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Proposed Loans, Grant and Administration of Loan and Grant

Republic of the Philippines: Market Transformation through Introduction of Energy Efficient Electric Vehicles Project

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CURRENCY EQUIVALENTS

(as of 6 June 2012)

Currency Unit	–	Peso (₱)
₱1.00	=	\$0.0230
\$1.00	=	₱43.53

ABBREVIATIONS

ADB	–	Asian Development Bank
ASR	–	Assessment, Strategy and Roadmap
BOI	–	Board of Investments
CDM	–	Clean Development Mechanism
CER	–	certified emissions reduction
CO ₂	–	carbon dioxide
CTF	–	Clean Technology Fund
DOE	–	Department of Energy
EIRR	–	economic internal rate of return
EV	–	electric vehicle
FIRR	–	financial internal rate of return
ICE	–	internal combustion engine
ICB	–	international competitive bidding
LGU	–	local government unit
Li-Ion	–	Lithium Ion
LIBOR	–	London interbank offered rate
Meralco	–	Manila Electric Company
NCB	–	national competitive bidding
PMU	–	project management unit
TODA	–	Tricycle Operators and Drivers Association

WEIGHTS AND MEASURES

GWh (gigawatt-hour)	–	1,000 megawatt-hours
kg (kilogram)	–	1,000 grams
kWh (kilowatt-hour)	–	1,000 watt-hours
mg (milligram)	–	0.001 gram
mm (millimeter)	–	0.001 meter
MW (megawatt)	–	1,000 kilowatts
MWh (megawatt-hour)	–	1,000 kilowatt-hours

NOTES

- (i) The fiscal year (FY) of the Government of and its agencies ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

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PROJECT AT A GLANCE

1. Project Name: Market Transformation through Introduction of Energy Efficient Electric Vehicles			
2. Project Number: 43207-013			
3. Country: Philippines		4. Department/Division: Southeast Asia Department/Energy Division	
5. Sector Classification:			
	Sectors	Primary	Subsectors
	Energy	√	Energy efficiency and conservation
	Transport		Transport management and policies
6. Thematic Classification:			
	Themes	Primary	Subthemes
	Economic growth	√	
	Environmental sustainability		
	Capacity development		
6a. Climate Change Impact:		6b. Gender Mainstreaming:	
Mitigation	High	Effective gender mainstreaming (EGM)	
		Gender equity theme (GEN)	
		No gender elements (NGE)	
		Some gender benefits (SGB)	√
7. Targeting Classification:		8. Location Impact:	
General Intervention	Targeted Intervention		
	Geographic dimensions of inclusive growth	Millennium development goals	Income poverty at household level
√			
9. Project Risk Categorization: High			
10. Safeguard Categorization:			
	Environment	C	
	Involuntary resettlement	C	
	Indigenous peoples	C	
11. ADB Financing:			
	Sovereign/Nonsovereign	Modality	Source
	Sovereign	Project loan	Ordinary capital resources
	Total		300.0
			300.0
12. Cofinancing:			
	Financier	Category	Amount (\$ million)
	Clean Technology Fund	Official-Grant	5.0
	Clean Technology Fund	Official-Loan	100.0
	Total		105.0
13. Counterpart Financing:			
	Source	Amount (\$ million)	
	Government	99.0	
	Others		
	Total	99.0	
14. Aid Effectiveness: Not Applicable			

I. THE PROPOSAL

1. This is a report and recommendation on (i) a proposed loan, (ii) proposed administration of a loan to be provided by the Clean Technology Fund, and (iii) proposed administration of a grant to be provided by the Clean Technology Fund to Republic of the Philippines for the Market Transformation through Introduction of Energy Efficient Electric Vehicles Project.¹

II. THE PROJECT

A. Rationale

2. Electric vehicles or e-vehicle represent a new technology with the promise to transform the way energy is used by today's internal combustion engine (ICE) vehicles. For net energy importing countries, such as the Philippines, electric vehicles can dramatically reduce the country's oil dependency, and improve long-term energy security. They are efficient, generate no harmful air and noise pollution and can be powered by indigenous renewable energy.

3. Countries around the world are introducing e-vehicles to reduce energy security concerns: for example, the government of Israel has created generous policy incentives to support its commitment to 100% electric vehicles by 2020; the United States Government provides rebates of up to \$7,500 per vehicle and have a target of one million electric cars by 2015. The International Energy Agency's Technology Roadmap², recently announced the proactive policies of the 17 countries—including the UK, Australia, Ireland, Japan, Singapore—that will support sales and deployment of seven million electric vehicles by 2020.

4. Accounting for the total energy consumed from well to wheel³, e-vehicles can reduce energy consumption by up to 50% and greenhouse gas emissions by up to 60% compared to ICE vehicles because: (i) no electricity is used while stranded in traffic jams (except air conditioning), (ii) energy losses in electric motors are about 5%-15%, compared with 70%-80% losses in the engines of ICE vehicles, and (iii) transmission and distribution of electricity is more efficient and cost effective than transportation of liquid fuels to the end user.

