system boundary, the duration of the project, etc.		X	
4.3	The roles of the actors involved are clearly described.		X	CAR4 (1)
4.4	The process for registering and accepting projects into the program is clearly described and the registration form is attached to the program description.	X		
4.5	The admission criteria are fully listed and numbered in the program description.		X	
4.6	Only projects that meet the requirements of Article 5 of the CO ₂ Ordinance are included in the program. (Art. 5a Para. 1 Letter c CO ₂ Ordinance) This point is recorded in the admission criteria.		X	
4.7	Only projects that use a technology specified in the program - description are included in the program. This point is recorded in the admission criteria.		X	
4.8	Only projects whose implementation has not yet started are included in the program (Art. 5a Para. 1 Letter d CO ₂ Ordinance). This point is recorded in the admission criteria.		X	
4.9	Projects can only be included in existing (=implemented) programs. This point is recorded in the admission criteria.		X	
4.10	The projects can only be included in the program after they have been registered with the program. This point is recorded in the admission criteria.		X	

Table 5: Project/program description: reference scenario

checklist Point		n / A	True	Does not apply
5.1	Are various plausible alternatives to the project/program scenario presented?		X	
5.2	Is the selected reference scenario the most economically attractive alternative that at least corresponds to the state of the art? If the economically most attractive alternative is not accepted as the reference scenario, this is justified.		X	

Table 6: Project/program description: Dates

checklist Point		n / A	True	Does not apply
6.1	The start of implementation is correctly defined.		X	
6.2	The start of implementation of the project/program was no longer than three months before the application was submitted (Art. 5 Para. 1 Letter d CO ₂ Ordinance).	X (see detail in Section 4.5 of this report)		
6.3	The evidence for the start of implementation is consistent with the information in the project/program description.		X	
6.4	In the case of structural measures, the duration of the projects/plans corresponds to the standardized useful life of the technical systems.		X	
6.5	For non-structural measures: The duration of the project or plan corresponds to the duration of the effect.	X		
6.6	The planned start of the effect is listed		X	
6.7	The start and end of the credit period are listed correctly, even if it is a re-validation.		X	
6.8	The project/program is not yet finished.		X	
For programs only				
6.9	The program description correctly defines the start of implementation of the program and the start of implementation of the projects.		X	
6.10	The period of effectiveness of the projects is specified (Art. 6 Para. 2 Letter j CO ₂ Ordinance).		X	CAR4 (7)

Table 7: Grants

checklist Point		n / A	True	Does not apply
7.1	The financial aid that is likely to be available and non-repayable cash benefits from the federal government, cantons or municipalities to promote renewable energies, energy efficiency or climate protection ⁶ , for which a distribution of effects is necessary, are shown (contribution amount and origin) and with documents in Appendix A2 of the project/program description.	X		
7.2	The facts and current status of the possible receipt of the cost-oriented feed-in tariff KEV ⁶ is described in the project/program description. The validation body has commented on this in the validation report. This in particular with regard to the consequences that a possible purchase of the KEV would have for the project (sharing of effects, profitability).	X		

⁶ See <https://www.bfe.admin.ch/bfe/de/home/foerderung/erneuerbare-energien/einspeiseverguetung.html>

Table 8: Distinction from companies that are exempt from the CO₂ tax

checklist Point		n / A	True	Does not apply
8.1	The project/program has interfaces to companies that are exempt from the CO ₂ tax. The companies are listed with their address and ideally the associated expected emission reductions are shown separately.	X		

Table 9: Double counting due to other compensation for the ecological added value

checklist Point		n / A	True	Does not apply
9.1	The monitoring concept includes measures to avoid double counting due to other compensation for the ecological added value. (cf. Art. 10 Para. 5 CO ₂ Ordinance)	X		
9.2	The measures enable the effective avoidance of double counting due to other compensation for the ecological added value.	X		

Table 10: System boundary, emission sources, leakage

checklist Point		n / A	True	Does not apply
10.1	The emission reductions are achieved domestically.		X	
10.2	All direct emissions are included (geographical extent, technical parts, investment-related adjustments).		X	
10.3	All indirect emissions (within the system boundary) are addressed and included.		X	
10.4	All leakage emissions (changes outside the system boundaries caused by the project/program) are quantified and included.		X	

Table 11: Influencing factors

checklist Point		n / A	True	Does not apply
11.1	All essential influencing factors are identified and described.		X	
11.2	National, cantonal and municipal law are taken into account when selecting the reference development and the project emissions, e.g. minimum requirements from the federal government, canton and local community.		X	
11.3	The project/program complies with the applicable environmental regulations.		X	

Table 12: Ex-ante expected project emissions/project emissions, emissions in the reference development and total emission reductions

checklist Point		n / A	True	Does not apply
12.1	The assumptions used to calculate the expected emission reductions are understandable and appropriate. The principle of conservatism is observed.		X	CAR1 (2)
12.2	The expected emission reductions are realistic.		X	
12.3	The project/program provides for measures that lead to an additional reduction in emissions compared to the reference development (Art. 5, Para. 1, Letter b, Item 3 CO ₂ Ordinance).		X	
12.4	The distribution of effects is defined and any supporting documents are signed by the stakeholders concerned.		X	CR3
12.5	The impact sharing due to non -repayable cash benefits is correctly calculated.	X		
For programs only				
12.6	The expected number of projects on which the estimates are based is given.		X	

Table 13: Permanence of carbon storage

Checklist item		n / A.	True	Does not apply
13.1	For the projects to increase the sink capacity, the durability of the storage of carbon is verified.	X		

