This is a new section of the Public-Private Partnership Resource Center website and is currently in draft form. Your feedback is welcome: If you would like to comment on the content of this section of the website or if you have suggestions for links or materials that could be included please contact us at ppp@worldbank.org.

Photo Credit: Image by Freepik

E-bus Deployment Model for ERP

Download Chatbot

On this page: *E-Bus Deployment leveraging a New-Refurbish-Finance-Bulk-Fees model - Model 6 in the ERP Project Guidelines. Read more below, or visit Strategic Guidance for Country System Assessments, Guidance for Countries in Assessing ERC Projects, or Mobilizing ERC Finance.*

Project Type: Energy efficiency (Transportation)

Sector: Transport

Applicable Project Methodology: VM0038 Methodology for Electric Vehicle Charging Systems

The objective of this project type is to implement an electric bus transport system as a means of reducing greenhouse gas (GHG) emissions in the transportation sector. The project proponent will replace the current fleet of internal combustion engine buses with new e-buses. This program will focus on introducing e-buses on existing bus lines thus replacing the usage of conventional diesel and natural gas buses. Additionally, a charging station service network can be established to facilitate the charging of these e-buses.

Proposed Structure of this Public Private Partnership (PPP) Model

The project will be leveraging a **New-Refurbish-Finance-Bulk-Fees** model. To convert the current public utility buses to electric vehicle (EV) buses with the appropriate charging infrastructure leveraging both supported financing and subsidies from the party purchasing the emission reduction credits will require commercial coordination that may be best handled by a new private entity working closely with the municipal government or state-owned entity and relevant transport authorities. Given the potential for negative impacts to the business of bus operators, engaging an independent new entity, and a non-profit organization as is assumed in this model, to execute the project activities may enable better cooperation and buy-in from all parties involved.

Table 1: Model Attributes

Dimension	Attribute	Description
Business	*New*	This model assumes that a new entity will be created to coordinate the procurement, deployment, maintenance, financing, and monitoring of the project
	Existing	
Construction	*Build*	The model involves the replacement of existing public utility buses with their EV counterparts, as well as the installation of charging ports to service them
	Refurbish	
Private Funding	*Finance*	The project company will be supporting the bus operators involved in securing financing for the non-subsidized portion of the EV bus purchase price, while financing for the installation of the charging ports and the subsidies will be the obligation of said new entity
Service	*Bulk*	The project company will be collecting payments from the government or state-owned entity for the service of replacing the current lighting
	User	
Revenues	*Fees*	Revenues in this model will originate from the pre-agreed payments of the municipality to the private company for the service of replacing the current lighting
	Tariffs	

Proposed risk allocation of the Public Private Partnership Model

Risk allocation	Public	Private
Design		●
Build		●
Financing		●
Operations and maintenance		●
Demand/Revenue Upside	●	●

Key features of PPP structure

- Private sector entity to design, build, finance, operate and maintain public transport project via a long-term agreement with the ministry/ government or state-owned entity
- The private sector entity acts as the implementation partner, and is responsible for all activities related to the implementation, management, monitoring and reporting of the project over the project crediting period
- In exchange, private sector entity can earn the fees from public transport use by end users as well as EV charging services

- Ministry offers long term concession agreement to the private sector entity operating company in exchange for receiving a portion of proceeds from emission reduction credit (ERC) sale
- Potential to include financiers in this PPP structure in exchange for portion of ERCs earned in this project