5. The Philippines is in the forefront of developing local e-vehicle industry—e-Trikes, e-Jeepneys, and e-Buses. Since 2009, e-vehicle enthusiasts have undertaken a number of small isolated initiatives, and the Government plans to fast track the process using electric tricycles or e-Trikes as a priority. In April of 2011, ADB introduced⁴, as a pilot, 20 locally made electric tricycles (e-Trikes) powered by imported Lithium-ion batteries in the City of Mandaluyong. Promising technical results has prompted the Government to scale-up the pilot program⁵ and use an early-adopter opportunity to establish a sustainable local e-vehicle industry. This initiative has also attracted a number of reputable global battery and car manufacturers in the country, who considers the local market as the launching pad for a potential export market for these \$4,000 to \$5,000 e-Trikes to neighboring countries in southeast and south Asia.

¹ The design and monitoring framework is in Appendix 1.

² Technology Roadmap: Electric and plug-in hybrid electric vehicles, International Energy Agency, June 2011. Available at http://www.iea.org/papers/2011/EV_PHEV_Roadmap.pdf

³ Energy consumed and green house gases (GHGs) emitted from the time a vehicle's energy source leaves the well to the time it is consumed by the vehicle, details available at: http://web.mit.edu/evt/summary_wtw.pdf

⁴ Financed by RETA 6441: Efficiency Improvement and Connectivity Strengthening in Southeast Asia. Manila.

⁵ Prepared by *Technical Assistance to the Republic of the Philippines for Mitigation of Climate Change through Increased Energy Efficiency and the Use of Clean Energy*. Manila. (TA 7754-PHI), ADB. 2010.

6. The Government plans to transform the nascent e-Trike industry to an industry with at least three large local e-vehicle manufacturer. Large reputable global electric car (and battery) manufacturers are focused on bringing in the early adopter's family car (Nissan Leaf, Chevy Volt and Toyota Prius) with price tag of about \$45,000 for markets in Europe, the United States, and Australia. The Philippine vision is to transform the "base of the pyramid", the tricycles, through technology leapfrogging. The combination of Lithium-ion battery technology and professionally designed e-Trikes to international standards will establish higher safety, environmental and efficiency principles. The proposed electric vehicle policy⁶ also directly supports electric vehicle related businesses and will provide tax-exemption on imported electric vehicles for nine years.

7. Use of Lithium-ion battery will also reduce the risk of re-introduction of Lead into the transport sector. Excessive use of e-bikes and e-Trikes with Lead Acid batteries and improper disposal prompted authorities in the Peoples Republic of China to crackdown⁷ the industry. Philippines faces the risk of large import volume of substandard tricycles with poor quality Lead acid batteries reintroducing Lead in the environment. This may add to existing concerns on illegal smelting⁸ of Lead. Detailed discussions on are in the supplementary document 24.

8. For this transformation, the Government has sought support from the Clean Technology Fund (CTF), which have resources amounting to more than \$4 billion pledged by major donors such as Australia, France, Germany, Japan, Spain, Sweden, the United Kingdom, and the United States. In December 2009, the Trust Fund Committee for the CTF endorsed the Philippine Country Investment Plan (CIP)⁹, which the Government updated and submitted for approval in June 2012 to use CTF funds to buy down the cost of transforming the energy use by the tricycles. A detailed discussion on emissions reduction is in supplementary document 23.

9. In 2010, the Philippines spent about \$10 billion¹⁰ (a 39% increase from 2009) on oil import or about \$27 million a day, of which 80% was for the transportation sector. The average cost of import was about \$80 per barrel and, on an average, between 30 to 40 days worth of inventory was in the system—key concerns on energy security. Preliminary modeling shows that a 7% electric vehicle penetration by 2015 and 15% by 2030, can reduce fuel imports by approximately 6% in 2015, 13% in 2020, and more than 40% by 2030 with more reductions in greenhouse gas emissions and air pollution.

10. The National Framework Strategy on Climate Change¹¹ 2010-2022, recognizes a low-carbon path in the transport sector as an essential element and promotes models to improve the transport sector's efficiency, as part of its strategic priority. The proposed Project is consistent with Department of Energy's Fueling Sustainable Transport Program (supplementary document 15) and the Alternative Fuel Vehicles Incentives Act of 2011. The promotion of new technology and energy efficient transportation solutions is part of the core lending strategy of the Assessment Strategy and Roadmap for the Philippine energy sector, and the program is in the Country Operations Business Plan¹², 2012-2014).

⁶ Senate Committee Report No. 44 on Senate Bill No. 285—Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2011. Available in the list of supplementary documents in Appendix 2.

⁷ Recently, government closed down 583 lead-acid battery manufacturing plants because of improper disposal of hazardous waste and poor technical standard. http://www.zhb.gov.cn/zhxx/hjyw/201108/t20110802_215645.htm

⁸ Philippines Department of Environment and Natural Resources recently ordered a nationwide campaign against illegal smelting of lead acid batteries. <http://www.gov.ph/2011/09/01/denr-orders-crackdown-on-illegal-used-lead-acid-battery-recycling-plants-in-region-3/>

⁹ Published in December 2009, available at: <http://www.dotc.gov.ph/Philippines%20CTF%20CIP%20Nov%2009.pdf>.