Table 14: Analysis of additionality and economic analysis

checklist Point		n / A	True	Does not apply
14.1	The analysis method used for the economic analysis is correct.		X	
14.2	The formula for calculating profitability is complete and correct.		X	
14.3	The profitability analysis is calculated using the assumptions specified in the Emission Reduction and Carbon Storage Projects and Programmes (e.g. interest on capital).		X	CAR2 (5)
14.4	The other assumptions used to calculate profitability are understandable and appropriate.		X	
14.5	The assumptions used to calculate profitability are plausible, and uncertainties are offset by conservative assumptions.		X	CAR2 (3)
14.6	All documents for checking data, assumptions and parameters of the economic analysis are available.		X	CAR2 (2)
14.7	The calculation of profitability is complete and correct.		X	

checklist Point		n / A	True	Does not apply
14.8	Uncertainties in the calculation of profitability are offset by conservative assumptions.		X	
14.9	All financial aid is included in the profitability analysis.		X	
14.10	Two calculation variants were implemented (with and without including certificates).		X	CAR2 (4)
14.11	The project(s) are not economical without emission reduction certificates being issued.		X	
14.12	The contribution from the proceeds of the certificates makes a relevant contribution to overcoming the inefficiency:		X	
14.13	If 14.12 does not apply resp. is not applicable: The reason why the financial additionality is nevertheless fulfilled is plausible and understandable.	X		
14.14	The sensitivity analysis is correct. (All parameters that have a significant impact on profitability are identified and taken into account.)		X	
14.15	The sensitivity analysis is robust (at least 10% deviation of all main parameters, +/- 20% for construction costs of large technical plants, +/- 25% for biogas plants).		X	
14.16	The proof of additionality is comprehensible and verifiable.		X	
For programs only				
14.17	The additionality of the projects is stated in the program description: - either based on <i>a representative project</i> and ensures that Art. 5 and 5a CO ₂ Ordinance is fulfilled for all projects that meet the admission criteria of the program. This means that new projects no longer have to be checked individually for inefficiency . - or the inclusion criteria stipulate that <i>individual proof of the inefficiency</i> must be provided for each project and the project can only be included in the program if additionality is proven in this way.		X	CAR2 (1)
14.18	The admission criteria state whether an individual proof of additionality is required for each project.		X	CAR4 (4)

Table 15: Explanations of other barriers and common practice

checklist Point		n / A	True	Does not apply
15.1	The barriers asserted are justified.	X		
15.2	The barrier asserted are correctly quantified, i.e monetized and documented (and no complex approval procedures, lack of willingness to invest or lack of financial resources, lower profit or lower project returns).	X		

checklist Point		n / A	True	Does not apply
15.3	The costs associated with overcoming the obstacle amount to at least 10% of the total funds budgeted for the project/program implementation.	X		
15.4	The project or plan does not conform to standard practice.		X	CAR1 (1)

Table 16: Description of the selected detection method

checklist point		n / A	True	Does not apply
16.1	The verification method is clearly described in Chapter 5.1 of the project/program description.		X	
16.2	The parameters provided are suitable and appropriate for demonstrating emission reductions. With the selected calculation method, a significant misjudgment of the ex-post emission reduction can be ruled out with a sufficient degree of certainty.		X	
16.3	The calculation method and the various assumptions selected do not lead to an overestimation of the emission reductions.		X	CAR4 (7)
16.4	If the project/program includes scientific support, this is clearly described in Section 5.4 of the project/program description.	X		
For programs only				
16.5	In the event that the determination of the emission reductions is based on data collected with random samples, the type of selection of the random sample is described. The sample size guarantees sufficient significance. The monitoring concept specifies how the monitoring proceeds if the planned sample size cannot be reached.	X		

Table 17: Ex-post calculation of eligible emission reductions

checklist Point		n / A	True	Does not apply
17.1	The formulas used to calculate the emission reductions achieved are complete and correct.		X	
17.2	The emission reductions are verifiable and quantifiable. (Art. 5, Para. 1, Letter c, Item 1 CO ₂ Ordinance)		X	
17.3	In the case of replacement systems (e.g. boiler replacement), only the emission reductions achieved during the remaining useful life will be claimed in full.	X		
17.4	The assumptions for the calculation of the emission reductions achieved take into account all relevant uncertainty factors and avoid a significant misjudgment of the emission reductions.		X	
17.5	All parameters used in the formulas are listed in Chapter 5.3 of the project/program description.		X	

checklist Point		n / A	True	Does not apply
17.6	The impact sharing due to non -repayable cash benefits is correctly calculated.	X		
17.7	The issue of double counting has been implemented correctly		X	
For programs only				
17.8	With regard to the parameters, a clear distinction is made between parameters that affect the program structure and parameters that affect the projects.		X	

Table 18: Data Collection and Parameters

checklist point		n / A	True	Does not apply
Fixed parameters				
18.1	Each fixed parameter is fully documented (information on designation, description, unit, value and data source are filled in).		X	
18.2	For the fixed parameters, the given assumptions from the Emission Reduction and Carbon Storage Projects and Programmes (e.g. calorific value, emission factor) are used, if available.		X	
Dynamic parameters				
18.3	All dynamic parameters (future measured values) are fully documented (information on designation, description, unit, data source and survey instrument are filled in)		X	
18.4	The survey instrument and the type of evaluation of the measured values are suitable for all dynamic parameters for determining the emissions.		X	CAR4 (8)
18.5	The measurement procedure, the intended calibration or verification, the measurement interval, the accuracy of the measurement method and the person responsible for the measurements and measurement devices are listed for all dynamic parameters		X	
18.6	The measurement accuracy is reasonable.		X	
Plausibility check of the data and calculations				
18.7	For parameters identified as fundamental, a plausibility check ("cross-check") of the monitoring data with data from other sources is provided.		X	
18.8	The type of plausibility check of the monitoring data is appropriate.		X	
18.9	Each parameter that is used to check the plausibility of measured values is fully documented (details of the designation, description, unit and data source are filled out).		X	

checklist point		n / A	True	Does not apply
Influencing factors				
18.10	The influencing factors listed in section 3.2 of the project/program description and critical for the validation result are described in full (effect on project emissions or emissions of the program projects or the reference development).		X	
18.11	The intended adjustment of the reference development is described (when and in which cases it will be adjusted and how).		X	
18.12	The data source for each influencing factor is indicated.		X	