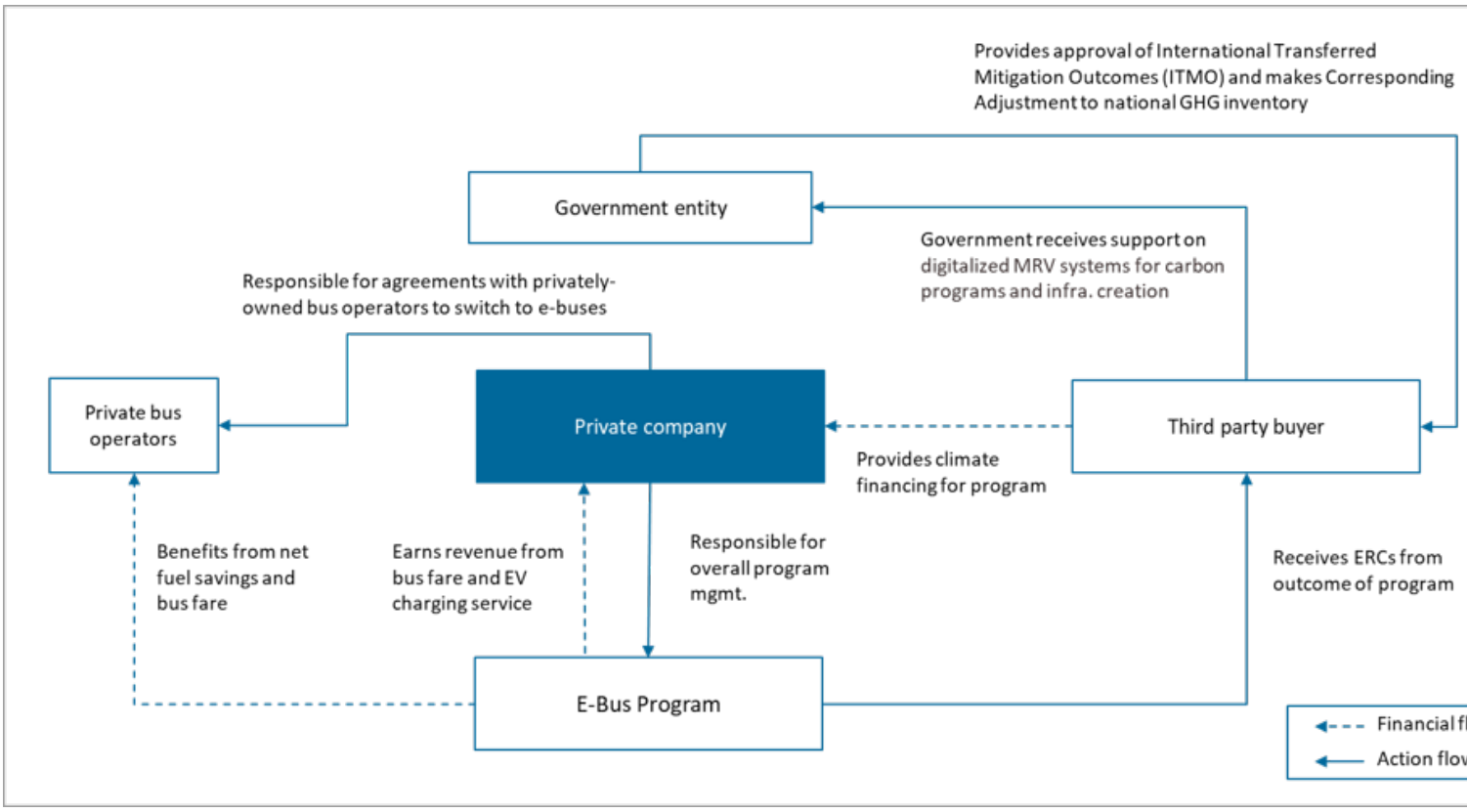
Expected ERC end use

- End use can belong to project developer as part of additional revenue stream

Key considerations/risks for proposed project

- Extensive stakeholder engagement required to ensure buy-in from operators of public transport as well as any other relevant stakeholders
- Need to consider any regulatory requirements of minimum domestic company involvement according to local company law
- Need to work with grid operators to ensure stable good energy grid capabilities to withstand increased electricity consumption from use of electric vehicles
- Demand for EV public transport will need to be high to justify project build out (e.g., increased public transport modal share from private vehicle usage)
- Stable political environment key to enable smooth execution of large-scale public transport project
- Partnering with a service provider for the project's marketing, sales and pricing is needed to identify potential offset buyers, negotiate contracts, and secure good target price per tonne to enable the financial viability of ERC generation
- Contracting a monitoring, verification and reporting (MRV) service provider with experience in conducting MRV and preparing the necessary documents for generating ERCs in a voluntary carbon market standard will reduce risk of registration and issuance delays or bottlenecks, and strengthen credibility of project's carbon integrity quality

Figure 1: Financing and Activity Flows for the Model



Case study: Bangkok E-Bus Program, Thailand

Project description

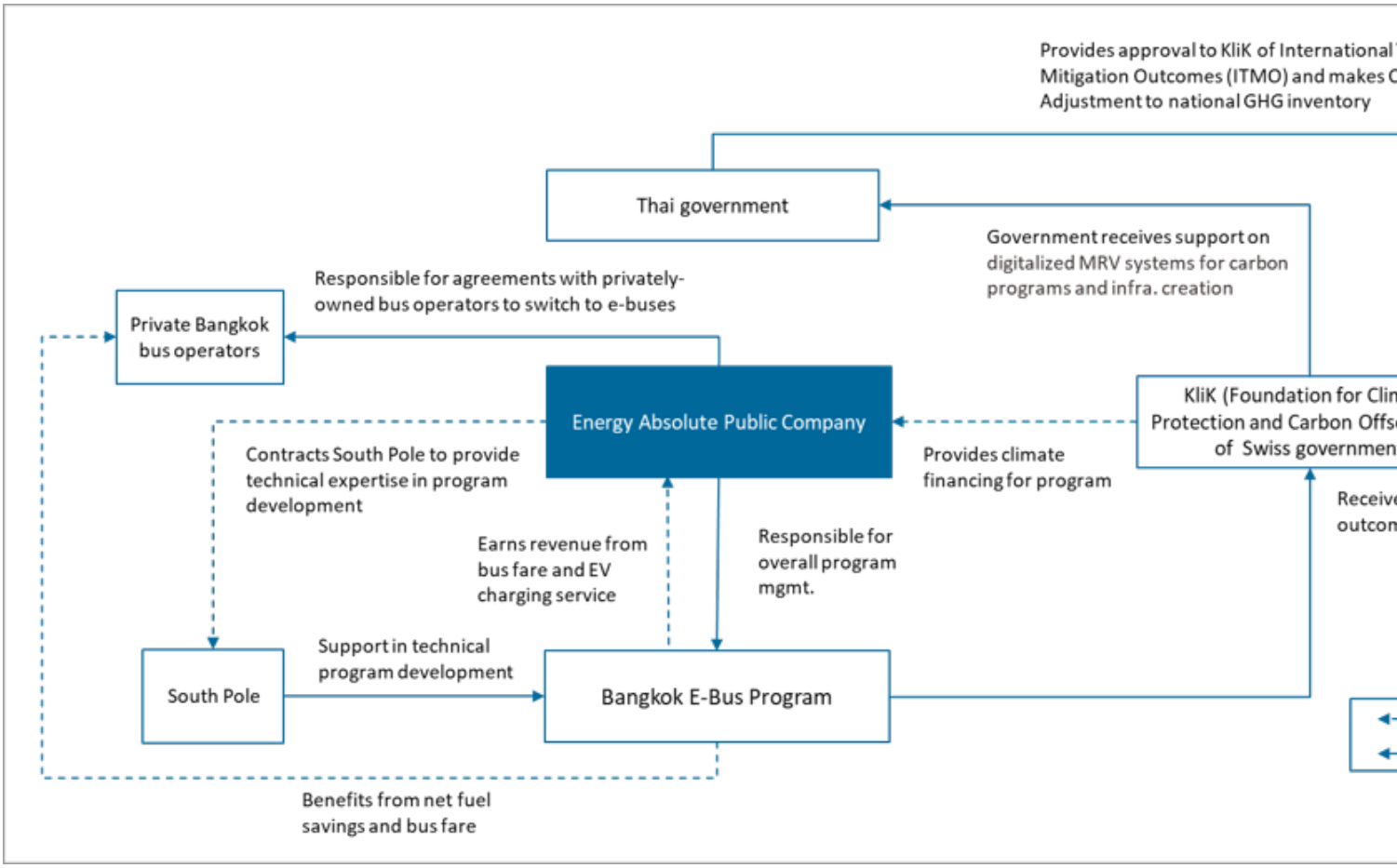
The program aims to introduce electric vehicles for privately-owned public transport in Thailand's capital Bangkok to reduce GHG emissions on a broader scale. Energy Absolute will enter into agreements with privately-owned operators of scheduled bus routes in the Bangkok Metropolitan Region with the 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 program will replace the use of 500 conventional (diesel & natural gas) buses with e-buses on a substantial number of existing and new privately operated bus lines that provide a regular, scheduled service. The daily bus ridership in Bangkok serves up to 800,000 to 900,000 passengers.

Targeted results

Expected ERCs from the program will be a minimum of 500,000 tonnes. The climate protection measure will contribute significantly to improving the air in the capital is expected to pioneer the electrification of Thailand's mobility sector.

Figure 2: Structure of Case Study PPP



Thailand and Switzerland signed a cooperation agreement on climate action under Article 6 of the Paris Agreement on 24 June 2022. This bilateral agreement regulates the cooperation between the two countries and establishes the legal framework for the implementation of climate protection activities by the KliK Foundation. The internationally transferred mitigation outcomes (ITMOs) achieved with KliK Foundation's

financial support are transferred in accordance with the bilateral agreement and used to meet Switzerland's emission reduction target under the Paris Agreement. The cooperation agreement ensures that the ITMOs, in addition to Thailand’s unconditional nationally-determined contributions (NDCs), meet the highest standards of quality, environmental integrity, sustainable development goals (SDGs) and human rights. To avoid double counting, Thailand commits to increase its emissions balance by the amount of ITMOs transferred to Switzerland.

Cooperation under the bilateral agreement leads to investments in climate mitigation technologies. The goal is to foster more efficient and more innovative businesses as well as more modern and cleaner technologies in Thailand. Until 2030, the KliK Foundation expects to support climate mitigation technologies in Thailand with $100 million (M)[1].

The experience to be gained from this KliK-supported Mitigation Activity will provide valuable insights on digitalized MRV systems for carbon programs and support infrastructure creation. In doing so, it will support greater NDC mitigation ambition for Thailand. Carbon finance by the KliK Foundation from the purchase of around 500,000 tonnes of ITMOs until 2030 shall be used to level total cost of ownership differential between baseline buses and the program e-buses.

Summary of the model financials

Assuming a similar project context of replacing 500 diesel-powered buses with E-buses, the project’s Net Present Value (NPV) only considering non-ERC inflows through other revenue streams or cost savings enabled by the project – is negative at $ 11 M. With ERC cashflows, total project finances improves to have a positive NPV of $ 2M. Generating ERCs is crucial in this type of project as it enables it to generate a positive cash flow in the long term. These projects may also find it difficult to be executed due to typically high upfront capital requirements (e.g., replacement of total bus fleet). ERCs can be effective in establishing market attractiveness for investors looking to finance green projects as well as obtain ERCs.

Table 2: Summary of sources of inflows and outflows and key assumptions

Value component	Assumptions	Sources
ERC revenues or inflows	• Two issuances across the project’s 7-year crediting period, at year 3 and year 7 • $50 per tonne today for 250,000 estimated tonnes of ERCs likely generated in the first issuance • 10% price increase to $55 for 250,000 estimated tonnes of ERCs likely generated for the second issuance	Based on assumption that unique project obtains price premium

Value component	Assumptions	Sources
Non-ERC revenues or inflows	• Scrap value for diesel-powered buses: $2900 per unit • Average kilometer (km) travelled for fixed route bus/year: 63,218 km • Average energy consumption by EV: 0.2 kilowatt hour (kWh) per km • EV charging use in Thailand cost: 0.25 per kWh • Daily bus ridership in Thailand: 900,000 • Operator revenue from EV charging service: 10% • E-bus useful life: 10 years	Press search
Project investment and implementation cost	• Number of buses to be replaced: 500 • E-bus cost per unit: $210,000 • Median cost of DC-50 EV charger: $54,500 • Project implementation cost: Assumed to be 5% of investment costs annually	Press search
ERC generation	• $10,000 for the project's registration and first issuance • $15,000 for each verification process across issuance cycles • $0.14 per tonne for subsequent issuances	Verra Fee Schedule

Table 3: Net cashflows summary (in USD)

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
ERC Component			
Revenues/Inflows	5,000,000	21,000,000	26,000,000
Costs/Outflows	0	-110,000	-110,000
Net value	5,000,000	20,890,000	25,890,000
Primary/Non-ERC Component			
Revenues/Inflows	91,450,000	1,264,360	92,714,360
Costs/Outflows	-107,725,000	-1,090,000	-108,815,000
Net value	-16,275,000	174,360	-16,100,640
Total Net Value			
NPV	$2,160,817		
NPV (ERC Component)	$13,152,067		
NPV (Non-ERC Component)	-$11,041,990		

Footnote 1: All prices are expressed in United States Dollars (USD)

Related Content

- **Guidance for Countries in Assessing ERC Projects (Download PDF version)**

Additional Resources

- Climate-Smart PPPs
- Finance Structures for PPP

This section is intended to be a living document and will be reviewed at regular intervals. The Guidelines have not been prepared with any specific transaction in mind and are meant to serve only as general guidance. It is therefore critical that the Guidelines be reviewed and adapted for specific transactions. Unless expressly stated otherwise, the findings, interpretations, and conclusions expressed in the Materials in this Site are those of the various authors of the Materials and are not necessarily those of The World Bank Group, its member institutions, or their respective Boards of Executive Directors or member countries. For feedback on the content of this section of the website or suggestions for links or materials that could be included, please contact the Public-Private Partnership Resource Center at ppp@worldbank.org.