¹⁰ Source: Department of Energy, available at: <http://www.doe.gov.ph/DO/Report2010.htm>

¹¹ The National Framework Strategy on Climate Change 2010-2022 available at: <http://climate.gov.ph>

¹² ADB, Manila, September 2011, available at <http://www.adb.org/sites/default/files/cobp-phi-2012-2014.pdf>

B. Impact and Outcome

11. The impact of the proposed Project is sustainable energy use by the transport sector, and the outcome is the transformation of the tricycle industry through large-scale adoption of locally made energy efficient e-Trikes.

C. Outputs

12. The proposed Project has five outputs: (i) complete e-Trike units delivered to Local Government Units (LGUs) accompanied by a standard 3-year warranty; (ii) Lithium-ion battery supply chain with associated support services established; (iii) solar charging stations pilot in selected areas; (iv) material recovery from ICE tricycles and used batteries; and (v) successful communication, social mobilization and technology transfer.

13. **Output 1: E-Trike units.** The Project will deliver 100,000 complete e-Trike units to selected cities (para. 22) and areas to replace existing ICE tricycles. The supply contract will include a standard warranty on mechanical and technical performance of the e-Trikes. The risk of technical defects and poor performance of batteries during this guaranteed performance period (at least 3 years or 2,000 charges) will be borne by the battery manufacturer. All e-Trikes will be clearly marked with a “battery supplied by” (similar to “Intel Inside” in computers) label to make consumer aware of the brand and obligations of the suppliers under the project.

14. **Output 2: Battery supply chain.** The Project will initiate creation of Lithium-ion battery supply chain in the Philippines by creating an initial substantial¹³ market. The transformation objective is to attract reputable international suppliers, who have supplied at least one large global vehicle brand¹⁴.

15. **Output 3: Solar charging stations.** The Project will establish (i) on a pilot basis, 5 off-grid solar charging stations—200 kW each—either as a cluster or stand alone, (ii) certain number of grid-connected charging stations. The solar charging stations will be sufficient to support the electricity needs of 1,000 e-Trikes. Most of this off-grid charging stations will be in the two island locations—Boracay and Puerto Princessa. For other areas, certain number of grid-connected charging stations will be included to reduce the “range anxiety” of drivers. Existing electric utilities will also be encouraged to establish charging stations as commercial operation.

16. **Output 4. Material recovery from ICE tricycles and used batteries.** The Project will collect old ICE tricycles (both the side-car and the motorcycle), following the requirements of United National Framework Convention on Climate Change (UNFCCC). Used batteries (Lead Acid from ICE tricycles and Lithium Ion from e-Trikes) will also be recovered.

17. **Output 5. Communication, social mobilization and technology transfer.** All stakeholders will be educated about the project—its benefits, technical parameters, costs and market potential of e-Trikes. This includes specific training of the drivers on use and maintenance of e-Trikes and technical training to other stakeholders to develop local human resources to support local industry development.

¹³ By April 2012, Nissan sold about 11,000 electric cars (Nissan Leaf) in the US which required about 264 MWh of Lithium ion batteries—the 100,000 e-trike will need at least 300 MWh of Lithium ion batteries.

¹⁴ Table 5A: Manufacturers of EVs/PHEVs and partnering battery manufacturers, Electric and plug-in hybrid electric vehicles, Technology Roadmap, International Energy Agency, Updated June 2011

D. Investment and Financing Plans

18. The Project is estimated to cost \$504 million (Table 1). ADB will provide \$300 million from its ordinary capital resources, with a 15-year term, including a grace period of 5 years, an interest rate determined in accordance with ADB's London Interbank Offered Rate (LIBOR)-based lending facility¹⁵, and a commitment charge of 0.15% per annum, and such other terms and conditions set forth in the draft loan and project agreements. Based on these loan terms and repayment method, the average loan maturity is 11 years and there is no maturity premium payable to ADB. The CTF will co-finance the Project with a grant of \$5 million (\$1 million for capacity building and \$4 million for a solar charging pilot) and a loan of \$100 million, with a 40-year term, including a grace period of 10 years, a management fee of 0.10%, 2% principal payment (year 11-20), 4% principal payment (year 21-40) and an interest charge of 0.25% of disbursed and outstanding credit balance. ADB will administer the CTF funds. CTF funds will be used to blend with ADB's investment and to fill the investment gap. ADB will finance the financial charges during construction for both ADB and CTF loans. The Project will likely receive payments (about \$20 million) for carbon credits after the Project is implemented. The Government will finance the remaining \$99 million, including taxes and contingency amounts for the e-Trikes.