Table 19: Process and management structure

checklist Point		n / A	True	Does not apply
19.1	The responsibilities and processes for data collection and data archiving are clearly defined and appropriate.		X	
19.2	The responsibilities and processes for quality assurance /quality control are defined and appropriate.		X	
19.3	The processes for obtaining information are defined and appropriate.		X	
For programs only				
19.4	The process for managing the projects (roles of those involved, coordination and implementation, registration and admission process) are clearly defined.		X	
19.5	The process for collecting and storing the monitoring data from the various projects has been defined.		X	
19.6	For programs in which the monitoring is limited to a limited selection of representative projects: The criteria for the selection of the projects are specified and ensure that with these representative projects a significant misjudgment of the effective emission reduction of the program can be ruled out with a sufficient degree of certainty can.	X		

Table 20: Final assessment

checklist Point		n / A	True	Does not apply
20.1	Any information in the “Miscellaneous” chapter of the project/program description is understandable. Based on the information, there is no need for action with regard to the monitoring plan or requirements for the initial verification.		X	
20.2	All attachments are listed in full and documented accordingly. All references in the report are verifiable, correct and clearly assigned.		X	

checklist Point		n / A	True	Does not apply
20.3	The project/program description and supporting documents are complete and consistent. The date and versions of the documents were checked again at the end of the validation.		X	
20.4	The information in section 7.1 of the project/program description (declaration of consent to the publication of the documents) has been filled out completely.		X	
20.5	<p>The information on the project/program corresponds to the requirements of the CO₂ Ordinance.</p> <p>If there are deviations from the recommendations of Emission Reduction and Carbon Storage Projects and Programmes and the EC, these are highlighted in the validation report in the "Summary/Overall assessment" chapter. The VVS has also taken a position on this and confirms the equivalence of the deviations from the recommendations.</p>		X	

Annex 3: Overview of Findings

Findings Overview Summary

	CARs	CRs	FARs
Total Number raised	3	1	-

Date:	28/08/2022	Raised by:	Pitipoom T.
Type:	CAR	Number:	01
		Reference:	

Lead Assessor Comment:

Information inconsistency in MADD

1. Under section 2.1.1 mentioned that “No e-bused are currently in use.” but the section 2.6 mentioned “Penetration rates of e-bus are below 1% across all vehicle categories.” Also please provide evidence
2. Under section 2.5.1
 - a. the methodology name of T-VER-METH-TM-05 mentioned incorrect.
 - b. NCV Value of NG as 48 MJ/kg. is not sourced from DEDE (Ministry of Energy) as mentioned
 - c. Power consumption at 1.11 kWh/km. is not the same value used in the investment analysis
 - d. Grid emission factor is not the latest EF published by TGO. Also the footnote described the information contradict to requirement of methodology

Project Participant Response:

Date: 02/09/2022

1. The sentence “No e-buses are currently in use” has been updated in the MADD version 4.0 dated 2 September 2022 to reflect that there were no e-buses in operation before the start of the Bangkok e-bus Program.

The sentence “Penetration rates of e-bus are below 1% across all vehicle categories.” has been updated to be “the penetration rate of e-buses is lower than 2% for buses operating in Metropolitan Bangkok”, to be consistent with the common practice analysis in Annex A Part A2.
2. Formulae and parameters are now aligned to Version 03 of TM-05 and TM-06. Further information pertaining to the emission reduction calculations are in Annex A Part A3.

Documentation Provided by Project Participant:

1. 02092022 MADD_eBus_Program

Information Verified by Lead Assessor:

1. Reference the the updated MADD version 05.1 dated 20/09/2022, the sentence has been updated as “Nonetheless, the penetration rate of e-bus prior in Thailand, Bangkok Metropolitan Region was very small (less than 2%, refer to section 2.6 for additional information).”
Supporting evidence has also provided as the public available data on website of statistical bureau, Department of Land Transport (i.e. <https://web.dlt.go.th/statistics/index.php>). It is showing 115 buses are registered as electricity vehicle from total 8,831 buses (1.30%) in Bangkok Metropolitan region as of 31/05/2022. In addition, the dominant fuel type registered are contributed to natural gas at 65.90% and diesel at 32.77%.
2. The following adjustment have been checked;
 - a. All the reference to the applied methodologies are specified as T-VER-METH-TM05 Version03 and T-VER-METH-TM06 Version03.
 - b. In the response the NCV of NG is derived from the EPPO energy statistic report with additional reference of the density at 27.81873313 Tons/MMSCF (<http://www.eppo.go.th/index.php/th/petroleum/gas/ngv/ngv-unit>)
 - c. The letter from NEX (i.e. bus assembler) referenced to the manufacturer that electricity consumption will be vary from 0.7-1.1 kWh/km. hence in the ER calculation has been applied as the average from the minimum to maximum at 0.9 kWh/km. but in the investment analysis applied as 0.7 kWh/km with conservative manner.

d. The GEF has been updated to the latest information available on TGO website where it is 0.4771 tCO2/MWh for electricity consumer. And description in the footnote has been removed.	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 24/09/2022
CAR#01 is closed as result from revision in MADD and supporting evidence provided.	
Acceptance and Close out by Lead Assessor:	Date: 24/09/2022

Date:	28/08/2022	Raised by:	Pitipoom T.		
Type:	CAR	Number:	02	Reference:	

Lead Assessor Comment:

Additionality Demonstration

1. Following section 6.1 of ER-CS-PP, the additionality have to proof with the economic feasibility analysis (with sensitivity analysis) and common practice analysis. As well as the specific information for programmes which mentioned the guidance that “*Additionality is demonstrated at the level of programm’s planned component activities and not at the programme level.*”
2. Please substantiate that all the figures and information used for investment analysis are available at the time of decision making.
3. From the supporting evidence provided, please justify to below issues;
 - a. Is there any different in operational cost of the e-buses with battery capacity with 302.14 kWh & 151.07 kWh?
 - b. Evidence to the battery replacement cost is not related to the cost of battery. It is the different cost of e-buses with battery capacity with 302.14 kWh & 151.07 kWh. Also why the e-bus need to be replace battery in 7 years basis, what is the remaining battery capacity at year 7?
 - c. Why the office and terminal construction have to be included as CAPEX and multiplied with 5?
 - d. As per the power purchase agreement, it is not specific electricity rate at 4.60 THB/kWh. Please confirm the assumption used.
 - e. Following the confirmation from NEX, why the electricity consumption rate has been considered as 1.1 kWh/km? As the letter showing the consumption rate is in the range 0.7-1.1 kWh/km.
 - f. Average labor cost of the driver and steward in the analysis are not consistent with evidence provided (i.e. driver at 1,000 THB/day and steward at 750 THB/day).
 - g. What is the activity of daily bus maintenance which cost at 500 THB/day?
 - h. Why the terminal expense have to be considered in the analysis? Is it related to only 154 bus operation? Also the land rental fee are not consistent to the figure used in the analysis.
 - i. Why the analysis have to be considered both construction of terminal & terminal rental fee?
4. No evidence provided for the following values;
 - a. Revenue : Average No. of bus ticket per trip and ticket scheme/price
 - b. ITMO price