Table 1: Project Investment Plan^a
(\$ million)

Item	Total
A. Base Cost^b	
1. E-trike components	
a. Lithium Ion battery	118.80
b. Body and other parts	211.20
c. Motors	37.84
2. Supporting infrastructure	
a. Charging stations	0.48
b. Battery recycling	2.30
c. Old tricycles disposal/recycling	2.64
d. Communication, social mobilization and admin support	0.87
e. Solar charging station pilot	4.00
3. Consulting Support	-
a. Technology Transfer and Local Industry Support	0.87
b. Implementation Consultant	0.87
Sub-Total (A)	379.86
B. Contingencies^c	
1. Physical	44.38
2. Price	14.07
Sub-Total (B)	58.45
C. Taxes	51.25
D. Financial Charges During Construction^d	14.44
Total	504.00

^a Includes taxes and duties, government's contribution will be as tax exemption.

^b In mid-2011 prices.

^c Physical contingencies (11.6% for foreign and 12.6% for local base costs). Price contingencies at projected using the differential between international inflation rate and inflation rate on local currency costs.

^d Includes interest during construction and commitment charges. Interest during construction for ADB loan(s) has been computed at the 5-year London interbank offered rate fixed swap rate plus a spread of 0.4%. Commitment charges for an ADB loan are 0.15% per year to be charged on the undisbursed loan amount. ADB loan may finance local transportation and insurance costs. This covers interests accrued from both ADB and CTF loans.

Source: ADB Estimates.

¹⁵ Government's choice to borrow under LIBOR-based lending was its own independent decision.

Table 2: Financing Plan

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank	300.00	59.53%
Clean Technology Fund (loan)	100.00	19.84%
Clean Technology Fund (grant)	5.00	0.99%
Government	99.00	19.64%
Total	504.00	100.00

Source: Asian Development Bank estimates.

E. Implementation Arrangements

19. As the Executing Agency, DOE will be responsible for the overall implementation, technical supervision and execution of the Project. It will oversee and coordinate the implementation, monitoring and evaluation of the program; execute contract of sale agreements with the local government units to ensure effective implementation; and establish and oversee the Project Management Unit. DOE, as the EA, will lead in all project procurement activities including management of the supply and service contracts of various suppliers.

20. Landbank will pay the Bureau of Treasury of DOF the amount disbursed by ADB under the loan for the supply e-Trikes. Landbank will recover this amount from the LGU, which will repay Landbank the amount paid to the Bureau of Treasury. LGUs will allot the e-trikes to the drivers and charge a single-digit interest rate over the cost of the e-trikes from the supplier. This project will cover the cost of operation of the independent E-Trike office, which will act as a Project Implementation Unit. The drivers will repay this amount through daily payments (below 200 Pesos) over a 5-year period. The E-Trike office at a LGU may involve a private agency (or an NGO) for collection of the daily payment (boundary) from the drivers and use the collected fund to repay the Landbank loan.

21. To avoid the establishment of a national monopoly for the supply of e-Trikes, it is proposed that at least three vehicle manufacturers/assemblers will be selected through International Competitive Bidding for the supply and support of the vehicles in the Philippines in accordance with ADB's Procurement Guidelines (2010, as amended from time to time). The project will be organized into two phases: (i) a development phase, during which certain geographic supply packages will be procured to allow new operators to gain a foothold, plus allow the project to address any initial implementation issues, and (ii) a wider scale-up phase. The industry development phase is planned to be 24 to 30 months long, and a mid-term review will conclude this phase. The mid-term review will finalize the cities to be included in Phase II. Initial industry development phase will procure 20,000 e-Trikes, and the remaining 80,000 units will be manufactured and distributed over the remaining period of 30 to 36 months.

22. The following criteria were used for selecting cities: (i) the LGU leadership's commitment and interest in e-Trikes including own previous initiatives; (ii) commitment to set up public electric charging infrastructure; (iii) large number of existing ICE tricycles in the area; and (iv) the electricity supply and demand situation. Accordingly, the following sixteen areas were chosen for the industry development phase: Antipolo, Boracay, Cabanatuan, Caloocan, City of Manila, Dagupan City, Davao, Lipa City, Los Banos, Makati City, Mandaluyong City, Paranaque City, Puerto Princesa City, Quezon City, Sta Cruz, and Tarlac City.

23. The project will replace existing tricycles (ICE motorcycles with a side car) in the following order of priority: two stroke tricycles, tricycles that a driver owns, and older tricycles. ADB and the DOE will approve the selection criteria for each area—areas where the number of single stroke tricycles are less, drivers may be selected by a public lottery among the applicants. DOE and ADB will select a neutral party or a participating NGO to conduct public lotteries.

24. The overall implementation schedule is conservative, taking into account the nascent state of the industry. The implementation arrangements are summarized in Table 3 and are described in detail in the Project Administration Manual,¹⁶ which also include details on the selection process and selection criteria of the drivers.