Project Participant Response:

Date: 02/09/2022

1. The additionality is demonstrated at programme level which covered 154 e-Bus.
2. All figure and information used for investment analysis are available prior to the investment decision making date, May 23rd, 2022.
3. Supporting evidence
 - a. The different of operation cost between e-bus with battery capacity 302 kWh and 151 kWh is the cost battery pack replacement at end of life, 7years
 - b. The cost of battery replacement and technology lifetime has been provided by the manufacture. The end-of-life battery pack from e-bus would be applied to another application such as battery bank or battery storage.
 - c. The office and terminal construction cost has been indicated to 5 specific terminals.

- d. The assumption of electricity rates has been revised to 4.13 THB/KWh, based electricity cost 2.48 THB/KWh and charging cost 1.30 THB/KWh
 - e. The consumption rate in the financial analysis has been revised to 0.7 kWh/km for conservativeness
 - f. Labour cost of driver and steward have been revised to 1,152 THB/day and 840 THB/day as per the company's labour structure
 - g. The daily maintenance task contains filling refrigerant, charging staff and water level of coolant.
 - h. The bus terminal is an essential component to the operation of buses. At end of the day buses must park and maintenance. Hence, bus terminal expense should consider in the analysis. The total capacity of 5 terminal mentioned in the analysis is 650 buses. As a result, the input value has been considered convert to 154 buses.
 - i. Bus terminal construction considered as CAPEX. At end of the day buses must park and maintenance. Hence, bus terminal expense should consider in the analysis. Then, Terminal rental fees considered as OPEX with fixed outflow. This expense is monthly recurring with the long-term lease contract without terminal rental the operation of buses cannot operate.
4. No evidence provided for the following values;
- a. No. of bus ticket per trip data referred to operation historical data. Ticket scheme/price Estimate based on the middle price range of DLT concession license (15,20,25).
 - b. ITMO price referred to the assumption of cost of ownership submitted to Klik foundation

Documentation Provided by Project Participant:

- 1. 01. Bangkok E-Bus_Financial Analysis_02SSep2022
- 2. 02. General Meeting of Shareholders No 5/2022 (May 2022).
- 3. Supporting Documents
 - a. 03. Battery pack replacement Quotation (6Jan22)
 - b. 04. Confirmation letter from e-bus manufacturer
 - c. 05.1. Bus Terminal/depot construction quotation (22April22) and 05.2 Bus Terminal/depot construction quotation (06May22)
 - d. 06.1.MEA Electricity price performance and 06.2. MoU between Energy Mahanakorn and Thai smile bus (23Nov21)
 - e. 04. Confirmation letter from e-bus manufacturer
 - f. 07.1. TSB Salary Structure (Bus) (10Jan22) and 07.2. TSB Salary Structure (Terminal) (4April22)
 - g. 08. Buses maintenance quotation (9May22)
 - h. 10.1 Taling Chan_Bus Terminal Lease contract, 10.2 Beung Kum_Bus Terminal Lease contract, 10.3 Phrapadang_Bus Terminal Lease contract, 10.4 Pak Kred_Bus Terminal Lease contract, 10.5 Sutisan Bus Terminal Lease contract and updated 01. Bangkok E-Bus_Financial Analysis_02Sep 2022
 - i. 05.1 Bus Terminal/depot construction quotation (22April22), 05.2 Bus Terminal/depot construction quotation (06May22) and updated 01. Bangkok E-Bus_Financial Analysis_02Sep 2022
- 4. No evidence provided for the following values;
 - a. 14. Thai Smile Bus Historical Data
 - b. 09. EA_financials_incl Carbon (submitted 11May2022)

Information Verified by Lead Assessor:

- 1. The investment analysis provided from PP is covered 2 programm's planned component activities (project level) only. Hence there is no supporting evidence provided to demonstrate section 2.6 "Programme level additionality"
- 2. Following the evidences provided,
 - a. Buses purchased agreement was dated 15/06/2022 where after the date of decision making on 23/05/2022.
 - b. No evidence for the station construction cost of Prapadeang provided.
 - c. Reference to the station construction cost of Talingchan is incorrect mentioned.
 - d. Why the insurance fee is fixed throughout 14 years of analysis?
 - e. No fair values of the CAPEX (i.e. buses, batteries and terminal) considered at the end of analysis.

- f. The concession license for bus route S4 is provided however the bus operator mentioned in the license is Racha Road Co.,Ltd.
3. Following the evidences provided, some point need to be justified
 - a. See below,
 - i. It is unclear why the battery pack to be replaced have to considered both type B_NJL6106BEV and C_NJL6106BEV (mentioned in quotation) for e-bus model XML6115JEV?
 - ii. No evidence provided for the battery with capacity at 151 kWh, why using the half of cost to 303 kWh battery?
 - b. What is the fair values of the battery replaced as it would be applied to another application such as battery bank or battery storage?
 - c. See below,
 - i. Please clarify why the cost for station construction is not vary by the capability of the station? For example the cost for Talingchan is 6.24 M but can service only 57 buses in total.
 - ii. No any figure used information reference to the evidence "05.2. Bus Terminal depot construction quotation (06May22.pdf"
 - iii. No evidence provided for construction cost at Prapadeang terminal
 - iv. Also please clarify why the bus terminal and bus parking area mentioned in the concession license is not consistent?
 - d. Why the margin price using in the analysis is fixed as the highest 1.65 THB/kWh? It is vary from 1.65 to 0.60 THB/kWh.
 - e. PP considered the lowest electricity consumption rate following the confirmation from bus manufacturer.
 - f. See below,
 - i. It is unclear how to calculate the incentive for the bus steward at 309 THB/day. Also the evidence provided is the excel sheet, please confirm the reference to original document.
 - ii. Evidence provided for labor cost to station master is 500 THB/day, why the analysis is using 16,000 THB/month.
 - iii. No justification provided for the No. of Terminal Manager, Admin and Station Master using in the analysis.
 - g. As per the information in the concession license, the bus operator have the contract with Gold SC Co.,Ltd. for bus maintenance and equipment supply but the evidence provided is quotation from Auto Bus Service Co.,Ltd. Please clarify.
 - h. See below,
 - i. Land rental fee structure considered for Buengkum and Prapadeang are not following the information in the agreement
 - ii. No evidence provided for rental fee in Sutthisan station.
 - i. Clarification to the cost of terminal construction and land rental is satisfied.
4. Evidences for revenue estimated are provided.
 - a. See below,
 - i. The number of trip per day using in the analysis is inconsistent with minimum trip indicated in concession license.
 - ii. Historical record used for the average ticket per trip was calculated from 01/05/2022 – 07/07/2022 where not available at the time of decision making.
 - b. See below,
 - i. No reference of exchange rate using in the analysis (i.e. 37.5 THB/CHF)
 - ii. Please substantiate to showing that the investment analysis "09. EA_financials_incl Carbon (submitted 11May2022).xlsx" has been prepared and submitted to Kliik foundation before decision date.
 - iii. What is the assumption or scenario used to estimate the revenue from advertisement? And any cross reference to this value.
5. Benchmark selection for the project IRR is inappropriate following the guidance. As the bond yield is require for cost of debt demonstration only. And the investment to project also planned to source by loan and owned equity.

Reasoning for not Acceptance or Acceptance and Close Out:	Date: 07/09/2022
CAR#02 still open due to point No. 1, 2, 3, 4 and 5	
Project Participant Response:	Date: 16/09/2022
<ol style="list-style-type: none"> 1. The result of investment analysis has been provided to section 2.6 “Programme’s planned component activities additionality”. 2. Following the evidence provided, <ol style="list-style-type: none"> a. The cost of E-Bus could be refer to the e-bus quotation at 10th May 2022 which was before the investment decision date. b. Construction cost of Phrapadaeng is 2,923,616 THB as mentioned on the 05.2. Bus Terminal depot construction quotation (6May22), page 2. c. The reference cost of construction of Taling Chan Bus terminal has been updated. d. The cost of e-bus insurance covered only to the passengers and outsider regardless to the damages of buses. Hence, the mentioned cost of insurance is conservative. e. Fair value of CAPEX has been provided and included in financial analysis. Salvage cost of Bus is 55,000 THB/Bus, Salvage cost of Battery in 32 USD/kWh or 965 THB/kWh and Salvage cost Bus terminal is 0 THB Due. Bus Terminal would belong to the landlord after end of lease term. Hence, salvage cost of Bus terminal equal to 0 THB. f. Raja Road is sister company of Thai smile bus. 3. Following the evidence provided, some point need to be justified <ol style="list-style-type: none"> a. See below, <ol style="list-style-type: none"> i. The battery pack for E-bus with 302 kWh consist of 2 packs level, 2 Battery Packs of Type B_NJL6106BEV and 8 Battery Packs of Type C_NJL6106BEV with the certain amount as mentioned in the quotations. ii. According to the manufacturer, battery specification both 151 kWh and 302 kWh only difference in battery capacity, number of cells. Other relevant components still be the same. Hence, the cost of battery pack between 151 kWh and 302 kWh could be reduced by half as shown as in battery quotation. b. The fair value of second life of EV’s Battery pack matched to the salvage cost of Battery pack regardless to the application of them. Hence, 32 USD/kWh could be defined as fair value of battery bank or battery storage. c. See below, <ol style="list-style-type: none"> i. Suthisan and Taling Chan terminal are the new construction from empty land which requires civil work from ground to the building. Hence, the cost of construction compared to the total capacity of each are higher the other terminal. On the other hand, Bueng Kum, Pak Kret and Phra Padang plan to renovate from the existing infrastructure of each land. ii. The construction cost of of 05.2. Bus Terminal depot construction quotation (6May22), 2,923,616 THB came from 1,037,412 THB and 1,886,204 THB mentioned in Quotation iii. Construction cost at Prapadeang terminal mentioned in 05.2. Bus Terminal depot construction quotation (6May22) page 2 on the top of page, client project location. iv. The bus terminal and bus parking area mentioned in the concession license are the proposed locations which are not the final decision yet. However, after received concession licenses Thai Smile Bus choose another location that much more suitable to the operations. Also, the bus terminal location and other details could be amended as mentioned as DLT manual. d. According to the financial analysis, the annual distance of 154 buses is 4,923,850 km and 0.7 kWh/km consumption rates that equal to 3,446,695 kWh/year at 5 relevant bus terminals or 57,444 kWh/month/terminal. Considering to the full capacity of each 5 bus terminals, 543 buses indicate an average monthly electricity consumption is 202,549.28 which still falls under 1.65THB/kWh scenario. e. The lowest electricity consumption rate of each e-Bus is the most conservative in term of financial outflow. f. See below, <ol style="list-style-type: none"> i. The incentive for the bus steward has been updated from 309 THB/day to 295 THB/day as mentioned in 07.2. TSB Salary Structure (Terminal) (4April22) ii. The labor cost of station master has been revised to 500 THB/day at 22 days as same as to the other employee position. 	