Table 3: Implementation Arrangements

Aspects	Arrangements		
Implementation period	October 2012 – September 2017 (60 months)		
Estimated completion date	September 2017		
Management			
(i) Oversight body	Project Steering Committee headed by Secretary of DOE(Chair), National Economic and Development Authority (NEDA), Department of Transportation and Communication (DOTC) and Department of Environment and Natural Resources (DENR) as Members		
(ii) Executing agency	Department of Energy. DOE will establish a PMU to be responsible for: overall management and supervision of project implementation.		
(iii) Key implementing agencies	Local Government Units (LGUs) involved. First procurement package includes Puerto Princesa, Boracay, Mandaluyong City and Cabanatuan City.		
(iv) Implementation unit	LGU will create an E-Trike Office (PIU) which will be responsible for the implementation and monitoring of the Project at the ground level.		
Procurement: Industry Development Phase	International competitive bidding with domestic preference	Procurement of assembled vehicles with associated warranty and support services	\$ 110.64 million
Procurement: Scale Up Phase	International competitive bidding with domestic preference	Procurement of assembled vehicles with associated warranty and support services	\$ 216.25 million
Consulting services	Quality-and-Cost-Based Selection (QCBS) and Quality-Based Selection(QBS)	119 person-months (Project Implementation Consultant)	\$ 1 million
	Single- source selection (Individual Consultants)	36 person-months (Technology transfer and Local industry Support, Communications)	\$ 1 million
Advance Contracting	Advance procurement of 5,000 e-Trikes for Boracay (500 units), Cabanatuan (1,500), Mandaluyong (1000), Paranaque (1,000), and Puerto Princesa (1,500 units) in 2012		
Disbursement	Direct Payment for procurement packages. Separate Imprest Account for CTF and ADB for administration and other categories. The ADB loan and CTF loan grant proceeds will be disbursed in accordance with ADB's <i>Loan Disbursement Handbook</i> (2007, as amended from time to time).		

¹⁶ Project Administration Manual (accessible from the list of linked documents in Appendix 2).

III. DUE DILIGENCE

A. Technical Assessment

25. According to the Massachusetts Institute of Technology (MIT)¹⁷, more efficient battery technologies are providing a cleaner alternative to pollution-emitting internal combustion engines. In many cases, conventional motorcycles emit more pollution than even large SUVs because they are not equipped with equivalent emissions-control technology. An electric motorcycle can immediately eliminate tailpipe emissions, can dramatically reduce a city's overall pollution rate. GHG emissions could be negligible, as these e-vehicles can be powered with renewable energy, especially solar.

26. The United States Department of Energy views Lithium-ion battery technology as one of the most promising new battery options, due to its high energy and power densities and its potential to last the lifetime of the vehicle¹⁸. In 2008, MIT's Electric Vehicle Team designed eMoto¹⁹ and found that use of Lithium-ion batteries could reduce the weight of an electric vehicle battery pack by up to 76% (from 93 kg to 23 kg). The lighter vehicles with a longer battery life proved to be more cost efficient and were able to travel farther and accelerate faster than models using heavier battery technology. ADB's pilot project compared e-Trikes with different options: the Lithium-ion batteries (38 kg) were 72% lighter than the Lead acid (140 kg).

27. The 20 e-Trikes pilot project used different battery size and charging options: 10 e-Trikes with 3 kWh batteries for fast (20 minutes) charging in public stations, and the 10 e-Trikes with 6 kWh batteries with on board chargers for home charging (6 hours). The pilot concluded that: (i) Lithium-ion batteries are the sustainable battery choice; (ii) properly designed e-Trikes are capable of meeting the variable range, speed, and terrain considerations in the Philippines; (iii) fast charging is possible and can be locally designed and built; (iv) due to sophisticated battery and charging technologies, the drivers and LGUs will not be able to manage the risk of a faulty battery; and (v) the fuel savings are significant and are sufficient to support a rent-to-buy e-Trike scheme for the drivers. This e-Trikes financed by this project will use Lithium ion batteries.

B. Sustainability

28. Local support infrastructure and technical capacity is an essential pre-requisite for the Project. In 2008, one Manila city bought 200 e-Trikes (with lead acid batteries), unfortunately, only less than 10 are still operating. Apart from the main problem of lack of cash to replace Lead Acid batteries within 12 to 15 months, lack of ongoing technical support contributed to this failure. The lesson from the Mandaluyong pilot is similar: to make e-Trike initiative sustainable an essential pre-requisite will be a vibrant local industry that will provide, among others, skilled technicians, repair and support services, insurances, charging stations, and spare parts.

29. The project will transform the risk allocation: the owner of e-Trikes will not absorb the risks associated with this new technology, the battery manufacturers are best placed to manage the risk of poor performing batteries. By backing off the risk of unreliable batteries through the supply chain, via the vehicle supplier, the risk will be allocated to the battery maker.

¹⁷ The Technology Review, published by MIT, 2007, available at: <http://www.technologyreview.com/energy/19069/>.

¹⁸ Center for Transportation Research Argonne National Laboratory, operated by The University of Chicago, for the United States Department of Energy. Available at: <http://www.transportation.anl.gov/pdfs/TA/149.pdf>

¹⁹ An electric motorcycle that demonstrated low cost electric vehicle, available at: <http://web.mit.edu/evt/emoto.html>.

C. Financial Analysis

30. Broadly, typical tricycle driver uses approximately \$5²⁰ worth (5 liters) of gasoline to drive 100 km per day but can save about \$4 per day by switching to an electric tricycle, which consumes 5 kWh of power costing \$1²¹. With large-scale adoption, these individual savings could accumulate to a significant national savings of over \$4 billion per year. Replacement of 100,000 gasoline tricycles with electric tricycles at a cost of \$450 million, for example, can generate about \$175 million each year from avoided fuel imports. Detail financial analysis was carried out in real terms using 2011 prices, that examined the aggregate costs and incremental benefits measured by the revenue from drivers or users.

D. Economic Analysis

31. The Project's economic analysis is based on incremental cost and benefit streams associated with the Project component, whose economic performance is evaluated by comparing with- and without-Project scenarios. Benefits are derived mainly from the fuel savings or avoided costs from the importation of fuel and income from the boundary payments of drivers/users. The overall economic internal rate of return exceeds the economic hurdle of 12%. This indicates that the Project, from the perspective of the Government, is economically viable.

E. Governance

32. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the Government. The specific policy requirements and supplementary measures are described in the Project Administration Manual.²² To ensure transparency and good governance, DOE will publicly disclose on its website information on how loan proceeds are being used. For each procurement contract, LBP and DOE will disclose (i) the list of participating bidders; (ii) the name of the winning bidder; (iii) basic details on bidding procedures adopted; (iv) the amount of the contract awarded; (v) a list of goods and services purchased; and (vi) the intended and actual utilization of loan proceeds under each contract being awarded. ADB will organize special training for LBP, DOE and PMU staff covering all aspects of Project implementation and ADB procedures, including procedures for implementation, procurement, use of consultants, disbursement, reporting, monitoring, and prevention of fraud and corruption.

F. Poverty, Social and Gender

33. With an e-Trike the drivers will receive a higher daily take-home pay. In Davao, 92% drivers were renters, and about 80% were married with about three dependents and 70% had secondary degree. In Boracay, about 40% drivers are owners. The fuel cost savings of ₱200 per day will greatly benefit the driver community and is the basis for the rent-to-own scheme. The Project will not displace or negatively impact on the livelihood of tricycle drivers or families. Since fabrication and assembly could be largely domestic, the Project could create a net employment gain of around 10,000 jobs by 2015. The Project is not expected to have a significant effect on the existing oil-fuelled local tricycle assembly industry in the short term.

²⁰ Tricycles in Boracay, with its hilly terrain and heavy traffic uses about 6 liters (\$8.20) to drive about 30 km per day.

²¹ Assuming cost of power of 20 cents /kWh in the Philippines, one of the highest in the region.

²² Project Administration Manual (accessible from the list of linked documents in Appendix 2)

34. The pilot e-Trike design has incorporated women's needs with better seating arrangements. Female passengers will be consulted on the design and safety aspects of proposed e-Trike models, especially for metro-Manila, ADB women personnel will be used as a focus group. As this is a replacement program, the scope for female drivers will be limited. ADB will target that at least 30% of charging station jobs to be filled by women (only during day-time shifts). Female workers will also be trained to inspect the e-Trikes for basic safety issues (road-worthiness, for example) and collection of e-Trike data on every charge. The health and safety benefits of the new design will be significant for the population, especially children.

G. Safeguards

35. The Project is categorized as C for environment, involuntary resettlement and indigenous people. The e-Trikes will have no tail-pipe emissions and no engine noise. Because of classified as category C, no separate environmental assessment will be required, although environmental implications need to be reviewed. According to ADB's publication on electric bikes²³, lead pollution is an inherent problem with electric vehicles and electric bikes with Lead acid batteries will increase the overall pollution rates than the ICE motorcycles. The Lithium-ion batteries are not an environmental hazard²⁴ and are classified by the U.S. federal government as non-hazardous waste²⁵ and are safe for disposal in the normal municipal waste stream.

H. Special Features

36. The proposed Project aims to create an internationally competitive local e-vehicle industry using latest battery and charging options including solar charging. The Project will ensure ongoing competition where possible to prevent market inefficiencies, and "regulate" where necessary with the ultimate aim that sufficient competition exists across the entire value of the e-Trike industry. The Project will be cofinanced with CTF resources.

1. Clean Development Mechanism (CDM)

37. The Project is likely to be registered under CDM of the Kyoto Protocol. Considering large amount of renewable energy component of the Philippines electricity grid, and the inherent efficient of the electric motors, the emission from the e-Trikes would be significantly less than the fossil fuel consumption of the gasoline driven tricycles i.e. the baseline scenario. Potential for emission reduction per electric tricycle distributed and operational is likely to be approx. 3.8 tCO₂e.²⁶ The project would apply for registration under the CDM, and if registered, the project would generate certified emission reductions. Income from these carbon credits will be an important source of revenue for the project and promotion of such programs by the DOE. DOE has submitted the project design documents²⁷ to UNFCCC.

I. Risks and Mitigating Measures

38. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.²⁸

²³ ADB. 2009. *Electric Bikes in the People's Republic of China: Impact on the Environment and Prospects for Growth*. Manila (available in the list of supplementary documents in Appendix 2).

²⁴ <http://www.ehso.com/ehshome/batteries.php>

²⁵ <http://www.epa.gov/osw/hazard/wastetypes/universal/batteries.htm>

²⁶ Assumptions: 80km/day; 15km/liter on gasoline tricycle; emission factor of baseline vehicle=146.93 gCO₂/km.

²⁷ Available at: <http://cdm.unfccc.int/UserManagement/FileStorage/3KY4J2IW70AZPTX9MS6VGU1QORNE8F>

²⁸ Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

Table 4: Summary of Risks and Mitigating Measures

Risks	Mitigating Measures
Poor quality e-Trikes underscoring technology credibility and project viability.	Pre-qualified bidders will be asked to competitively supply professionally designed e-trike units. Tight quality control measures will be applied at all levels. Minimum warranty and support will be guaranteed by the suppliers.
Poorer batteries selected through international bidding under the project	Strict minimum technical standards and commercial qualification criteria will ensure only reputable international manufacturers products are incorporated into the vehicles
Excess financing cost because of multiple intermediaries.	ADB worked closely with the government to ensure the drivers pay single-digit interest rates.
Inadequate e-Trike demand discouraging new investment	Extensive communication and public awareness campaign will ensure, drivers, users and policy makers understand key benefits.
Inadequate capacity of local industry to meet demand	Procurement will be phased to ensure a ramp up period for early adoption and new investments.

Source: Staff Analysis

IV. ASSURANCES

39. The Government has assured ADB that implementation of the Project shall conform to all applicable ADB policies including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the Project Administration Manual and loan documents.

40. The Government has agreed with ADB on certain covenants for the Project, which are set forth in the loan agreements and grant agreement.

V. RECOMMENDATION

41. This is a recommendation for
- (i) the loan of \$300 million to Republic of the Philippines for the Market Transformation through Introduction of Energy Efficient Electric Vehicles Project from ADB’s ordinary capital resources, with interest to be determined in accordance with ADB’s London Interbank Offered Rate (LIBOR)-based lending facility; for a term of 15 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan agreement presented to the Board;
 - (ii) the administration by ADB of a loan not exceeding the equivalent of \$100 million to the Republic of the Philippines for the Market Transformation through Introduction of Energy Efficient Electric Vehicles Project to be provided by the Clean Technology Fund; and
 - (iii) the administration by ADB of a grant not exceeding the equivalent of \$5 million to the Republic of the Philippines for the Market Transformation through Introduction of Energy Efficient Electric Vehicles Project to be provided by the Clean Technology Fund.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and/or Indicators	Data Sources and/or Reporting Mechanisms	Assumptions and Risks
<p>Impact</p> <p>Sustainable energy use by transport sector</p>	<p>Fuel used by the transport sector is reduced by at least 2.8% (based on 20 million Barrels per year consumption in 2010) or an equivalent of 89.2 million Liters of gasoline per year.</p> <p>Pollution in selected cities reduced by at least 20% (from the baseline measurement under the project)</p>	<p>Data published by the Department of Energy</p>	<p>Assumption</p> <p>Sufficient renewable energy investment in the power sector across the country</p> <p>Public transport use pattern will not be altered significantly by introduction of cheap (electric) fuel</p> <p>Risks</p> <p>Uncontrolled growth of electric vehicle across the country</p> <p>Cheaper and poorer quality electric vehicle flooding the market</p>
<p>Outcome</p> <p>Tricycle industry transformation through large scale adoption of locally made energy efficient e-Trikes</p>	<p>At least 5 companies are established that are registered by the Board of Investment as new industries</p> <p>At least two retailers distributing (and assembling) Lithium-Ion and others high energy density batteries locally</p> <p>At least 50% of the conversions outside the project boundary using Lithium Ion batteries</p>	<p>Data published by the LGUs collected by project implementation consultants</p> <p>Published reports by the Department of Energy and Board of Investment</p> <p>Market survey during the mid-term review</p>	<p>Assumptions</p> <p>Locally made e-Trike will meet its expected design life</p> <p>Enough local technical expertise is available to support the local industry</p> <p>Risks</p> <p>Oil price will not drop significantly from its current high level</p> <p>Significant increase of electricity price and power shortage in specific region</p> <p>Local e-Trike business becomes unviable because of cheaper imports</p>
<p>Outputs</p> <p>Complete e-Trike units delivered to LGUs with at least standard 3-year warranty</p> <p>Battery supply chain including support infrastructure created</p>	<p>At least 17,000 e-Trikes operating by December 2013, and 50,000 by 2014, and 100,000 by 2015</p> <p>At least three internationally reputable battery companies established active presence in the Philippines by 2014 from none in 2011</p>	<p>Project Reports TRU Reports</p> <p>Industry commission and Board of Investment Reports</p> <p>Report from Securities and Exchange Commissions</p>	<p>Assumptions</p> <p>Project will transform local industry and will be able to attract overseas investors to partner with local businesses enabling technology transfer and employment generation</p> <p>Government commitment to electric tricycle will continue and government will resolve registration and franchise issue across the country</p> <p>Drivers and passengers</p>

Design Summary	Performance Targets and/or Indicators	Data Sources and/or Reporting Mechanisms	Assumptions and Risks								
<p>Solar and other charging stations available in selected areas to meet the public charging needs</p> <p>Material recovery from ICE tricycles and used batteries: a. Lithium Battery Recycling b. Body Disposal</p> <p>Communication, Social Mobilization and Technology Transfer</p>	<p>At least 2 reputable motor suppliers by 2012 oive solar charging stations of 200 kW each will be established.</p> <p>At least 500 locally assembled charging stations are installed in selected project areas</p> <p>At least 30% operators of public charging stations will be women (only during daytime shift)</p> <p>Battery recycled options studied and pilot operating</p> <p>Old tricycles are collected and disposed of as per UNFCC's requirements and local environmental rules</p> <p>Consumers are aware of benefits of electric vehicles (3 workshops) and at least six companies selling in Metro-Manila with service support by December 2012</p>		<p>acceptance of e-Trike will continue Project will be able to attract reputable Lithium-ion battery manufacturer/supplier in the Philippines</p> <p>Local manufacturing will be able to meet the project demand</p> <p>Risks</p> <p>Financing cost increases because of involving multiple layers of intermediaries</p> <p>Resistance of businesses using current technology</p> <p>Inadequate capacity of industry to meet local demand</p> <p>Stakeholder acceptance of rent to own e-Trike</p> <p>Accident and unforeseen event undermining e-Trike technology</p>								
<p>Activities with Milestones</p> <p>Output 1: Complete e-Trike units delivered to LGUs with standard 3-year warranty</p> <p>1.1 Signing of Memorandum of Agreement between DOE, Lang Bank, and LGU (intermittent per LGU) (01/09/2012 – 30/09/2012)</p> <p>1.2 Finalize prequalification and bidding documents for goods package (01/06/2012 – 30/06/2012)</p> <p>1.3 Conduct prequalification and bidding documents for goods package (30/06/2012 –30/9/2012)</p> <p>1.4 Conduct procurement activity from advertisement, bid submission, bid evaluation to contract award (intermittent 8 packages, 01/08/2012 – 30/03/2016)</p> <p>1.5 Delivery and distribution of e-Trikes to LGUs (for drivers) and signing of supply and maintenance agreement between supplier and LGU (31/03/2013 – 31/12/2016)</p> <p>1.6</p> <p>Output 2: Battery supply chain including support infrastructure created</p> <p>2.1 Conduct procurement activity and signing of supply and maintenance agreement between suppliers and LGUs (for drivers) (01/08/2012 – 30/03/2016)</p> <p>2.2 Identify and establish a service center per LGU (1/3/2012-29/3/2013)</p>			<p>Inputs</p> <table border="0"> <tr> <td>ADB</td> <td>\$ 300</td> </tr> <tr> <td>CTF (loan)</td> <td>\$ 100</td> </tr> <tr> <td>CTF (grant)</td> <td>\$ 5</td> </tr> <tr> <td>Government</td> <td>\$ 99</td> </tr> </table>	ADB	\$ 300	CTF (loan)	\$ 100	CTF (grant)	\$ 5	Government	\$ 99
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CTF (loan)	\$ 100										
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Design Summary	Performance Targets and/or Indicators	Data Sources and/or Reporting Mechanisms	Assumptions and Risks
<p>Output 3: Solar and other charging stations available in selected areas to meet the public charging needs</p> <p>3.1 Identify electricity provider for each area (01/01/2012-31/05/2014)</p> <p>3.2 Signing of memorandum of agreement between electricity provider, LGU and DOE (01/01/2012-31/09/2012)</p> <p>3.3 Finalize technical specifications for charging stations per LGU (01/01/2012-31/09/2012)</p> <p>3.4 Conduct procurement activity from advertisement, bid submission, bid evaluation to contract award, turnkey package for Solar Charging stations in Boracay and Puerto Princesa (01/07/2012 - 31/12/2012)</p> <p>3.5 Installation of solar charging stations (01/01/2013 – 31/05/2013)</p> <p>Output 4: Material Recovery from ICE Tricycles and used batteries</p> <p>4.1 Finalize material recovery plan for batteries and old tricycles (01/04/2012 – 31/08/2012)</p> <p>4.2 Allocate budget for each LGU and designate area for collection and disposal (01/07/2012 – 31/12/2015)</p> <p>4.3 Develop database of old tricycles in each LGU (01/01/2012 – 31/12/2016)</p> <p>Output 5: Communication, Social Mobilization and Technology Transfer</p> <p>5.1 Conduct project implementation general training on project management unit, identified LGUs, other related agencies and establish technical working group to prepare material recovery plan (intermittent, 01/01/2013 – 31/05/2016)</p> <p>5.2 Prepare and implement general information, education, and communication plan for each LGU (01/01/2013 – 31/05/2015)</p> <p>5.3 Undertake training and workshop on e-Trike technical operations and maintenance (O&M) (01/01/2013 – 31/08/2016)</p>			

ADB = Asian Development Bank, CTF = Clean Technology Fund, DOE = Department of Energy, LGU = Local Government Unit

Source: ADB Project Team.