- iii. Number of terminal employees could be referred to 07.3. TSB Salary Structure_2 (Terminal) (4April22)
- g. As per the information in the concession license, the bus operator have the contract with Gold SC Co.,Ltd. However, after received concession licenses Thai Smile Bus plans to deal with Auto Bus Service Co.,Ltd. instead due to lower cost of services. As a result, these details could be amended as mentioned as DLT manual.
- h. See below,
 - i. Land rental fee for Buengkum has been revised to 300,000 THB/month as mentioned in the agreement. Prapadeang's rental fee has been updated in-line to the agreement
 - ii. The evidence of Suthisan rental fee is the land lease survey report.
- i. Clarification to the cost of terminal construction and land rental is satisfied.
- 4. Evidence for revenue estimated are provided.
 - a. See below,
 - i. Concession License of the S4 route have been provided. Hence, the total minimum trip equal to 530 trip per day as mentioned in the financial analysis
 - ii. Operation historical data has been updated (March to April 2022) prior to the decision-making date
 - b. See below,
 - i. The currency rate between CHF and THB on 11 May 2022 was 34.85 THB/CHF ([Bloomberg 2022](#)). As a result, the currency exchange rates in financial estimation have been updated to 34.85 THB/CHF.
 - ii. The initial financial estimation has been prepared before the investment decision making date.
 - iii. The estimated revenue of advertisement referred to the quotation of 10 buses for 8 months with 990,000 THB. AS the result, the average advertisement income is 12,375 THB/Bus/ month.

The MADD has been updated as per the guidance of the ER-CS-PP 2022 section 6.3.1 Economic feasibility analysis. The economic feasibility analysis, IRR demonstrated the programme planed component comparing to the Benchmark analysis, WACC.

Documentation Provided by Project Participant:

- 1. 07092022 MADD_eBus Program
- 2. -
 - a. E-Bus Quotation_10May2022.
 - b. 05.2. Bus Terminal depot construction quotation (6May22), page 2. (2nd Submission folder)
 - c. 01. Bangkok E-Bus_Financial Analysis_06Sep 2022
 - d. 13. Bus Insurance Invoice (14Oct21). (2nd Submission folder)
 - e. 01. Bangkok E-Bus_Financial Analysis_06Sep 2022
 - f. 18. General Meeting Report_Takeover to others bus operators.
- 3. -
 - a. -
 - i. Confirmation communication Mine Mobility Corporation Co.,Ltd to Energy Absolutes PCL.
 - ii. Confirmation communication Mine Mobility Corporation Co.,Ltd to Energy Absolutes PCL.
 - b. Estimated Battery salvage cost provided from EA, ([FutureBridge, 2 Feb 21](#)) And 16. Bus_Salvage Sold.
 - c. -
 - i. Justification provided and updated in 01. Bangkok E-Bus_Financial Analysis_16Sep 2022
 - ii. 05.2. Bus Terminal depot construction quotation (06May22) (2nd Submission folder)
 - iii. 05.2. Bus Terminaldepot construction quotation (6May22) page 2 on the top of page, client project location. (2nd Submission folder)
 - iv. 19. DLT Manual, page, section 12.
 - d. Justification provided during the meeting 15 September 2022.
 - e. 01. Bangkok E-Bus_Financial Analysis_06Sep 2022.
 - f. -
 - i. 07.2. TSB Salary Structure (Terminal) (4April22) (2nd Submission folder)

- ii. 01. Bangkok E-Bus_Financial Analysis_06Sep 2022.
- iii. 07.3. TSB Salary Structure_2 (Terminal) (4April22)
- g. 19. DLT Manual, page, section 12.
- h. –
 - i. 01. Bangkok E-Bus_Financial Analysis_16Sep 2022.
 - ii. Bus terminal land survey report.
- 4. –
 - a. –
 - i. 15.8 Concession License_S4 (549) and 01. Bangkok E-Bus_Financial Analysis_06Sep 2022.
 - ii. Thai Smile Bus Historical Data_March to April 2022
 - b. –
 - i. ([Bloomberg 2022](#)) and 01. Bangkok E-Bus_Financial Analysis_06Sep 2022.
 - ii. 07.1. KliK and EA_TCO and expected ITMOs Email communication and 07.2. EA_financials_incl Carbon (submitted 11May2022).
 - iii. 17. Advertisement Income_18Feb22 and clarification email from TSB
- 5. 20. ER-CS-PP_Juy 2022, page 41 section 6.3.1 and page 43 Benchmark

Information Verified by Lead Assessor:

1. PP has changed the section title to consistent with the level of additionality demonstration where it is Programme's planned component activities additionality. This is in compliance with the specific information for programmes in section 6.1 of *ER-CS-PP that additionality is not demonstrate at program level.*
2. Additional information provided as below;
 - a. The buses quotation before starting date of project has been provided, dated on 10/05/2022.
 - b. Evidence provide and consistent to information in the analysis sheet.
 - c. Revised the reference of station construction cost of Talingchan.
 - d. PP considered only the insurance fee to cover the public insurance to third parties, not the damage of own buses. Hence this is conservative for inclusion.
 - e. Fair value of the buses and battery have been included in the analysis with appropriate evidence provided. But the salvage of bus terminal has not been considered as it will belong to landlord after lease term.
 - f. Clarification of the relationship between Racha Road and Thai Smile Bus is satisfied, also there is the meeting report provided as evidence.
3. Below points are assessed;
 - a. Clarification letter from the buses assembler confirm that 2 series of battery pack are suitable for buses purchased for project activities which need to be replaced at year 7. Also the cost of battery pack for the buses with capacity between 302 kWh and 151 kWh could be reduced by half.
 - b. Fair value of the replaced battery pack has been considered in the year 7 and the same amount in year 14.
 - c. See below,
 - i. Clarification from PP is satisfied as the cost related to bus terminal construction are consist of two different works (i.e. new construction and renovation). The cost for the new construction is higher when comparing to the cost of renovation.
 - ii. Reference of the construction cost is provided and found consistent at 2,923,616 THB.
 - iii. Evidence is provided and found satisfied.
 - iv. Bus terminal location have been changed and updated to the most appropriate implementing circumstance.
 - d. Considering to the maximum capacity of 5 bus terminals at 543 buses, the electricity consumption still fall under the margin price at 1.65 THB/kWh scenario. Hence the later buses to be added to the program have to be justify on the margin price.
 - e. Closed.
 - f. See below,
 - i. PP revised the cost (incentive for the bus steward) to be 295 THB/day consistent to the evidence provided.
 - ii. The cost structure of station master has been changed to 6 days/week and resulted as 13,000 THB/month.

- iii. No. of Terminal Manager, Admin and Station Master are 1, 2 and 2 respectively. In the analysis have considered conservative manner by multiply the cost with the portion of buses comparing to the station capacity.
- g. With the lower maintenance cost hence the PP decided to change the maintenance company to Auto Bus Service Co.,Ltd.
- h. The rental fee for Buengkum and Prapadeang have been revised to consistent with structure in the agreement. As well as, the evidence for Suthisan is provided.
- 4. See below,
 - a.
 - i. In the updated investment analysis, total trip per days has been revised to 530 trips consistent to the concession license.
 - ii. Statistical data of average ticket per trip is adjusted to inline with decision making date. However the result still the same at 52 tickets/trip/bus.
 - b.
 - i. Exchange rate reference is provided and the same have been adjusted in the analysis sheet at 34.85 THB/CHF
 - ii. Evidence of email as the initials investment sheet has been prepared and submitted to Klik Foundation before the decision making date.
 - iii. PP using the actual agreement to estimate the advertisement revenue @ 12,375 THB/bus/month with the assumption that 50% of bus are occupied with the advertisement contract. This found reasonable.
- 5. The benchmark using in the revised MADD is developed from the WACC. Considering the evidences provided the below information are assessed;
 - a. Debt – Equity ratio – following the analysis sheet that EA submitted to Klik Foundation for initial MOPA application at 70-30.
 - b. Cost of Equity – following the default values of the CDM tool 27 latest version (version 11.0) for group 2 project categories (including transport) in Thailand at 11.04%
 - c. Cost of Debt – referenced to the loan agreement of EA with commercial bank before the decision making date at 3.44%
 - d. Corporate tax rate – following regulation at 20%

With the values verified as above, the WACC result as 5.24%

Reasoning for not Acceptance or Acceptance and Close Out:	Date: 24/09/2022
Reference to the justification and evidences provided, hence CAR#02 is closed.	
Acceptance and Close out by Lead Assessor:	Date: 24/09/2022

Date:	28/08/2022	Raised by:	Pitipoom T.
Type:	CR	Number:	03
		Reference:	

Lead Assessor Comment:
Stakeholder engagement
Reference to section 2.4.7 of MADD version 3.0 dated 19/08/2022, information is missing as below;
Stakeholder engagement: Identification of and consultations with stakeholders. What partnerships or legal means (appeals, grievance) are in place / necessary to ensure the fundamental rights of the stakeholders? Also the last sentence mentioned in MADD “CCME will perform further stakeholder consultation to identify any risks regarding stakeholder rights prior to project implementation”.

Project Participant Response:	Date: 26/09/2022
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The stakeholder engagement was revised in section 2.4.7 of MADD version 5.2 dated 26 September 2022 stating that the first stakeholder consultation was organised in early August 2019 involved private sector operator representative to explore the possibility and interest to develop and implement the Activity. The activity is further studied and developed in collaboration with government sector and established as “Bangkok e-bus program”. The fundamental rights for grievance are also included for both bus users and bus operator (individual employee) in section 2.4.7 as complaint communication channel via call centre and website. The last sentence was a typo error and has been updated in section 2.4.7. Another stakeholder engagement was also conducted with the passengers and communities along the bus route as part of sampling survey of passengers from October 2021 to April 2022 by Thai Smile Bus (Bus operator). From the survey, a significant number of respondents indicated their agreement to the development of the Bangkok e-Bus Program, and there was no objection or concern about the development of the Bangkok e-Bus Program.

Documentation Provided by Project Participant:	
MADD version 5.2 dated 26 September 2022	
Information Verified by Lead Assessor:	
In the revised MADD, information of stakeholder engagement has been updated with the main stakeholder identification into 5 groups and deleted the inappropriate information in the last sentence. The brief information of stakeholder consultation have been described for each main stakeholder including the topics discussed, concerned issues raised and the channel for further communication between the program and stakeholder. These found consistent with the guidance in MADD format version 04.	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 26/09/2022
CR#03 is closed due to the additional information of stakeholder engagement has been described followed the requirement.	
Acceptance and Close out by Lead Assessor:	Date: 26/09/2022

Date:	28/08/2022	Raised by:	Pitipoom T.
Type:	CAR	Number:	04
		Reference:	

Lead Assessor Comment:	
<u>MADD description</u>	
There is no description of following point in the MADD version 3.0 dated 19/08/2022;	
<ol style="list-style-type: none"> 1. Table 1 "Mitigation activity proponent", the information of <ol style="list-style-type: none"> a. Entity that claims the legal right on the mitigation outcomes b. Entity that claims the right to request the creation and transfer of ITMOs 2. Table 1 "Summary", it has been described the summary of Bilateral Agreement. But there is no information of Mitigation Activity (e.g technology, number of buses planned) 3. Section 1.2.7 "Role of Carbon", please clarify who will be the beneficiaries of the payments. 4. The procedure for registering planned component activities : Reference ER-CS-PP section 2.8.1 <ol style="list-style-type: none"> a. Specific information for programme : The procedure for registering planned component activities in programme must be specified in the programme description 5. Crediting period of programme : Reference ER-CS-PP section 2.8.2 6. Description and evidence demonstrated that methodologies applied in the programme have been recognised by the FOEN 7. Expected emission reduction : Reference ER-CS-PP section 5.4 and VV-DPP section 5.2.2 "Expected project and reference emission" <ol style="list-style-type: none"> a. Specific information for programme : An ex-ante estimate of the expected reference and project emissions at programme level is always required. 8. Monitoring Plan : Reference VV-DPP section 5.2.4 "Measurement procedure and measurement interval for monitoring" <ol style="list-style-type: none"> a. Minimum requirement for measurement accuracies are specified by the applicant b. Verification of meter that are relevant for billing, in accordance with the provision of the Measuring Instruments Ordinance of 15/02/2006 (MIO, SR 941.210) 9. Reference CO2O Article 6 Letter n point 2 : Strategy for financial sustainability that cover the long term operation and maintenance of the technology after the end of crediting period 	
Project Participant Response:	Date: 02/09/2022
<p>1-9: The MADD has been updated, please refer to MADD version 4.0 dated 2 September 2022.</p> <ol style="list-style-type: none"> 1. Please refer to footnote 1. 2. The point has been added "This project activity will replace the use of conventional (diesel & natural gas) buses with e-buses on a minimum number of 122 (existing and new) privately operated bus routes that provide a regular, scheduled service within the Bangkok Metropolitan area." 	

<ol style="list-style-type: none"> 3. The sentence “As the TCO will be borne by the project activity operator, the beneficiary of the payments is the project activity operator.” has been incorporated into section 1.2.7 4. The procedure for registering CPA has been elaborated in section A1.2 of Annex A Part 1: “As to the procedure for registering planned CPA into the Program, the T-VER standard is flexible to allow the inclusion of additional CPA(s) with similar planned component activities to be included after the validation and registration of the T-VER PoA. TGO would review the validated PoA-DD for inclusion of planned component activities (CPA) into programme”. 5. Refer to #4. 6. Please refer to the email “BKK e-bus program: application of the methodologies”, where it is mentioned that the Bangkok e-bus Program applies the T-VER standard for claiming emission reduction, and sought FOEN’s concurrence on the use of the T-VER methodologies and its version. 7. The ex-ante estimate of the expected reference and project emissions at programme level are in Annex 1 Part 3, Tables A14 and A15. 8. Where meters are concerned, the calibration frequency of the electricity consumption meters are described in Annex 1 Part A3. 9. Please refer to sections 1.2.8 and 2.4.8, where we explained that the additionality analyses are based on a 14-year period, which extends the Activity beyond the 7-year crediting period, and that carbon finance will be required for the 14-year period for the Activity to be considered as financially viable. 	
Documentation Provided by Project Participant:	
<ol style="list-style-type: none"> 1. <i>02092022 MADD_eBus_Program</i> 2. <i>BKK e-bus program- application of the methodologies</i> 	
Information Verified by Lead Assessor:	
<ol style="list-style-type: none"> 1. Energy Absolute Public Company Ltd is only one entity that claims the legal right on the MO and the right to request the creation and transfer of ITMOs. 2. In the revised MADD, the summary has been included the details of Mitigation Activity following the MADD format version 4 dated 12/04/2022. 3. Section 1.2.7 has been updated. 4. Procedure to registering the planned component activities has been updated under section A1.2 “Detailed description of the Bangkok e-bus Program” including the routes and inclusive criterias. 5. PP have revised the crediting period of program under MADD as 01/10/2022 – 31/12/2030 following the FOEN criteria and guideline. 6. PP emailed to FOEN to confirm that methodologies to be applied in the project activities which are T-VER-METH-TM05 and T-VER-METH-TM06. 7. Ex-ante estimation of expected emission reduction have been justified. With reference to project implementation plan, the first year (2022) will consider only the ER from 2 CPAs and the rest of planned component activity will be added to the programme by the mid of 2023. Hence it is estimated to 75% of total buses route in concession license. Then the expected ER from 2024-2030 are calculated with 100% buses. 8. PP mentioned that the electricity meter which use for e-buses charging will be calibrated in the first year and every 3 years afterwards. 9. The investment analysis to demonstrate additionality has been carried out with 14 years operational lifetime of e-bus. This is showing that the project can continue and sustain the operation after the crediting period of the MA in 2030. 	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 24/09/2022
CAR#04 is closed due to the correction in the revised MADD to meet the requirements.	
Acceptance and Close out by Lead Assessor:	Date: 24/09/2022

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A.4 Annex 4: Team Members Statements of Competency and Declaration of Independence

Statement of Competence and Declaration of Independence

Name: Pitipoom Tungsiriteekul

Role in the Project

- Lead Assessor	<input checked="" type="checkbox"/>	- Technical Expert	<input checked="" type="checkbox"/>
- Local Assessor	Thailand	- Technical Reviewer (Quality Manager)	<input type="checkbox"/>

Scopes of Expertise

- | | |
|-------------------------------------|-------------------------------------|
| 1. Energy efficiency in households | <input type="checkbox"/> |
| 2. Renewable energies in households | <input type="checkbox"/> |
| 3. Energy efficiency in industry | <input checked="" type="checkbox"/> |
| 4. Renewable energies in industry | <input checked="" type="checkbox"/> |
| 5. Buildings | <input type="checkbox"/> |
| 6. Waste | <input checked="" type="checkbox"/> |
| 7. Biogas | <input checked="" type="checkbox"/> |
| 8. Methane reduction in agriculture | <input type="checkbox"/> |
| 9. Electromobility | <input checked="" type="checkbox"/> |
| 10. Public Transport | <input checked="" type="checkbox"/> |

I hereby confirm my independent, impartial and free from conflicts of interest during the validation process in particular the customer of the validation and the operators of the individual projects.

Signature: Pitipoom Tungsiriteekul Date: 19/08/2022

Statement of Competence and Declaration of Independence

Name:

Role in the Project

- | | | | | | |
|---|----------------|--------------------------|---|--------------------------------------|-------------------------------------|
| - | Lead Assessor | <input type="checkbox"/> | - | Technical Expert | <input type="checkbox"/> |
| - | Local Assessor | <input type="checkbox"/> | - | Technical Reviewer (Quality Manager) | <input checked="" type="checkbox"/> |

Scopes of Expertise

- | | | |
|-----|----------------------------------|-------------------------------------|
| 1. | Energy efficiency in households | <input type="checkbox"/> |
| 2. | Renewable energies in households | <input type="checkbox"/> |
| 3. | Energy efficiency in industry | <input checked="" type="checkbox"/> |
| 4. | Renewable energies in industry | <input checked="" type="checkbox"/> |
| 5. | Buildings | <input type="checkbox"/> |
| 6. | Waste | <input checked="" type="checkbox"/> |
| 7. | Biogas | <input checked="" type="checkbox"/> |
| 8. | Methane reduction in agriculture | <input type="checkbox"/> |
| 9. | Electromobility | <input checked="" type="checkbox"/> |
| 10. | Public Transport | <input checked="" type="checkbox"/> |

I hereby confirm my independent, impartial and free from conflicts of interest during the validation process in particular the customer of the validation and the operators of the individual projects.

Signature: Date: