CLEAN TECHNOLOGY FUND
REVISED INVESTMENT PLAN FOR THE PHILIPPINES

June 2012

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BRT	Bus Rapid Transit
CIP	CTF Country Investment Plan
CIP-R	Revised CTF Country Investment Plan
CTF	Clean Technology Fund
EE	Energy Efficiency
EEEVs	Energy Efficient Electric Vehicles
FIT	Feed-in Tariff
GHG	Greenhouse Gas
GoP	Government of the Philippines
IBRD	International Bank for Reconstruction and Development
ICE	Internal Combustion Engine
IFC	International Finance Corporation
$MtCO_2e$	Million tons of carbon dioxide equivalent
PV	Photovoltaic
RE	Renewable Energy
RPS	Renewable Portfolio Standard
SCS	Solar charging station
WBG	World Bank Group

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EXECUTIVE SUMMARY

The Government of the Philippines (GoP) is pleased to provide a revised Clean Technology Fund (CTF) Country Investment Plan (CIP) which has been updated from the version which was endorsed by the Trust Fund Committee (TFC) in December 2009. This document has been revised pursuant to discussions with the CTF Trust Fund Committee held in Washington, DC on 4 November 2011, and it also takes account of subsequent comments received and additional stakeholder consultations, superceding the revised CIP submitted in January 2012.

The revisions reflect recent adjustments and refinements to relevant national policies and priorities, including the establishment of a National Framework Strategy on Climate Change in April 2010 and an accompanying National Climate Change Action Plan, which was approved in April 2011 after extensive inter-departmental and stakeholder consultations. The Philippine Energy Reform Agenda has also been agreed, with three pillars: (i) ensuring energy security, (ii) achieving optimal energy prices, and (iii) developing sustainable energy systems.

The overall context and objectives of the CIP remain unchanged. No changes have been proposed to the CTF allocation for the projects and programs to be implemented in partnership with the World Bank Group. However, the proposed change will reallocate funds for public sector investments to be implemented in partnership with the Asian Development Bank (ADB), originally proposed to support an Energy Efficient Appliances Project and a Rooftop Solar Development Project, to cleaner and more energy efficient transport under an Energy Efficient Electric Vehicles (EEEVs) Project and a revised approach to renewable energy promotion through a Solar Energy Development Project. The funding request for the Energy Efficient Appliances Project is withdrawn, though the Government plans to pursue this idea in modified form, subject to the availability of alternative financing. Table ES1 summarizes the indicative financing plan as endorsed by the CTF Trust Fund Committee in December 2009. Table ES2 presents the indicative financing plan after the proposed reallocations.

The Government's proposed investment in the EEEVs Project stems from its strategy to emphasize investment in end-use energy efficiency in public transport systems via public-led investment as a high priority for market transformation. As a net importer of energy, the shift in priority for CTF funding to electric vehicles will simultaneously reduce greenhouse gas emissions, contribute to better urban air quality and associated health benefits, and improve energy security.

With respect to the proposed Solar Energy Development Project, it must be noted that Philippine consumers pay some of the highest electricity tariffs in the world. As there are no subsidies for the generation sector, consumers and policy makers are rightfully concerned about further electricity price increases that may result from feed-in tariffs which are higher than average retail electricity tariffs. At the same time, a solar feed-in tariff proposed by the electricity regulator has created large interest from the private sector for new investment, but the proposed feed-in tariff for solar will apply only to an additional 50 megawatts (MW) of ground-mounted installations. Private sector developers have indicated interest in installing up to 300 MW of capacity. In this context, the government has decided not to "crowd out" this significant private sector interest, which is why the net metering solar rooftop expansion project proposed in the original CIP will not be pursued. However, the proposed Solar Energy Development Project can help to transform that segment of the solar rooftop market outside of the proposed solar feed-in tariff (and 50 MW cap) while supporting the development of net metering in the country.

Table ES1: Indicative Financing Plan Endorsed in December 2009 ($ million)

Financing Source	**Renewable Energy (WBG)**	**Urban Transport (WBG)**	**RE and EE (ADB)**	**Total**
CTF	75	50	125	250
GoP / DBP	180	50	50	280
IBRD Loans	250	250	0	500
IFC Loans	250	0	0	250
ADB Loans	0	0	400	400
Private sector	750	0	350	1,100
Total	**1,505**	**350**	**925**	**2,780**

Source: CTF Investment Plan for Philippines 2009
ADB=Asian Development Bank, CTF=Clean Technology Fund, DBP=Development Bank of the Philippines, EE=energy efficiency, GoP=Government of the Philippines, IBRD=International Bank for Reconstruction and Development, IFC=International Finance Corporation, RE=renewable energy, WBG=World Bank Group

Table ES2: Indicative Financing Plan After Reallocation ($ million)

Financing Source	**Renewable Energy (WBG)**	**Urban Transport (WBG)**	**Energy Efficient Electric Vehicles (ADB)**	**Solar Energy Development (ADB)**	**Total**
CTF	75	50	105[a]	20[a]	250
GoP / DBP	180	50	99	20	349
IBRD Loans	250	260	0	0	510
IFC Loans	250	0	0	0	250
ADB Loans	0	0	300	80	380
Private sector	750	0	(tbd) [b]	(tbd) [b]	750
Other cofinancing (AFD loans)	0	245	0	0	245
Total	**1,505**	**605**	**504**	**120**	**2,734**

Source: MDB teams
ADB=Asian Development Bank, AFD=Agence Franciaise de Developpement, CTF=Clean Technology Fund, DBP=Development Bank of the Philippines, EE=energy efficiency, GoP=Government of the Philippines, IBRD=International Bank for Reconstruction and Development, IFC=International Finance Corporation, RE=renewable energy, (tbd)=to be determined, WBG=World Bank Group
Notes:
[a] For the EEEVs project, a CTF grant of $1 million is requested for fine-tuning of technology options, technology transfer, local industry support and capacity building (implementation support, including monitoring and evaluation activities will be financed by the ADB loan). For the Solar Charging Systems component a CTF grant of $4 million is requested to ensure its technical viability and whether solar charging could be implemented within the current tariff of about $0.20/kWh; see discussion in main text and concept paper in Appendix 2 for further details.
[b] Private sector entities will participate in project implementation via supply of goods and services. For the EEEVs project, private sector investment is expected during replication and scale-up, and as such no private sector cofinancing is shown in Table 4. Private sector cofinancing for the Solar Energy Development project has yet to be determined.

During stakeholder consultations with non-government and civil society organizations (NGOs, CSOs) conducted in Manila in May 2012, a number of key issues were highlighted, with subsequent adjustments made to the CIP:

(i) a range of issues and alternatives were put forward regarding design of the EEEVs Project, including those relating to the funds flow model, where civil society organizations emphasized the need for transparency, especially in light of the upcoming local elections, and it was clarified that manufacturers would receive direct funding;
(ii) participant contributions also influenced the proposed EEEVs Project design with respect to warranty issues, disposal options, and the e-trike design;
(iii) it was noted that there have been significant price reductions in the cost of solar power, especially in the last year, so a solar rooftop project with net metering could be

developed without the subsidies provided by way of the feed-in tariff – and this was incorporated into the revised CIP, albeit at a more modest scale than conceived in 2009;

(iv) civil society and renewable energy representatives expressed strong interest in promoting the use of solar energy to charge electric vehicles, without imposing any additional financial burden to the drivers and end users, and a proposal for such a pilot project was incorporated into the CIP that is meant to encourage private investors to provide such services and broaden support for electric vehicles with the lowest possible carbon footprint.

The adjustments to the CIP are based on broad stakeholder engagement covering CSOs, NGOs, local government units, industry representatives, and public transport owners and operators. The proposed CIP revisions will achieve a better balance between supply-side and demand-side investments, without crowding out private sector investment in renewable energy while fully supporting the Philippines energy reform objectives to promote affordable and sustainable energy security. The proposed projects will result in greater and more cost-effective GHG emissions than proposed in the original CIP, with enhanced development impacts.

As the EEEVs Project has reached the appraisal stage, it is presented simultaneously to the CTF Committee for funding approval alongside the requested endorsement of the revised CIP. Additional project-specific considerations relating to the Solar Energy Development Project will be addressed when that project reaches the appraisal stage and is presented for funding approval to the Trust Fund Committee.

I. INTRODUCTION

1. The Philippines Clean Technology Fund (CTF) Country Investment Plan (CIP) was endorsed by the Trust Fund Committee (TFC) in December 2009, with an envelope of $250 million in CTF cofinancing. The original CIP comprised clean energy and transport sector investments in both the public and private sector.

2. The proposed change will reallocate funds for public sector investments led by Asian Development Bank (ADB) from the original net metering with solar power generation concept to investments in energy efficient electric vehicles (EEEVs) including a solar-powered charging stations (SCS) component. The scope of the project proposed in the original CIP -- net metering with rooftop solar -- will be reduced and the project will be formulated in the context of the Philippines evolving renewable energy framework. This change in investments is consistent with the long-term objectives of the original CIP. The overall context and objectives of the CIP are the same as the original CIP. The revised CIP (CIP-R) is a business plan owned by the Government of the Philippines (GoP), and is a dynamic document with the flexibility to consider changing circumstances and new opportunities.

3. No changes have been proposed to the CTF allocations for the International Bank for Reconstruction and Development (IBRD) and International Finance Corporation (IFC). Therefore, this document primarily covers the proposed changes and program to be implemented by the Asian Development Bank (ADB), and is organized as follows:

- Section I – Introduction to the Philippines revised CTF CIP;
- Section II -- Review of the status of implementation of the original investment plan;
- Section III -- Explanation of the circumstances and rationale for revising the investment plan and making changes to the projects or programs included;
- Section IV -- Description of the proposed changes, i.e., proposed reallocation of funds as requested by the GoP;
- Section V -- Assessment of the potential impact of the proposed changes on achieving the objectives and targets of the original investment plan;
- Appendix 1 – Summarizes the GoP decision-making process and stakeholder consultations relating to the proposed changes to the CIP; and
- Appendix 2 and 3 – Concept papers for the proposed investments to be supported with CTF cofinancing.

II. STATUS OF ORIGINAL INVESTMENT PLAN IMPLEMENTATION

4. The status of program and project development and approvals is presented in Table 1 and discussed below.

Table 1: Processing Status of IBRD and IFC Investment Programs and Projects

Project	TFC Approval Date	CTF Amount ($ million)	Leveraged Funding ($ million)
IFC Renewable Energy Accelerator Program	September 2010	20	330
IFC Sustainable Energy Finance Program	February 2011	10	209
IBRD Renewable Energy/Energy Efficiency Project	December 2012	45	200
IBRD Urban Transport (BRT) Project (Cebu)	September 2012	25	170
IBRD Urban Transport (BRT) Project (Manila)	September 2013	25	385
Total IBRD, IFC and Leveraged Investments		**125**	**1,294**

Source: MDB project teams.

IBRD Renewable Energy Program

5. The IBRD/CTF operation would support investments in renewable energy (RE) generation and in utility-level energy efficiency (EE). The operation would build on IBRD projects that are active in these sub-sectors. In RE, the focus will be on leveraging private sector investment in the context of the emerging policy and regulatory framework for renewables, and ensuring that CTF is used strategically to leverage as much private investment as possible. In EE, the goal is to scale-up the efforts of electric cooperatives (ECs) to continue to reduce losses, as one key input for enhancing the financial strength of these service providers. Stronger ECs will be better able to expand their customer bases, contributing to critical access objectives, and to serve those new customers with an increasing proportion of clean energy.

6. While the Philippines has an advanced framework for private participation and for attraction of private financing, there are significant barriers to the scale-up of RE and utility-led EE. For example, for administrative ease, the country has opted for a single, national feed-in tariff (FIT) rate per technology; but supply chain and other costs vary widely in the country, so some economically beneficial projects will not be financially viable under the FIT mechanism. Specific FIT rules are still to be finalized and made effective. The FIT regime will also not extend to certain renewable technologies (e.g., geothermal), nor will it cover off-grid generation. CTF will be used to provide critical additionality and leverage such that more, good projects will be financed, especially in regions of the country that might not otherwise see much activity. In the EC sector, there are 119 service providers but only about half are currently rated credit-worthy, and investment flows are falling well short of requirements even for the credit-worthy. CTF is targeted at both the supply side – by leveraging the flow of private credit to support investments – and at the demand side, by establishing programmatic eligibility criteria that will help incentivize more ECs to become credit-worthy.

7. GoP has made its formal request for project preparation funds from the CTF, and project preparation work is set to accelerate. Project appraisal is upcoming, and presentation to the IBRD Board is scheduled in mid-2013.

IBRD Urban Transport Program

8. The Program comprises investment and advisory services components to support the implementation of Bus Rapid Transit (BRT) projects in Cebu and Manila. The advisory services component includes support for implementation of the National Environmentally Sustainable Transport Strategy (NESTS). Since the Philippines CIP was prepared in December 2009, there have been a few minor changes made to the scope and design of the urban transport component. These adjustments are outlined below.

9. Through project preparation work undertaken since the initial CTF investment proposal, it has become evident that to ensure successful implementation of a BRT system in the Philippines, substantial capacity and institution building work will be necessary. To this end, it has been agreed with the counterparts that the BRT program would be undertaken in two phases, beginning with a Phase I demonstration project in Cebu City, from which lessons learned and institutional structures derived would be applied to Phase II, the development of a BRT in Manila. Given the substantive social and political hurdles involved in the Manila phase, the counterparts agreed that a successful demonstration in Cebu would facilitate more rapid implementation in Manila.

10. Also, for Phase I, to maximize greenhouse gas emissions mitigation benefits, as well as safety, gender, and poverty impacts, the program scope has been slightly expanded to also include upgrading the existing SCATS area traffic control system to better manage traffic and non-motorized transport (NMT) flows, not only on BRT corridors, but for the entire transport network. Further, Phase I will include significant training and capacity building work not just for the local government, but also relevant stakeholders, such as the jeepney operators.

11. Finally, since the initial CTF proposal, a parallel Sustainable Urban Energy Program (P125401) has been undertaken by the IBRD in Cebu City, through which it was determined that the greenhouse gas emissions from the transportation sector were 721,000 tons CO_2e in 2010, about 40 percent of Cebu's total greenhouse gas emissions. While this figure will be verified and refined during the CTF project preparation, the estimate provides a basis upon which to develop preliminary greenhouse gas emissions reduction targets that may be attributable to Phase I in Cebu, versus Phase II in Manila. Through the expanded project scope, a range of 100,000 to 150,000 tons CO_2e emissions reductions per year may be a reasonable estimate for Phase I, with more substantive emissions reductions to be expected in Manila, which is many times the size of Cebu City and has a much higher motorization rate. The success of Phase I is critical to expanding the scope to Phase II. However, in addition to CO_2e emissions reductions, it is expected that the Phase I demonstration project would have considerable impact on improving access to the poor, providing safer and more effective transport services to all residents, and influencing changes in land use design with a long-term impact on the city's ability to address climate change related issues.

12. Since the program will be undertaken in two phases, rather than one, funding allocations have been adjusted accordingly, as shown in Table 2. Further, additional financing and technical assistance funding has been secured from the Agence Française de Développement (AfD), which is also reflected in the revised figures. The CTF funds will continue to be needed to cover part of the additional costs of BRT systems compared to conventional bus networks.

Table 2: Revised Financing Plan for IBRD Urban Transport Program (US$ million)

Funding Source	December 2009 Original Proposed Contribution	October 2011 Revised Proposed Contribution	
		Phase I	Phase II
Government of the Philippines	50	15	35
IBRD	250	110	150
Clean Technology Fund	50	25	25
Agence Française de Développement	0	45	200
Total	**350**	**195**	**410**

Source: IBRD.
Notes: * To be confirmed during preparation.

13. Overall progress is shown above in Table 1. Project preparation work is proceeding well and 4 missions have been undertaken since April 2011. The Government has made a formal request for project preparation funds from the CTF. QER for the project is set for 3 July 2012, and appraisal is targeted for September/October 2012, with presentation to the Bank's Board in March 2013.

IFC Programs

14. As of October 2011, two private sector program proposals have proceeded: $20 million was approved in September 2010 for the IFC Renewable Energy Accelerator program, and $10 million was approved in February 2011 for the IFC Sustainable Energy Finance program.

IFC Renewable Energy Accelerator Program (REAP)

15. IFC would provide appropriate incentives for qualified solar, wind, and biomass developers to accelerate the implementation of RE projects. These projects would provide immediate GHG reduction impact and provide valuable information on the types and amounts of incentives required to catalyze RE development in the country. IFC will continue to develop projects with CTF support in close coordination with the GoP and the policies that govern private sector growth. The rationale is the same as envisioned in the original CIP. IFC continues to work with project developers and refining financial structures in the development of projects. Overall progress is shown above in Table 1.

IFC Sustainable Energy Financing Program (SEFP)

16. The program supports the scale up of sustainable energy finance projects in Philippines. It aims to contribute to increasing private sector involvement, support captive and grid-tied RE development, EE market transformation, and enhance energy savings. The CTF funds will continue to be needed to incentivize local financial institutions to undertake financing in lower carbon emitting technologies. The rationale is the same as envisioned in the original CIP. IFC continues to work with various stakeholders in developing projects under the program. IFC has a pipeline of projects that are at various stages of development that would fully utilize IFC's CTF allocation.

III. CIRCUMSTANCES AND RATIONALE FOR INVESTMENT PLAN REVISION

17. The overall rationale for CTF intervention in the energy and transport sectors remains unchanged. The revisions reflect recent adjustments and refinements to relevant national policies and priorities, including the establishment of a National Framework Strategy on Climate Change in April 2010 and an accompanying National Climate Change Action Plan, approved in April 2011 after extensive inter-departmental and stakeholder consultations. The Philippine Energy Reform Agenda has also been agreed, with three pillars: (i) ensuring energy security, (ii) achieving optimal energy prices, and (iii) developing sustainable energy systems. The GoP is requesting that the ADB allocation be revised to accommodate an Energy Efficient Electric Vehicles (EEEVs) Project and a Solar Energy Development Project. Major changes in circumstances since 2009 that have contributed to this adjustment include:

(i) The specific rules for the Renewable Portfolio Standard (RPS), feed-in tariffs (FIT), and net metering have yet to be finalized and become fully effective, though GoP remains fully committed to the RPS, FIT, and net metering programs. Finalization of the implementing rules is expected within the next 2 years, but there is no fixed deadline for completion.

(ii) The Philippines Department of Energy has proposed that the RPS for solar power apply to installation of 50 MW over a 3-year period, limited to ground-mounted

installations.[1] The proposed feed-in tariff has attracted initial private sector interest for several times this capacity. This private sector interest, combined with rapid decreases in solar photovoltaic system costs, obviates the need for concessional financing for projects which will avail of the solar FIT. However, RE development still entails higher initial capital costs, the retail market for solar power is non-existent, and concessional financing is needed during the foreseeable future to accelerate RE market transformation with the long-term objective of achieving grid parity. There is strong stakeholder support for continued public sector investment in RE development.[2]

(iii) Increases in fossil fuel prices since 2009 point to the need for additional investments in energy end-use efficiency, including the transport sector.

(iv) A successful pilot test of EEEVs,[3] conducted with ADB support, is ready for scale up. This project has support from the highest levels of the Government of the Philippines.

18. Based on circumstances (i) and (ii), the net metering project using distributed solar power proposed in the original CIP may still be relevant, but the project concept needs to be reformulated considering the evolving regulatory framework and market realities. In particular, given the private sector interest to develop solar projects under the proposed FIT and RPS (which will be limited to 50 MW of ground-mounted installations), and current installed costs for solar PV systems, FIT-supported investments in solar power will not require concessional financing. However, outside of the FIT envelope, concessional financing will be needed in the near term to accelerate solar market development and to establish a new use of solar power: off-grid solar charging for electric vehicles. Therefore, the original rooftop solar concept is being retained with a reduced scope, and the details will be developed by early 2013.

19. Taking account of circumstances (iii) and (iv), GoP believes that the bulk of concessional financing offered from CTF could be better utilized in the near term to begin converting the public vehicle fleet to EEEVs. Introduction of electric and hybrid vehicles is being complemented by other alternative and cleaner fuel development, including domestic production of renewable diesel and ethanol to meet mandated blending requirements, as well as other transport initiatives including public transport projects supported by IBRD (discussed in Section II).[4]

20. Given the need for convergence between climate change and energy security objectives, GoP proposes to shift part of the original $125 million of CTF resources slated for the solar net metering concept, and re-direct $105 million to the EEEVs project including a $4 million grant for demonstrating solar charging stations and a $1 million grant for project implementation support (fine-tuning of technology options, technology transfer, local industry support and capacity building). The balance of $20 million is proposed to support financing of a Solar Energy Development Project centered on rooftop PV applications as discussed above. The prospective investments are appropriate for CTF support given their transformational nature and the replication and scale-up potential. The shift of some CTF resources to demand-side

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[1] Philippines Department of Energy, Resolution dated 28 June 2011.

[2] Presentations from key stakeholder consultations are available at the following links:
https://www.dropbox.com/sh/5q2tobxqsovqp1l/xJkQYjJj90
http://www2.adb.org/Projects/eTrike/events.asp

[3] The vehicles are motorcycles with side cars which provide taxi services, known locally as “tricycles”; this tricycle design is somewhat unique to the Philippines. The pilot-tested EEEVs are also referred to as “e-trikes.” The transport services provided by tricycles are similar to auto-rickshaws utilized in other Asian countries including Bangladesh India, Indonesia, and Thailand. Hence the potential for replication and scale-up is regional in scope.

[4] For the sake of brevity, an exhaustive discussion of transport sector interventions including demand management and other “avoid and shift” prospects is not included here. A detailed discussion is presented in the original CIP.

investments is fully consistent with GoP energy and transport policies as outlined in the original CIP. A summary of stakeholder engagement during preparation of the revised CIP is presented in Appendix 1. The proposed projects are discussed below and in Appendices 2 and 3.

21. The changes in the proposed projects to be implemented in partnership with ADB are based on broad stakeholder engagement, including with government agencies, civil society organizations (CSOs), non-government organizations (NGOs), local government units (LGUs), industry representatives, and public transport owners and operators. The engagement process, including recent consultations, provided for discussions on a range of ideas and suggestions about the CIP, the proposed EEEVs project, and RE development. Participants at the stakeholder consultations raised a range of issues and provided alternatives for ADB and DOE to consider, and these are reflected in the updated program and EEEVs project design, including the funds flow model. Civil society representatives advocated for a more transparent funds flow model – especially in light of the upcoming local elections – and were pleased to see that the project would be funding manufacturers directly. Other aspects where participant contributions influenced the CIP-R and proposed project design include warranty issues, disposal options, and design of the e-trike itself. The consultation process also led to the decision to retain the rooftop solar concept proposed in the original CIP, albeit with a more modest budget (and specific components still to be determined).

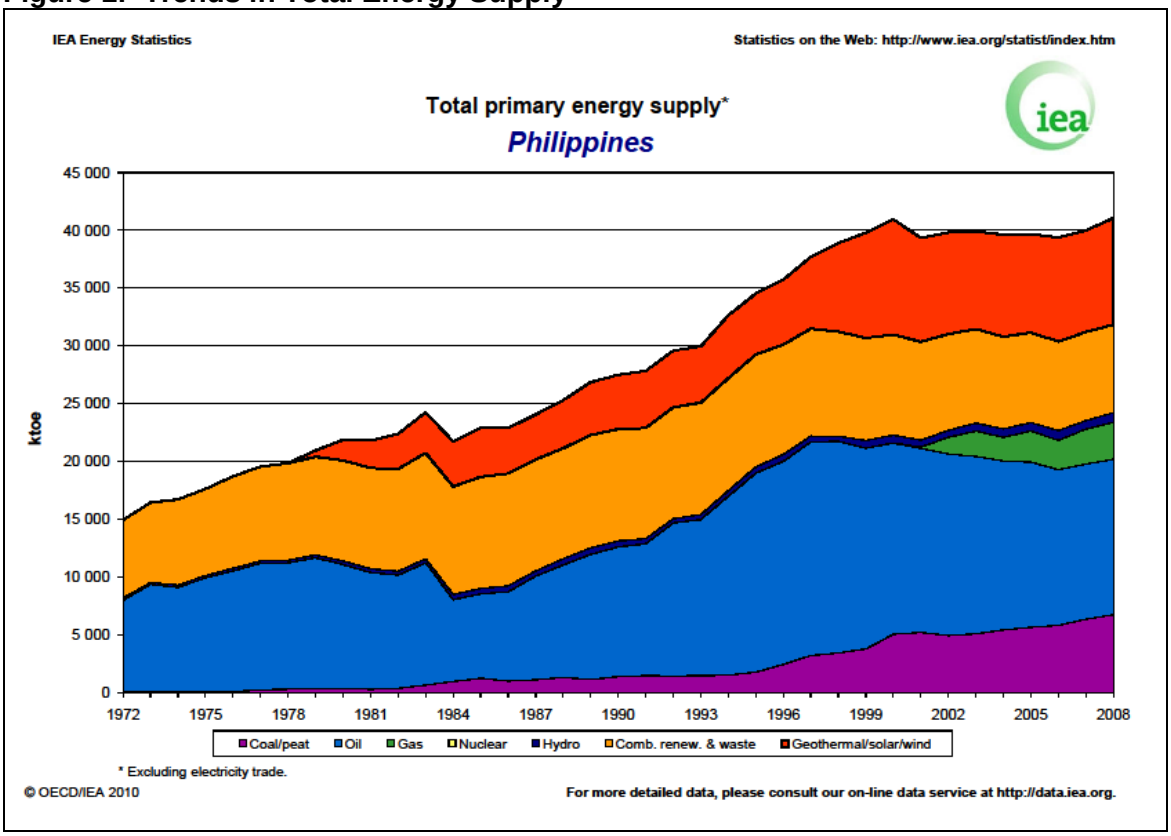
22. GoP is committed to reducing energy intensity and greenhouse gas (GHG) reductions through a comprehensive policy framework as described in the original CIP. Figure 1 illustrates trends in total primary energy supply, indicating that coal and natural gas have displaced oil for power generation, while the share of renewables has not increased substantially during the past several years. The trend of increasing coal use is of particular concern with respect to energy security and GHG emissions objectives. The IBRD and IFC programs (noted above in Section II) will focus on RE and EE investments intended to reduce demand, add clean energy generation capacity, and replace what might otherwise be power capacity additions through fossil fuels.

23. In 2010, the Philippines spent approximately $8.78 billion[5] on imported oil – 39% more than in 2009, about 66% of which was used by the transport sector. Under a business as usual scenario, with growing population and urbanization, the cost of fuel imports is likely to increase by multiple times over the next 10-15 years. GoP plans to improve energy security – a national priority alongside low-carbon development objectives – through RE, EEEVs, and other EE investments.

24. Based on the McKinsey marginal CO_2 abatement cost curve (Figure 2) and a study by ADB (Figure 3), GoP developed the investment strategy for the energy sector as shown in Figure 4, including $250 million in CTF financing. Energy efficient vehicles (including EEEVs), although a GoP priority, were not part of the original CIP prepared in 2009, as no project or program had been formulated at that time. The GoP now proposes to adjust its priorities considering changed circumstances in relation to increased private investor interest in RE generation projects, consumers' concern over potential impacts of the feed-in tariff, and prospects of higher electricity tariffs.

[5] Source: Department of Energy, available at: http://www.doe.gov.ph/DO/Report2010.htm

Figure 1: Trends in Total Energy Supply



Source: IEA, accessed on 11 August 2011 from: http://www.iea.org/stats/pdf_graphs/PHTPES.pdf

Figure 2: McKinsey Marginal CO_2 Abatement Cost Curve

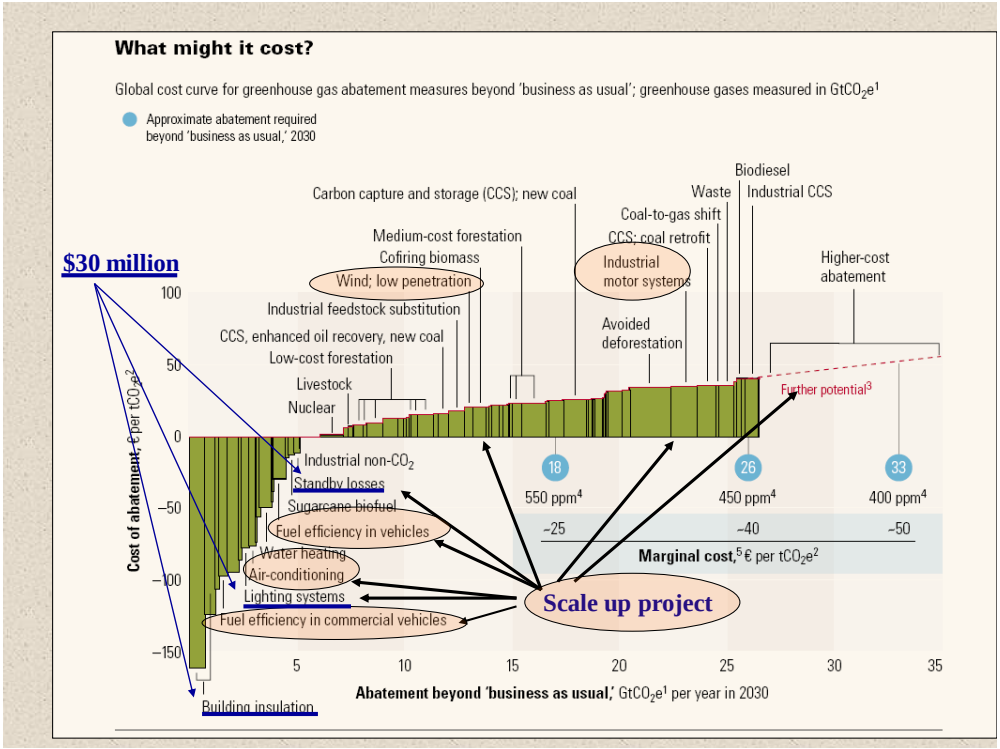


Figure 3: Philippines Marginal CO_2 Abatement Cost Curve

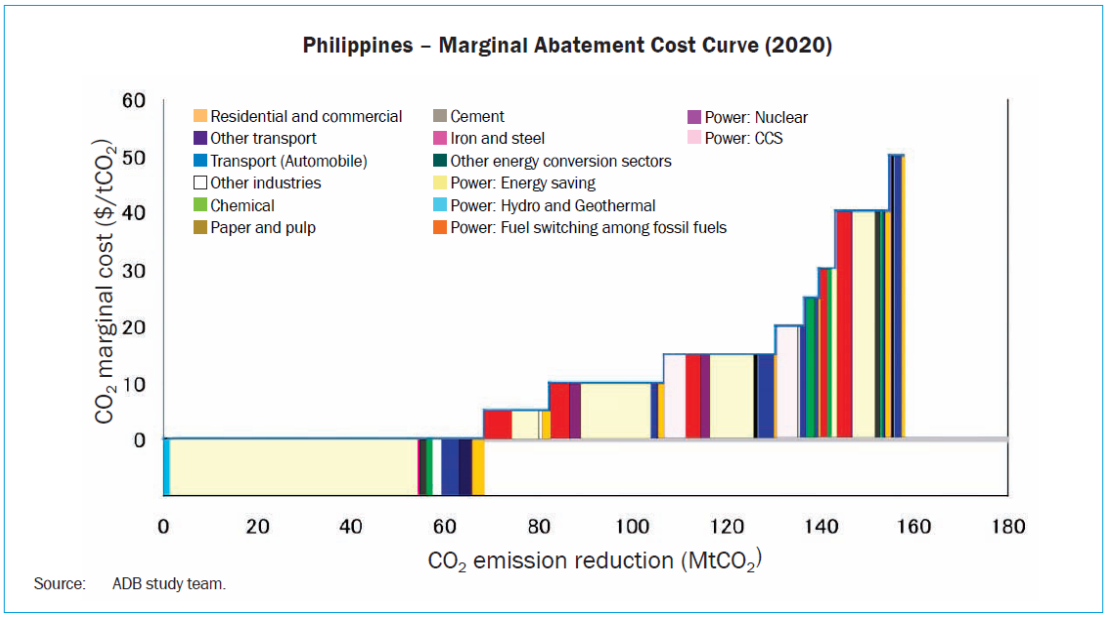
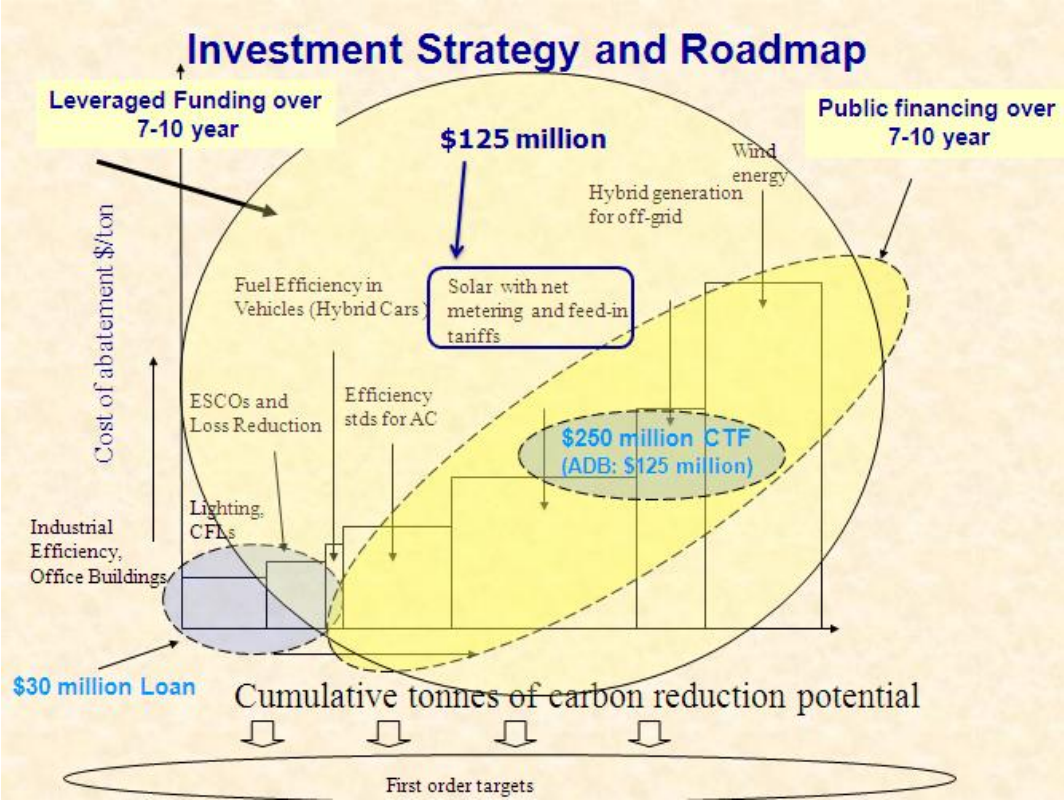
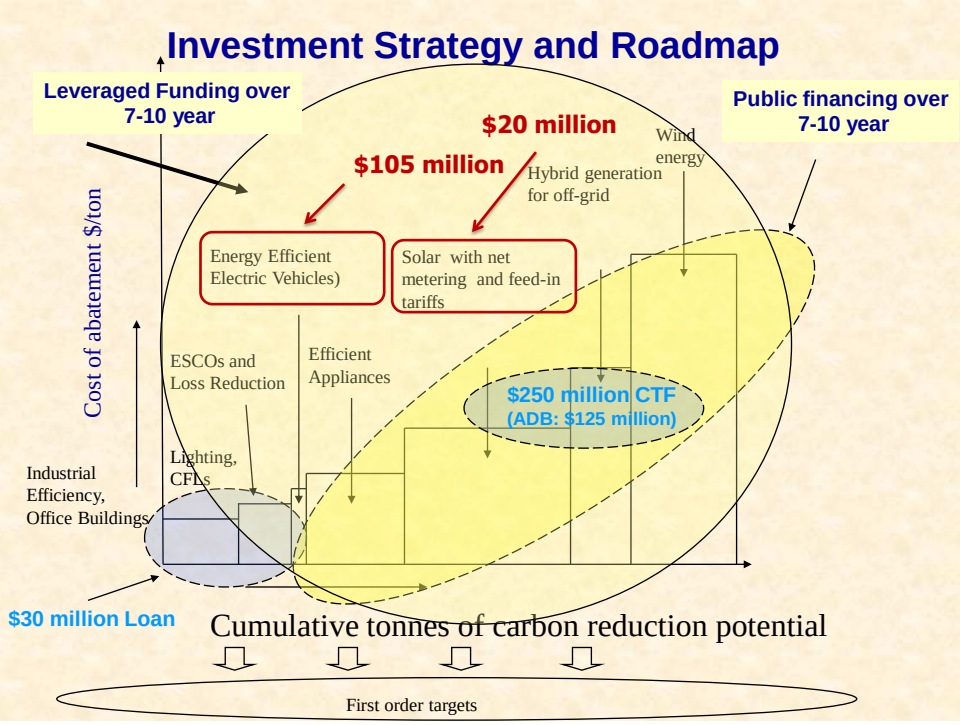


Figure 4: Investment Strategy and Priority CTF Projects (December 2009)



25. The government's high priority projects are illustrated Figures 4 and 5, with the former representing the originally proposed use of CTF resources, and the latter representing the updated CTF Country Investment Plan. The outer circle represents overall potential investment in various clean energy interventions, including private sector investments, superposed on the McKinsey curve for the Philippines. The small ellipse at the lower left represents investment potential in more efficient lighting, which has been partly addressed through public sector investment with ADB financial support. The larger ellipse represents the bulk of potential clean energy investment, toward which the original CIP directed $250 million in CTF cofinancing. Of this $250 million, $125 million was proposed to cofinance the startup of the net metering program with solar photovoltaic (PV) systems.

Figure 5: Investment Strategy and Priority CTF Projects (June 2012)



26. ***The GoP remains fully committed to its development policy framework for energy security, climate change, environmental management, and public health.*** The general approach and overall objectives for low-carbon development presented in the original CIP remain the same. GoP is committed to reducing energy intensity and greenhouse gas (GHG) reductions through a comprehensive policy framework as described in the original CIP. The energy and transport policy frameworks discussed in the original CIP remain in effect. The GoP remains fully committed to its development policy framework for energy security, climate change, environmental management, and public health. The general approach and overall objectives for low-carbon development presented in the original CIP remain the same.

27. ***The strategic rationale for CTF intervention in the energy and transport sectors remains unchanged.*** Comparison of Figures 4 and 5 clearly shows consistency in the underlying clean energy and cleaner transport strategies. The transport sector, power generation, and other energy end-use are highly dependent on imported fuels, which render the country vulnerable to energy supply disruptions and global price fluctuations. The Philippines has a variety of RE resources – biomass/biogas, geothermal, small hydropower, solar and wind – with estimated total potential of more than 15,000 MW, of which about 35% has been developed. In the near term, biomass, geothermal, hydropower, and wind are expected to account for most of the new RE capacity additions. Additional potential from solar and waste-to-energy is high but commercial development of these resources has high start-up costs; solar and waste-to-energy are not expected to contribute at the gigawatt (GW) scale in the immediate future. However, as noted, the landscape for solar power is changing rapidly as hardware costs continue to decrease, and near-term MW-scale development of solar PV systems is envisioned as an interim step to future GW-scale capacity. <u>Therefore, investments in more energy efficient transport systems and complementary development of solar rooftop systems with net metering are critical in the near to medium term.</u> Figure 5 illustrates the proposed partial reallocation of CTF funding to support the introduction of EEEVs and demonstration of solar charging, discussed in more detail below.

Status of Renewable Energy and Energy Efficiency Development

28. The Philippines RE potential is high, but new investment has been limited during the last several years relative to the potential. Table 3 shows the installed capacity as of 2010, and projected additions as outlined in the National Renewable Energy Program (NREP), which was formulated under DOE's leadership. Actual RE potential may prove to be higher, as prices for RE power generation technology fall and new systems are commercialized. Therefore, the NREP is a dynamic document, and the proposed capacity additions are not "cut in stone." For example, Table 3 shows a solar power objective of 285 MW by 2030, but a long-term aspirational target of 1,528 MW of solar potential is noted in the NREP, and commercial potential may be even higher.[6]

Table 3: Installed Renewable Energy Capacity and Projected Additions (MW)

Resource	Installed Capacity in 2010	Targeted Capacity Additions				Total Capacity Addition 2011 – 2030	Total Installed Capacity by 2030
		2015	2020	2025	2030		
Geothermal	1,966	220	1,100	95	80	1,495	**3,461**
Hydropower	3,400	341.3	3,161	1,891	0	5,394	**8,724.1**
Biomass	39	276.7	0	0	0	276.7	**315.7**
Wind	33	1,048	855	442	0	2,345	**2,378**
Solar	1	269	5	5	5	284	**285**
Ocean	0	0	35.5	35	0	70.5	**70.5**
TOTAL	**5,438**	**2,155**	**5,156.5**	**2,468.8**	**85**	**9,865.3**	**15,304.3**

Source: Philippines Department of Energy

29. To catalyze investment in RE, the Renewable Energy Law (R.A. 9513) became effective in 2009. The Renewable Energy Law mandates a universal charge on all customers to finance the proposed incentives for RE, especially the proposed FITs.[7] The Philippines already has the region's highest retail electricity tariffs. The potential increase in retail electricity price from this tariff could potentially further harm the broader economic development and investment climate. Although high electricity prices in the Philippines make clean energy projects financially attractive, without broad market transformation the desired objectives of the Renewable Energy Law will be difficult to achieve. The desired transformation requires adoption of new clean energy systems at scale, more responsive regulation, and consumer acceptance.

30. The already high retail electricity tariffs should make the Philippines one of the most attractive places for investments in EE. While high prices provide excellent incentives to undertake EE projects, very few EE projects have been implemented to date. The main barriers are considered to be lack of flagship projects to lead the way and generally weak awareness of EE opportunities by end users. The government has addressed the issue of lighting and building inefficiencies through the Philippine Energy Efficiency Project (PEEP), which is being implemented with ADB support. The PEEP is financing development of energy service companies (ESCOs) and implementation of a large-scale program to switch from use of incandescent to compact fluorescent lamps (CFLs). The PEEP is providing valuable learning experience to inform project design for EEEVs, solar lighting systems,[8] and energy efficient appliances.

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[6] The low-carbon scenario outlined in the original CIP (Figure 8 and Table 2) includes development of 2000 MW by year 2030.

[7] The incentives include a renewable energy certification scheme, feed-in tariffs, renewable energy portfolio standards, net metering schemes, priority dispatch options, and support for renewable energy host communities.

[8] For example, ADB recently provided technical and financial assistance for installation of solar lighting systems in the Boni Tunnel in the Metro Manila area. This installation offers a technical and business model for utilization of solar

Priority Introduction of Energy Efficient Electric Vehicles

31. Transport sector energy consumption is expected to grow at an average annual rate of 3.2%, with road transport accounting for 90% of energy demand for transport by 2030. The public transport sector, mainly tricycles, jeepneys, and buses, contributes a large portion of the country's CO_2 emissions: 3.5 million registered motorcycles and tricycles release 10 million tons of CO_2 into the atmosphere each year and consume close to $3 billion worth of fuel. Introducing new technology is the best immediate option to mitigate transport emissions. Electric vehicles are 3–5 times more efficient than internal combustion engine (ICE) vehicles, whether fueled by gasoline, compressed natural gas (CNG), or liquefied petroleum gas (LPG).[9] The public transport sector can thus save a significant portion of imported energy and reduce CO_2 emissions by switching to energy-efficient electric vehicles (EEEVs).

32. EEEVs represent a new and rapidly advancing technology with the promise to transform the way energy is used compared to today's ICE vehicles. For net energy importing countries such as the Philippines, EEEVs can dramatically reduce the country's oil dependency and improve long-term energy security. EEEVs generate no harmful local air and noise pollution and can be powered by indigenous RE. The envisioned fleet conversion will contribute to making the transport sector's energy use sustainable, by introducing new technology that eventually will allow domestic hydropower, geothermal, solar, and wind power to be used as a fuel source for the transport sector, replacing the largely imported fossil fuels used today.[10]

33. GoP's 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 concomitant reductions in GHG emissions and other air pollution. The proposed electric vehicle policy[11] directly supports electric vehicle related businesses and will exempt importation of all electric vehicles (plug in and hybrid) from taxes for nine years. The proposed EEEVs project will support the Department of Energy's Fueling Sustainable Transport Program and the Alternative Fuel Vehicles Incentives Act of 2011. ***This move to begin electrification of the vehicle fleet is fully consistent with the National Environmentally Sustainable Transport Strategy (NESTS) described in the original CIP.***

34. The transport sector accounted for about one-third of national GHG emissions in 2009 (excluding emissions from land use change and forestry). Transport sector emissions have increased by about 6-10% per year since 1990, from about 10 million tons per year CO_2e in 1990 to about 29 million tons CO_2e per year in 2007.[12] Vehicles are one of the dominant sources of urban pollution that threatens both people's health and economic activity. In the Philippines, motorcycles and tricycles comprise more than 52% of the vehicle population, and these vehicles are the bottom of the transport sector "pyramid." Compared to other vehicles, motorcycles and tricycles are less expensive (and therefore more affordable), they are very visible in most cities of the country, and they play an important role in the transport market, particularly as a key short-distance transport mode for "last-mile" connectivity. However, the use

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resources for EEEV charging systems. A brief description of the Boni Tunnel installation is available online at: http://www.adb.org/news/adb-support-brightens-dark-highway-tunnel-solar-powered-lights

[9] Greenhouse gas calculations are presented in the Appendices.

[10] Today, fossil fuels are trucked to the remotest consumption points from thousands of kilometers away. Domestic hydrocarbon production is dominated by natural gas, predominantly in offshore basins.

[11] Senate Committee Report No. 44 on Senate Bill No. 285–Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2011.

[12] CTF Investment Plan for the Philippines, endorsed in December 2009; paragraph 8 and Figure 3.

of these vehicles contributes to the already declining state of the environment, particularly urban air quality. In an ADB study, transport sector emissions accounted for 30% of air pollution in the Philippines and about 80% of air pollution in Metro Manila.

35. In order to improve urban transportation systems, control pollution from fossil fuels, enhance energy security, and mitigate long-term GHG impacts, the GoP has embarked on an ambitious program to introduce electric and compressed natural gas (CNG) vehicles into the public transportation fleet.[13] ADB is supporting a demonstration project[14] for introduction of e-trikes in Mandaluyong City (part of the Metro Manila core urban area). The initial results have been positive,[15] and GoP has requested ADB to provide financial support for the commercial deployment of 100,000 e-trikes by 2016.[16] The proposed EEEVs project will create an early-adopter opportunity to innovate in establishing sustainable local e-trike manufacturing capacity, battery and vehicle leasing schemes, and associated services for vehicle operation and maintenance, including prototype solar charging stations (SCS): the project is being designed to deliver an end-to-end infrastructure solution for cleaner transport which is consistent with GoP's overall energy security, economic development, and climate change objectives.

36. The private sector has indicated interest in EEEV development, including building and operating solar charging stations (SCS) for electric vehicles, but investors face a chicken-and-egg dilemma: until a commitment is made for large-scale deployment of EEEVs, private investors are unwilling to finance development of a charging network.[17] Therefore, the EEEVs project will include a prototype SCS component. The stations will utilize rooftop arrays at public transport stations, selling electricity at the same price as grid-supplied electricity so that EEEV operators can achieve the cost savings accruing from using electricity as transport fuel, while demonstrating the technological viability of the solar charging systems. The long-term objective is to facilitate scale-up of solar charging systems and achieve grid-parity (see further discussion in Appendix 2).

Renewable Energy Development

37. In keeping with the long-term objectives for energy security and economic development, GoP is committed to developing indigenous RE resources in a manner which protects consumer interests. RE development typically entails higher up-front capital costs, but lower operating and maintenance costs, and in most cases zero fuel costs.[18] The incremental upfront costs may be thought of as advance payments for renewable "fuel", which are amortized and depreciated over the lifetime of RE systems – the fuel may be free, but the conversion to useful energy is not. Policy support via FITs is designed to eliminate the upfront cost barrier, but in the absence of an operational FIT and RPS, as noted above, there is a need for concessional financing to support RE development.

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[13] CNG is used in some other countries (e.g., South Asia) for autorickshaws, and conceivably could be used for tricycles. However, GoP's emphasis on energy security and reduction of petroleum product imports points toward electrification as the preferred option.

[14] Financed by RETA 6441: *Efficiency Improvement and Connectivity Strengthening in Southeast Asia*. Manila.

[15] A summary of the initial results of the pilot and project concept can be found at: http://www.adb.org/projects/etrike/etrike-industry-presentation.pdf

[16] ADB. 2010. *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).

[17] This situation is further compounded by a lack of proven business models in other countries which would apply to "bottom of the pyramid" transport networks. Charging networks under development in countries such as Israel and the US cater to high-end 4-wheel private vehicles, i.e., the top of the transport pyramid.

[18] Exceptions are biomass power, where feedstock is normally not free, and geothermal, where steam production may be segregated and sold to generation units.

38. While the FIT and RPS remain in regulatory suspense, ADB has supported 2 noteworthy solar energy demonstration projects. In June 2012, ADB commissioned a 570 kW rooftop solar PV system at its Manila headquarters, which is the first of its kind in the Philippines and the largest rooftop PV project in Southeast Asia. The installed cost is well below that noted in the CIP in 2009, suggesting that there is scope for rooftop solar PV development outside the envelope of the FIT (which is limited to ground-mounted installations). As noted above, earlier in 2012, ADB also supported the Boni Tunnel lighting project to demonstrate the feasibility of solar PV and lithium-ion battery technology for large-scale street lighting applications. This project comprises 59 square meters of solar panels which provide power to 94 light-emitting diodes (LEDs) with 22-watt capacity each. This project provides about 19% of the tunnel power demand, but achieves a 51% energy savings compared to the old lighting system.

39. As noted above, the rooftop solar concept presented in the original CIP is being retained in the CIP-R, albeit with a modified scope. GoP is requesting to reduce the original allocation to $20 million of CTF cofinancing to support total investment of $120 million to finance at least 40 MW of new solar PV capacity outside the envelope of the proposed solar FIT (see further discussion in Appendix 3).

IV. PROPOSED CHANGES TO THE INVESTMENT PLAN

40. The original CIP identified several prospective interventions in EE, RE, and urban transport. The indicative financing plan endorsed in December 2009 is summarized in Table 4.

Table 4: Indicative Financing Plan Endorsed in December 2009 ($ million)

Financing Source	Renewable Energy (WBG)	Urban Transport (WBG)	RE and EE (ADB)	Total
CTF	75	50	125	250
GoP / DBP	180	50	50	280
IBRD Loans	250	250	0	500
IFC Loans	250	0	0	250
ADB Loans	0	0	400	400
Private sector	750	0	350	1,100
Total	**1,505**	**350**	**925**	**2,780**

Source: CTF Investment Plan for Philippines 2009
ADB=Asian Development Bank, CTF=Clean Technology Fund, DBP=Development Bank of the Philippines, EE=energy efficiency, GoP=Government of the Philippines, IBRD=International Bank for Reconstruction and Development, IFC=International Finance Corporation, RE=renewable energy, WBG=World Bank Group

41. ***The major change proposed is to restructure CTF funding implemented in partnership with ADB to focus on an Energy Efficient Electric Vehicles project and a revised Solar Energy Development project.*** In particular, EEEVs promise to transform the way energy is used by light-duty public vehicles. For net energy importing countries such as the Philippines, electric vehicles can dramatically reduce the country's dependence on imported energy resources, which in turn should reduce short term price volatility and increase long-term energy security. Electric vehicle technology presents the opportunity to transition from conventional fossil-fueled vehicles to vehicles which do not directly generate harmful local air and noise pollution and can be powered by indigenous RE resources such as solar, hydropower or geothermal. The complementary investments in solar energy development will provide part of the increased power demand from EEEVs.

42. These prospective investments are appropriate for CTF support given the transformational nature of the projects and the replication and scale-up potential.[19] It is proposed that $105 million be allocated to the ADB EEEVs project and $20 million to the solar energy development project, as shown in Table 5. Concept papers for the candidate investments are presented in Appendices 2 and 3.

Table 5: Indicative Financing Plan After Reallocation ($ million)

Financing Source	Renewable Energy (WBG)	Urban Transport (WBG)	Energy Efficient Electric Vehicles (ADB)	Solar Energy Development (ADB)	Total
CTF	75	50	105 [a]	20 [a]	250
GoP / DBP	180	50	99	20	349
IBRD Loans	250	180	0	0	430
IFC Loans	250	0	0	0	250
ADB Loans	0	0	300	80	380
Private sector	750	0	(tbd) [b]	(tbd) [b]	750
Other cofinancing	0	20	0	0	20
Total	**1,505**	**300**	**504**	**120**	**2,429**

Source: MDB teams
ADB=Asian Development Bank, CTF=Clean Technology Fund, DBP=Development Bank of the Philippines, EE=energy efficiency, GoP=Government of the Philippines, IBRD=International Bank for Reconstruction and Development, IFC=International Finance Corporation, (tbd)=to be determined, WBG=World Bank Group
Notes to Table 5:
[a] For the EEEVs project, a CTF grant of $1 million is requested for fine-tuning of technology options, technology transfer, local industry support and capacity building (implementation support, including monitoring and evaluation activities will be financed by the ADB loan). For the Solar Charging Stations component a CTF grant of $4 million is requested; see discussion in main text and concept paper in Appendix 2 for further details.[b] Private sector entities will participate in project implementation via supply of goods and services. For the EEEVs project, private sector investment is expected during replication and scale-up, and as such no private sector cofinancing is shown in Table 5. Private sector cofinancing for the solar energy development project has yet to be determined.

V. POTENTIAL IMPLICATIONS OF PROPOSED CHANGES FOR ACHIEVEMENT OF INVESTMENT PLAN OBJECTIVES

43. The proposed changes will enhance both the RE and cleaner transport programs by using CTF resources to accelerate investment in advanced electric vehicle systems, and will contribute directly to the near-term strategic RE investment program. An assessment of potential implications of the proposed changes for the achievement of objectives and targets of the original CIP is summarized in Table 6 and discussed below.

44. ***Transformational impact will be enhanced.*** The scope of RE and cleaner transport sector interventions will be expanded relative to the original CIP, bringing additional value by opening a new "window" for deploying EEEVs in sustainable transport systems. More efficient battery technologies are providing a cleaner alternative to pollution-emitting ICE-powered vehicles. In some cases, conventional motorcycles emit more pollution per unit than large sport utility vehicles, because the former are not equipped with equivalent emissions-control technology.[20] Electric motorcycles and tricycles can immediately eliminate tailpipe emissions, significantly reducing urban air pollution. Commercial success of e-trikes can be replicated in other types of vehicles, including jeepneys and buses (although technical complexity increases with larger vehicles). The SCS component will demonstrate the technological viability of RE-

[19] Pakistan, Indonesia, Malaysia, Bangladesh and Thailand have expressed interest in exploring options for implementing similar projects.
[20] The Technology Review, published by MIT, 2007, available at: http://www.technologyreview.com/energy/19069/

based charging systems for e-vehicles and a business model which can be replicated and scaled up with private sector investment. The RE development project will support the GoP long-term objectives for energy security and economic development, taking into account rapid advances and cost reductions in photovoltaic solar power technology.

Table 6: Summary Assessment of Proposed Adjustments to the Philippines CTF IP

CTF Investment Criteria	Original Investment Plan: Net Metering with Solar PV	Updated Investment Plan: Energy Efficiency Electric Vehicles and Solar Energy Development Projects
Potential for GHG Emissions Savings	Direct reductions would be relatively modest but replication and scale-up potential is quite high as the investments would promote GHG reductions through RE and EE.	ADB program will target end-use efficiency improvements in the transport sector which represent permanent energy savings via avoided fuel imports. The solar charging stations will demonstrate the feasibility of fueling EEEVs with 100% renewable energy. The solar energy development project will complement the FIT and RPS objectives. Replication and scale-up potential is high for electric vehicles, solar charging stations, and solar energy development
Cost-effectiveness	Initial direct reductions of 100,000 tCO_2e per year with 10:1 replication and scale-up potential Cost effectiveness: CTF$125 / 1 $MtCO_2e$ / year with replication and scale-up	EEEVs project: 100,000 vehicles will deliver net reduction of 270,000 tCO_2e per year; with 10-year vehicle lifetime total GHG reductions are 2.7 $MtCO_2e$. Replication and scale-up potential is at least 20 to 1. Cost effectiveness: CTF$105 million / 2.7 million tCO_2e = CTF$38 / tCO_2e, declining to CTF$3.89 / tCO_2e with replication and scale-up of 10 to 1. [See additional notes in Table 10 and Appendix 2.] Solar energy development project: At least 40 MW of rooftop solar PV operating at 15% load factor will deliver net reduction of about 0.03 million tCO_2e per year assuming grid emissions factor of 0.52 tCO_2e/MWh. With 15 year lifetime total GHG reductions are about 0.4 million tCO_2e. Replication and scale-up potential is at least 10 to 1. Cost effectiveness: CTF$20 million / 0.4 tCO_2e = CTF$49 / tCO_2e, declining to CTF$4.87 / tCO_2e with replication and scale-up of 10 to 1.
Demonstration Potential at Scale	Transformation potential[a] of at least 10	Transformation potential is estimated to be > 20 for EEEVs and >10 for solar energy development
Development Impact	The proposed investment would demonstrate viability of the net metering system (and business model) and accelerate development of the solar PV industry in the Philippines	The EEEVs and solar energy development projects will accelerate growth of the respective industries in the Philippines by demonstrating new technology / systems and business models. Impacts with respect to energy security and environmental benefits will be higher than the original CIP. Impacts on employment also may be higher than the original CIP given the potential benefits accruing to e-trike owner/operators and private sector firms involved in supply of hardware and after-market services for EEEVs, solar charging stations, and rooftop PV systems.
Implementation Potential	As the implementing rules and feed-in tariff for net metering have not been finalized, the originally proposed project is not	The EEEVs project has been developed based on a successful pilot project in the Metro Manila region and is at an advanced stage of preparedness. The solar energy development project is in the identification

CTF Investment Criteria	Original Investment Plan: Net Metering with Solar PV	Updated Investment Plan: Energy Efficiency Electric Vehicles and Solar Energy Development Projects
	ready for implementation.	stage, building on the Boni Tunnel Lighting project and ADB headquarters rooftop solar PV experience, and is tentatively scheduled for ADB Board consideration in 2013. See Table 8 for discussion of implementation risks and mitigation.
Additional Costs and Risk Premium	The additional costs of the solar PV systems and first-mover risk associated with net metering clearly justified the use of CTF resources.	The proposed projects will focus on using CTF for covering additional costs associated with introduction of electric vehicle systems and for covering additional costs and first-mover risks in solar energy systems investments (see Appendices 2 and 3).

[a] Transformation potential is defined in paragraphs 15 - 17 of the *CTF Investment Criteria for Public Sector Operations* dated 9 February 2009.
CIP=CTF Country Investment Plan, CTF=Clean Technology Fund, EE=energy efficiency or energy efficient, EEEVs=energy efficient electric vehicles, GHG=greenhouse gas, PV=photovoltaic, RE=renewable energy, tCO_2e=tons carbon dioxide equivalent

45. ***Emissions reductions from the EEEVs and solar energy investments will be higher than in the original investment plan, with higher replication and scale-up potential.*** The direct investments in the EEEVs and solar energy development projects will result in net avoided fossil fuel emissions estimated to be at least 0.3 million $tCO2_e$ per year: about 0.27 million $tCO2_e$ per year for the proposed EEEVs project and about 0.03 million $tCO2_e$ per year for the solar energy development project (emissions reductions estimates are discussed in Appendix 2). Cost-effectiveness will be better and replication and scale-up potential is equal to or higher than the original CIP as shown above in Table 6 (also see Table 10). In addition to the substantial energy security benefits, the EEEVs project will bring environmental and public health co-benefits equal to or greater than that which would have been realized under the original Investment Plan. The solar energy development project also will support expansion of the GoP clean energy infrastructure beyond that envisioned under the proposed FIT and RPS framework.

46. ***Replication and scale-up potential will be higher than originally planned.*** Commercial deployment of EEEVs will expand the urban transport program beyond the original CIP. The replication potential for e-trikes and motorbikes alone is at least 20 to 1 based on the current vehicle fleet size; however, replication and scale-up is conservatively assumed to be 10 to 1 for purposes of calculating total emissions reductions and indirect cost-effectiveness. Replication potential for investment in solar energy systems is well over 10 to 1. Using CTF to cofinance investment on these types of pioneer projects will eliminate first-mover risk and help mobilize future commercial investment for replication and scale-up. Private sector firms will be actively engaged in project implementation via service, supply, and maintenance contracts; the private sector is expected to take a prominent role in replication and scale-up.

47. ***Development impacts and co-benefits will be maintained or enhanced.*** New investment in EEEVs and solar energy systems will improve energy security, reduce GHG emissions, and reduce local pollutant emissions with substantial public health benefits. Using CTF to cofinance these types of pioneering projects will help mobilize future commercial investments (mainly by private sector entities) for replication and scale-up, which will stimulate economic growth and facilitate the long-term transition to low-carbon development. A comparison of proposed results indicators is presented in Table 7 (additional results indicators will be developed for project proposals in accordance with CTF guidance).

Table 7: Results Indicators

Results Indicator	Baseline	Expected Program Results in Original CIP: Net Metering with Solar PV	Expected Program Results For EEEVs and Solar Energy Projects
Cost of solar power units	$18,000 with 9.8 year payback	$10,000 with 2.5 year payback [a]	[To be determined during project identification and preparation.]
Number of commercial buildings with solar panels and net metering	Limited	30,000 buildings [a]	[To be determined during project identification and preparation.]
Number of e-trikes and support infrastructure in commercial operation	20 (with lithium ion batteries, post-pilot test) and about 200 using conventional lead acid batteries and less efficient motors.	n/a	100,000 e-trikes operating by 2016. Public charging infrastructure and battery leasing established in respective regions.
Number of Solar Charging Stations and Rated Capacity	n/a	n/a	Standardized design prototype solar powered charging stations. 5 x 200 kW solar-powered charging stations operating by 2015.
RE capacity and output	570 kW rooftop solar with 15% load factor	n/a	Standardized designs for rooftop solar PV 40 MW of rooftop solar PV by 2016, [b] Energy output of 52,560 MW-h per year at 15% load factor

Notes: [a] Indicators are from Table 1 of Executive Summary of the original CIP.
[b] Assumes $3 per watt installed system cost.
Source: October 2011 Joint Mission

48. ***Implementation potential for the EEEVs and solar energy projects is high.*** The EEEVs project is scheduled for presentation to ADB's Board of Directors in August 2012. This project has strong support at the highest levels of the GoP. For this reason, the project is being submitted to the CTF Committee for consideration of funding approval simultaneously with the requested endorsement of the updated Investment Plan. The solar energy project is at the identification stage, and is expected to be prepared and presented for ADB Board consideration in 2013. Risks and mitigation measures are summarized in Table 8.

49. The Philippines Department of Energy (DOE) will be the executing agency for these proposed projects, as DOE is the designated agency for RE development, energy efficiency, electric vehicles, and alternative fuels. The scope and implementation arrangements of the proposed projects have benefited from a substantial learning curve from the Philippines Energy Efficiency Project (PEEP, supported by ADB financial and technical assistance), the EEEVs pilot projects in Mandaluyong and Taguig Cities, the Boni Tunnel Lighting installation, and the rooftop solar installation at ADB headquarters. A key lesson learned from the EEEVs pilot projects is that for transformational impact to be realized, the investments must include the complete spectrum of stakeholders including vehicle owner/operators, equipment suppliers, and after-market service providers, i.e., the project must facilitate "end-to-end" infrastructure development including the development of a credible battery industry with new technology (i.e., the full supply chain must be developed).

Table 8: Risks and Mitigation Measures

Risk	Mitigation Measure	Residual Risk
Policy and regulatory framework: Clarity of policies related to EE and cleaner transport and RE	• High energy prices and price volatility provide macro-economic support to end-use efficiency investments • Application of innovative financing to cover part of front-end capital costs and to reduce first-mover risks	L
Implementation Capacity: Readiness of owner-operators to procure and operate electric vehicles	• Technical assistance to transfer know-how on project planning, financing, risk management, especially for pioneering projects	L/M
Technology: Limited know-how for after-market service of electric vehicles	• Technical assistance and know-how transfer for newly-introduced electric vehicles will be provided based on experience from pilot project	M/H
Finance: financial benefits of EEEVs need to be monetized	• E-trike operators are expected to improve net income by 50%; a rent-to-own approach will ensure affordability of vehicle ownership • Carbon finance will be mobilized to the maximum extent possible, including prospective post-2012 carbon revenue.	L/M
Environmental Management: Management and disposal of used appliances and batteries	• Battery leasing and recycling programs are integrated into the e-trikes projects. • Rigorous application of GoP regulatory framework and ADB safeguards for environmental and social impact.	L
Development Impact: Mobilization of investment for replication and scale-up; potential disruption of access to energy to “last mile” consumers	• Work closely with vehicle owners, business associations, and domestic financial institutions to raise awareness and promote future investment in electric vehicles and solar charging stations. • Electricity demand from the EEEVs project will be offset by 1338 MW of new grid-connected capacity, more than compensating for incremental EEEV demand (see Appendix 2)	L
Carbon finance delivery risk: Verification bottlenecks are currently delaying annual payments and affecting the financing structure of large scale transactions.	• Coordinate with ADB Future Carbon Fund to identify opportunities to maximize potential carbon revenues, and reduce or eliminate delays in methodology and verification processes • Consider voluntary transaction in secondary carbon markets	M/H
Procurement : Limited number of global suppliers for electric vehicle technologies may limit competition in some instances	• Competitive bidding will be utilized in accordance with MDB and GoP requirements.	M/H
Overall risk after mitigation	**Moderate**	

50. ***Additional costs and risk premiums justify use of CTF.*** The EEEVs and solar energy development projects are both first-of-a-kind in the Philippines. The EEEVs project will be the largest effort in the Asia region to begin electrification of the public vehicle fleet. These pioneer projects face first-mover risk, and present higher-than-normal end-user costs with respect to purchase of new vehicles and appliances (e.g., the e-trikes cost at least $1000 more per unit than conventional gasoline-powered tricycles). Lower operating costs will offset the initial purchase costs, but at present there is no mechanism to monetize the life-cycle savings to assist end-users in the initial purchase.

51. Carbon finance is facing constraints due to post-2012 market uncertainties. Carbon finance opportunities will be pursued, but any revenue is expected to be “on delivery” and will not be sufficient to catalyze up-front investment. Also, any CDM funds are uncertain until

registration with the UN, which typically occurs after the projects' financial close. Moreover, projects from the Philippines not registered by December 2012 will not be eligible for carbon financing under the European Emissions Trading System.

VI. ADDITIONAL CONSIDERATIONS OF THE PROPOSED PROJECTS

Net Impact on the Electricity Grid and GHG Reductions

52. Conversion from ICE to EEEVs will save energy, as the energy losses in ICE vehicles are typically 70–80% versus 5–15% in EEEVs. Additional electricity required for the EEEVs project will depend on the relative contribution of public charging stations used during peak time (6 MW of grid-connected charging stations, plus 1 MW of solar charging stations), and overnight home-based chargers (60 MW, off-peak). As both modes of charging will be implemented, and considering that overnight charging will provide night-time "valley filling" benefits, the incremental demand presented by the EEEVs project is expected to be less than 60 MW. A "maximum demand" case of 60 MW represents incremental power demand of about 0.37% of total installed generating capacity of 16,359 MW.[21] Total incremental energy demand due to the project is estimated at 150 GWh per year (assuming e-trike consumption of 5 kWh per day, 300 days per year operation, and fleet of 100,000 vehicles), which represents incremental consumption of about 0.22% of reported generation output in 2010 and about 18.8 MW of equivalent baseload generation capacity. This additional demand on grid-supplied electricity is considered to be negligible.[22] Table 9 presents estimated changes in energy balance assuming the EEEVs and solar energy development projects are both implemented, along with other committed near-term RE development.

Table 9: Capacity Balance for Vehicle Charging, Megawatts (MW)

Capacity Additions	**MW**
Solar Charging Systems (5 x 200 kW stations)	1
New Rooftop PV and/or other solar energy installations	40
Near-term RE Power Additions (see Appendix 2, Table A2.2)	138.5
Subtotal	179.5
Maximum Demand from EEEVs Project	60
Net Capacity Additions	119.5

Source: ADB staff estimates

53. In the case of the Philippines, with a large share of RE in the generation mix, the GHG reductions and overall end-use EE gains will be quite significant. As shown in Figure 6, clean energy accounts for about 66% of power generation and about 39% of total primary energy.[23] The GoP plans to establish solar charging stations wherever area and site access constraints do not exist, which will make the carbon footprint of these vehicles close to zero. Assuming consumption of 5 kWh per day and 300 days per year operation, an electric tricycle will use about 1.5 MWh of electricity per year, resulting in 780 kg CO_2e per year using a grid emission

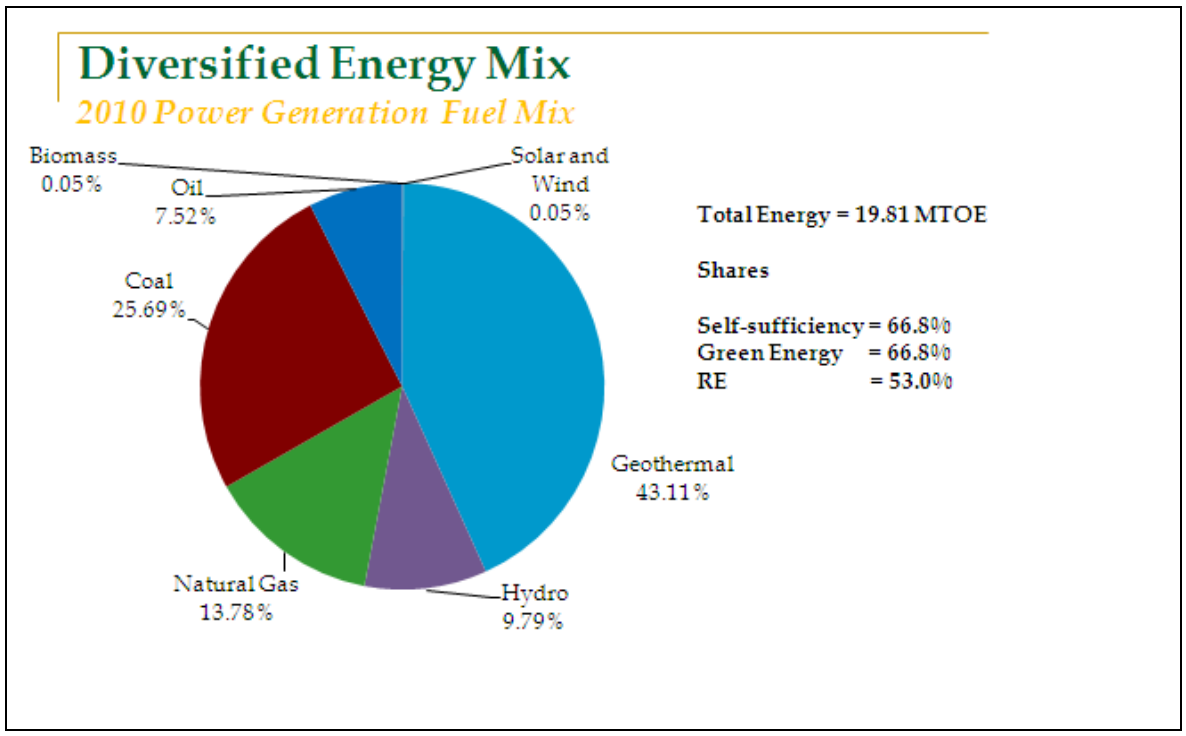
[21] Installed capacity is spread across 3 regional grids, as illustrated in the original CIP, Figure 11.

[22] Considering that 1200 MW of coal-fired capacity is being developed in addition to the 138.5 MW of RE noted in Table 9, grid-supplied electricity would not be stressed even if replication and scale-up of 20:1 is achieved: deployment of 2 million e-trikes would result in electricity consumption of 3000 GWh per year, which would require about 375 MW of equivalent baseload capacity. Baseload capacity assumes 8000 hours per year generation output. See additional details in Appendix 2.

[23] Figure 6 reflects the current situation with oil dominating the transport sector, which presents a tremendous opportunity for end-use efficiency gains via electric vehicles.

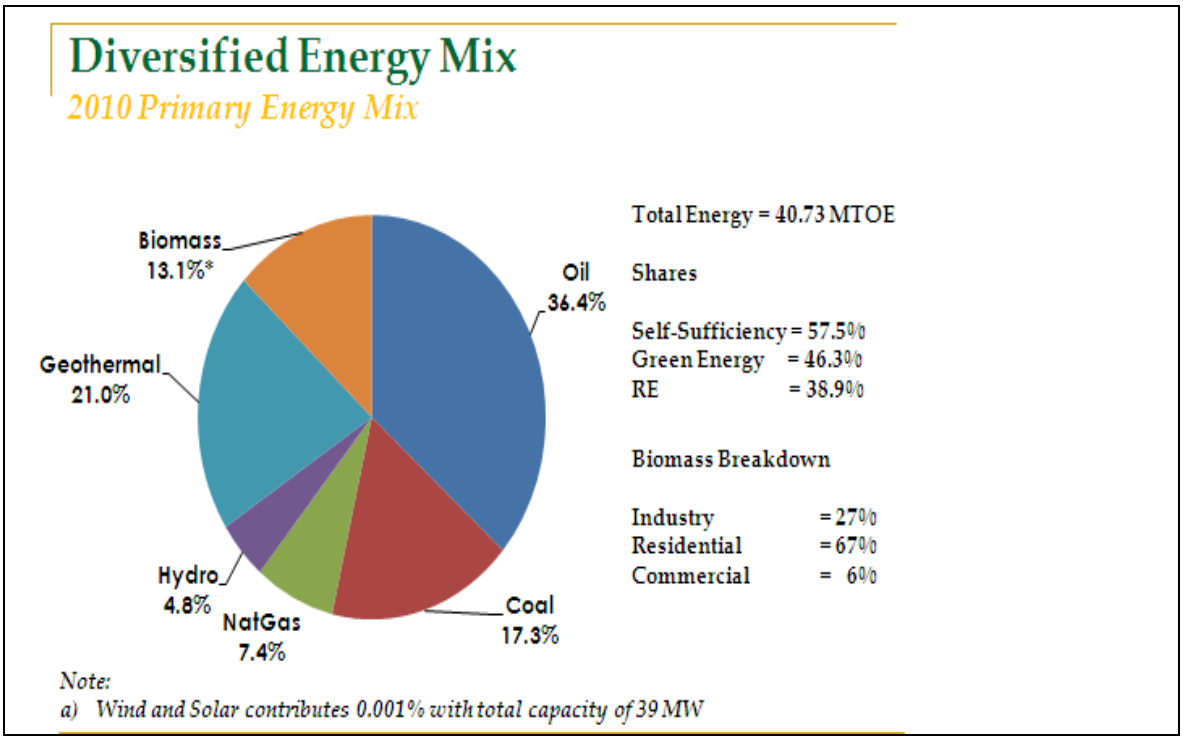
factor of 0.52 tCO_2e/MWh,[24] versus an equivalent ICE tricycle, which produces about 3.5 tons of CO_2 each for the same service delivery – more than a 70% GHG emissions reduction. This estimated GHG reduction is consistent with a recent study by MIT, which stated that accounting for the total energy consumed from well to wheel,[25] electric vehicles can reduce energy consumption by up to 50% and greenhouse gas emissions by up to 60% compared to ICE vehicles. The savings is in even more in congested urban areas, as the average speed is low (no electricity is used while stranded in traffic jams and these vehicles will not use any air conditioning). The energy losses in electric motors are less than ICE vehicles, and transmission and distribution of electricity is more efficient and cost effective than transportation of liquid fuels to the end user (additional calculations are presented in Appendix 2).

Figure 6: Primary Energy and Power Generation Mix (2010)



[24] The grid emissions factor of 0.52 tCO_2e/MWh is consistent with 2010 generation output and various CDM projects, and is lower than equivalent emissions from gasoline-powered vehicles which would be 0.807 tCO_2e/MWh for an ICE with 30% thermodynamic efficiency (see additional calculations and discussion in Appendix 2).

[25] 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



Choice of Battery Technology and Disposal Implications

54. ADB's publication on electric bikes[26] identified lead (Pb) pollution as an inherent problem with electric vehicles and, as long as electric vehicles use lead acid batteries, the overall pollution loads will be several times higher than ICE. According to the United States Environmental Protection Agency, Li-ion batteries are not an environmental hazard[27], and are safe for disposal in the normal municipal waste stream.[28] While other types of batteries include toxic metals such as cadmium, the metals in Lithium-ion batteries–cobalt, copper, nickel and iron–are considered safe for landfills or incinerators. Therefore, the e-Trikes will use Li-ion batteries at the outset; the battery leasing business model will allow for more advanced batteries to be supplied in the future.

Cost Effectiveness of the Proposed EEEVs Project

55. Tables 10 and 11 show additional calculations of the cost effectiveness and transformative impacts of the EEEVs project assuming a conservative replication and scale-up factor of 10 to 1. Table 10 indicates that cost effectiveness is well within expectations as presented in CTF investment guidance, even in a pessimistic scenario discounted by 30% for potential "rebound effects." The pessimistic scenario shown in Table 10 shows that the proposed EEEVs project would be more cost-effective than the net metering project proposed in the original CIP.

[26] ADB. 2009. *Electric bikes in the PRC: Impact on the Environment and Prospects for Growth.* Manila.
[27] http://www.ehso.com/ehshome/batteries.php
[28] http://www.epa.gov/osw/hazard/wastetypes/universal/batteries.htm

Table 10: CTF Cost-effectiveness of EEEVs Project vs. Original Net Metering Project

Net GHG Reductions ($MtCO_2e$/year)	Cost Effectiveness (CTF$/$tCO_2e$/year)	Cost Effectiveness (CTF $/$tCO_2e$) [a]	Scenario / Assumptions
0.33	306.06	30.06	National electricity and heat emissions factor of 0.6 tCO_2e/MWh [b]
0.27	374.07	37.41	ADB base case with grid emissions factor of 0.52 tCO_2e/MWh [c]
0.231	437.23	43.72	0.33 $MtCO_2e$/year discounted 30% for "rebound effect" [d]
2.31	43.72	4.37	Replication and scale-up of 10:1 on case assuming "rebound effect"
0.1	1250	50	Original CIP: net metering with solar PV; 25-year project lifetime [e]
1	125	5	Original CIP: net metering with solar PV; replication and scale-up of 10:1 [e]

Source: ADB Estimates.
Notes:
[a] Clean Technology Fund, Investment Criteria for Public Sector Operations, 9 February 2009; paragraph 11 notes that "...CTF co-financing will ordinarily not be available for investments in which the marginal cost of reducing a ton of CO_2-equivalent exceeds US$200...."
[b] Emissions factor calculated for Philippines electricity and heat consumption by UK Defra.
[c] Additional discussion of emissions factors is presented in Appendix 2.
[d] Consideration of potential rebound effects is not required by CTF guidance.
[e] Adapted from Original CIP, Annex 2.

56. Table 11 illustrates how the cost of avoided CO_2 drops significantly with larger transformation brought about by the CTF investment.[29] In the small, medium, and large project scenarios, CTF cost-effectiveness is well below the upper limit guidance of $200 per ton. Assuming a full transformation and scale-up with replication of 10-to-1, the lifecycle CO_2 cost will be well below the $5 per ton estimated for the net metering project proposed in the original CIP. E-trikes also will generate significant fuel savings and other social co-benefits: about $10,000 over the 10 year life, the overall cost of avoided CO_2 being about "**-$200 per ton**" – not uncommon for end-use EE projects, which is also reflected in the McKinsey abatement cost curve for "Fuel efficiency in vehicles" (Figure 2, above) of about "-€50 per ton" or "-$63 per ton" (based on 8 June 2012 exchange rate).

Table 11: EEEVs Project Cost-Effectiveness vs. Investment Scale

CTF Allocation and Scale Effects	Small isolated grids/ no CTF	Small Project	Medium Project	Large Project
Transformational Impact	Zero	Minimum	Partial transformation	Full transformation
Net Avoided CO_2e (t/y/vehicle)	2.5	2.6	2.6	2.7
Number of EEEVs	5,000	20,000	50,000	100,000
EEEV Cost ($/unit)	5,000	4,700	4,500	4,000
Total Cost ($ Million)	25	94	225	400
CTF Amount ($ Million)	0	30	70	101
CTF Cost-effectiveness ($/t/y)	n/a	576.92	538.46	374.07
CTF Lifecycle Cost-effectiveness ($/t)	n/a	57.69	53.85	37.41
Cost-effectiveness with 10x Replication and Scale-up ($/t)	n/a	5.77	5.38	3.74

$ = US dollars, CO_2e = carbon dioxide equivalent, t = ton carbon dioxide equivalent, y = year
Source: ADB staff estimates

[29] Table 10 assumes a replication and scale-up factor of only 10 to 1 versus the 20 to 1 factor used in Table 5.

Technology Options for Cleaner Transport

57. A recent ADB study concluded that to make tricycles more energy-efficient and green, two technology options were available: (a) retrofit of existing units using conversion kits to LPG and CNG fuels; or (b) replace the propulsion system with either hybrid or purely battery-operated, or with more efficient internal combustion engine (ICE). Only the battery operated option can reduce the country's reliance on fossil fuels. Battery operated electric vehicles can also be "zero-emission vehicles", because the electricity can be generated from 100% renewable sources, and these vehicles have no tail-pipe emissions. The electric option also represents a one-step solution, while retrofitting from gas to LPG entails a two-step solution (that may merely postpone an inevitable shift to electric). More importantly, e-trikes offer the highest net income potentials for tricycle operators and drivers. The annual operating cost is nearly 50% lower than a conventional gasoline-fueled trike.

Appendix 1: Summary of Stakeholder Engagement During Investment Plan Revision

A. Background

1. During development of the original CIP, the MDBs worked closely with the Department of Energy (DOE), Department of Finance (DOF), and the National Economic and Development Authority (NEDA). These agencies agreed that the $125 million in CTF financing to be administered by ADB would be earmarked for the energy sector. Since the EEEV project is fundamentally seen as an energy project, and falls within the mandate of the DoE–led Fueling Sustainable Transport Program, project ownership rests with the DOE, with the DOF as the key counterpart for all MDB-financed projects, including those with CIF funding. DOE communicated this to the Department of Transport and Communication (DOTC) and the Department of Environment and Natural Resources (DENR), explaining DOE's interest in reallocating CTF resources from the previously planned renewable energy (rooftop solar development) and energy efficiency (energy efficient appliances) projects to the proposed the EEEVs project. NEDA also was kept informed of these developments, and it approved inclusion of the EEEVs project in the GoP's foreign assistance program (Attachment 1a). The President of the Philippines serves as Chair of the National Climate Change Commission (CCC), and has supported the e-trikes pilot project and development of the EEEVs project. Given this tacit endorsement, DOE did not solicit further official comment from the CCC.[30]

2. Subsequent to presentation and discussion of the CIP-R in November 2011, a group of local and international civil society organizations (CSOs) raised concerns about a perceived lack of consultation on the proposed reallocation of CTF funds from supporting the promotion of renewable energy to sustainable transport. ADB responded in writing, clarifying that the EEEVs project was still under development, and therefore, wide discussions and consultations would address the vehicle design, safety, disposal, post-sale issues, and other concerns raised by various stakeholders. A specific set of consultations was subsequently organized and held on 21-23 May 2012, covering both the allocation of CTF resources and design of the EEEVs project. These consultations are summarized below in Section C.

3. The EEEVs project team and the Government have been actively engaging on project design with a range of stakeholders – tricycle drivers, suppliers, manufacturers, government officials, lawmakers, and academic institutions – for more than one year. Since July 2011, ADB has hosted, on behalf of DOE, 7 informal industry meetings to foster improved communications and potential cooperation among international investors and members of the local tricycle manufacturing community. ADB has shared at these meetings, among others, findings from the pilot project in Mandaluyong, technical details of e-trike specifications, charging options, and bidding processes. These and more formal meetings and workshops have provided venues for professional networking within this nascent industry.

4. The DOE also undertook a nationwide e-trike design competition and selected 3 top designs from 180 entries. An internationally reputed car designer is working on a design that meets international safety and comfort standards taking into account ideas from the 3 winning designs and the feedback of the drivers on the pilot units.

5. The EEEVs project concept is thus the result of extensive and extended engagement with a range of stakeholders, and the proposed solar energy development project concept has also benefited from an active dialogue amongst stakeholders dating back to the original CTF

[30] It should be noted that inter-governmental consultation is primarily the responsibility of the government.

Investment Plan's development. A solar energy development project is now being retained as part of the proposed CTF investment, based on stakeholder feedback, with the project concept to be further refined. The history of stakeholder engagement feeding into this Update is summarized below.

B. Informal Industry Meetings

6. Beginning in July 2011, the EEEVs project team began hosting informal industry meetings to foster communication and cooperation amongst industry players and to ensure local buy-in throughout the project preparatory process. Seven informal meetings were held to encourage representatives of the local tricycle manufacturing community to ask questions about e-trike specifications, design and bidding processes, and to maintain open communication with the project team. These well attended meetings took place on the following dates (a list of organizations represented is given in Attachment 1b):

- July 12, 2011 at the Asian Development Bank;
- July 26, 2011 at the Serendipity Lounge, Discovery Suites;
- August 9, 2011 at the Serendipity Lounge, Discovery Suites;
- August 23, 2011 at the Serendipity Lounge, Discovery Suites;
- September 6, 2011 at the Savannah Function Room, Discovery Suites;
- September 20, 2011 at the Savannah Function Room, Discovery Suites; and
- October 25, 2011 at the Savannah Function Room, Discovery Suites.

7. Company representatives were encouraged to submit presentations regarding e-trike design and business practices. Working groups comprising project team members and industry representatives were established to explore different aspects of the scale-up of a local e-trike manufacturing, assembly, and battery supply business model. The topics examined include (i) the best possible set of criteria for companies to participate in the project and how to best structure a local industry, (ii) registration and franchising challenges and potential solutions; and (iii) developing a set of options and best practices for e-trike disposal and recycling.

8. Through the informal meeting process, the project design team gained valuable insight into the challenges and concerns facing local manufacturers regarding the scale-up planned as part of the e-trike project. Primary concerns include production capacity, government support (taxes, duties and fees), the ADB bidding process, and e-trike design specification.

C. More Formal Meetings and Workshops

9. The project team has also organized more formal engagement with those interested in the EEEVs project design over the past year. Stakeholders have ranged from international electric vehicle experts, representatives of local governments, representatives from the Philippine Department of Energy (DOE) and other government agencies, representatives from Congress, and international battery manufacturers. Meetings such as these will continue throughout the project preparatory process and will transition to building community awareness and addressing industry, community and driver concerns as project implementation moves forward.

1. Energy Efficient Electric Vehicles Forum, April 28, 2011

10. The Energy Efficient Electric Vehicles Forum at ADB served as an important venue for project concept introduction on behalf of government and industry representatives. The proposed project was introduced by the ADB and DOE, and international consultants discussed best practices for electric vehicles around the globe. The Forum emphasized the role of government support and incentives in creating a successful electric vehicles program, the role of the private sector in achieving successful economies of scale, and the importance of technology transfer to achieve the economic and environmental goals of the project.

2. Boracay Consultation Workshop, August 14-15, 2011

11. Members of the project team traveled to Boracay Island to assess the existing conventional tricycle market and how to successfully work with local government officials and tricycle drivers to implement a full transfer to ADB sponsored e-trikes beginning in early 2012. Team members noted the concerns of local tricycle drivers, such as hilly conditions and passenger preferences geared towards promoting tourism (where to store luggage, seats facing out, etc.). Following the meetings and follow-up from project team members, the Municipal Council of Malay, which includes Boracay, passed a resolution on September 20, 2011 to shift to e-trikes in 2012. The resolution expresses the Council's support for the project not only on the Island of Boracay, but throughout the Philippines.

3. Meetings with Battery Manufacturers (Various Dates)

12. The project team has met with various international battery manufacturers – Toshiba, Samsung, LG, Kokam, etc. These meetings have enforced the team's commitment to lithium ion battery technology, helped to evaluate various power capacity options and cost concerns, and have helped to determine how to structure the e-trike leasing program to maximize benefits to end users. The project team is working with battery manufacturers to achieve a cost-effective, lightweight, and environmentally sound battery solution that can sustain the industry on a long-term basis.

4. Workshop with Japanese Battery Manufacturers, November 23, 2011

13. The DOE and ADB hosted a workshop for industry representatives and interested parties featuring presentations by Japanese manufacturers. Presenters included PriceWaterhouse Coopers Aarata, PUES Corporation, Yamaha Motor Co., Ltd., Prostaff Co., Ltd., Tokyo R&D Co., Ltd., Toyota Industries Corporation, Nissan Motor Co., Ltd., and SIM Drive Corporation. A question and answer session followed.

5. Workshop in Tokyo, November 28, 2011

14. A workshop was hosted at the Asian Development Bank Institute in Tokyo with representatives from the Philippine Embassy to Japan and ADB. Participants were invited to tour the Nissan factory and to see the electric vehicle model, the Leaf, in production. Participants included PwC, ITS Network, PUES Corporation, Tokyo R&D Co., Ltd., Assemblepoint Co., Ltd., Nissan Motor Co., Ltd., Toyota Industries Corporation, Toshiba Corporation, Prostaff Co., Ltd., E-Minimo Co., Ltd., MK & Associates, and Ibrida Cell Co., Ltd.

6. Electric Vehicle Summit in Shanghai, November 29-30, 2011

15. Representatives from DOE, ADB, and the Philippine e-trike industry attended the Electric Vehicle Infrastructure Summit in Shanghai from November 29-30, 2011. Features of the summit included the following:

- Outlook of the People's Republic of China (PRC) EV industry and infrastructure development in next 5 years from a regulatory perspective;
- Develop effective business models to ensure the commercial success of EV infrastructure in the PRC;
- Standardization: EV roadmap in the PRC;
- Cutting-edge EV, battery and charging technologies showcase;
- How to work with governments and regulators to ensure future proof policy development in PRC;
- Future business models for auto manufacturers in PRC and how to maintain;
- Profitability with new industry landscape;
- Technical innovations for future EVs and how it could benefit auto OEMs;
- Collaborating to accelerate development of vehicle-grid connectivity standards; and
- World pioneering EV pilot project case studies and implications.

16. Participants included the Department of Energy, the Department of Environment and Natural Resources, the Department of Finance, the Department of Interior and Government, the Department of Science and Technology, the Department of Trade and Industry, the Department of Transportation and Communications, Land Transportation Franchising and Regulatory Board, Land Transportation Office, Mandaluyong Tricycle Regulations Office, Metropolitan Manila Development Authority, National Economic Development Authority, Office of Senator Ralph Recto, Fabella Sto. Rosario Tricycle Operators and Drivers Association, Golden eBike Philippines Inc., eSave Transport System, Green Vector Ventures, Inc., GerWeiss Motors Corporation, Partnership for Clean Air, FilOil, North 68 Corporation, MD Juan Enterprises, Mto Seiki Mtg. Corp., and PHUV Inc.

7. Workshop with Korean Battery Manufacturers, December 13, 2011

17. On December 13, 2011 a workshop was held with representatives from the e-trike manufacturing industry, the project team, and Korean battery manufacturers. Presentations were given by Eco One and LG Chem Company, ETH Co., Ltd., and Power Logics. A question and answer session followed.

8. Presentation by Dr. Alastair Bacon, January 10, 2012

18. The ADB hosted representatives from the industry and from the DOE to hear a presentation by Dr. Alastair Bacon, the Vice President for Driveline and Transmission Systems for Ricardo, a global multi-industry consultancy for engineering, technology, project innovation and strategy. A question and answer session followed.

9. Consultation with Civil Society Organizations, February 9, 2012

19. ADB, DOE and 9 civil society representatives based in Washington, DC discussed the proposed reallocation of $125 million of CTF funding from the renewable energy (solar power generation and net metering) concept included in the original CIP to an energy efficient (EE)

appliances project and EEEVs project. During the meeting, discussion initially covered process issues, including the need for consultation and inter-agency support for the CIP-R. Discussion then shifted to address several substantive issues, beginning with alternatives considered for inclusion in the CIP-R, potential for emissions reductions and cost effectiveness, and closing with clarifications about additional costs and risk premiums. As the CSOs had shared their concerns in advance of the meeting, ADB and DOE explained their positions on each issue, and agreed to follow up the issue of GHG reductions highlighted in a recent report by the UNDP Risoe Center report (which is noted in Appendix 2).

10. Industry Meeting, March 30, 2012

20. On March 30, 2012, an industry meeting was held at ADB headquarters for DOE project updates and an open forum question and answer session. Over 60 people were in attendance from organizations and companies such as Meralco, Dow Chemical, Venture Japan K.K., Golden e-Bike Phils., Toyota Tsusho, Pricewaterhouse Coopers, Motolite, Itochu Corporation, Terra Motors Japan, Metchem, Gerweiss Motors, etc. Discussion largely surrounded the flow of funds, the bidding process, and the requirements and qualifications of the supplier.

C. May 2012 CTF Stakeholder Consultations

21. A range of CSOs, NGOs, private sector, and other interested stakeholders were invited to participate in public consultations regarding the revised CTF Country Investment Plan, including the proposed EEEVs project on 21-23 May 2012. A steering committee with representatives from various interested CSOs/NGOs began meeting in February 2012 to develop agenda items and identify participants. The 3-day consultations began with discussions on the use of CTF resources for renewable energy versus sustainable transport investments. They then turned to issues surrounding design of the EEEVs project and CTF support for the renewable energy sector.

22. Day 1 of the consultations was entitled “Why Not Renewable Energy for the Clean Technology Fund?,” and its objectives included:

1. To present the CTF and the original Country Investment Plan (CIP) with its original components;
2. To understand the current state of RE in the Philippines and why a shift was being proposed to sustainable transport for the CTF;
3. To present the revised CIP and rationale for deviating from the original; and
4. To engage in a discussion on the use of the CTF for a transformational strategy in the energy sector to address growing demand.

23. Based on advice from the consultations steering committee, over 160 invitations were issued by email together with a web-based notice opening them to the public,[31] and nearly 100 participants attended to hear speakers and discuss related topics. Presentations included “Philippine Policy Framework for Renewable Energy”, “Harnessing RE Resources: Potential,

[31] There was good agreement among steering committee members on a range of issues, but full consensus could not be reached on all aspects of timing and approach prior to their conduct. DOE requested ADB to move ahead based on directions received from the steering committee, and a neutral facilitator was engaged to moderate discussions. Many of the relevant documents had been posted on the web some time in advance of the meetings, while others were distributed the week prior to the events. Every effort was made to send invitations more than a week in advance of the meetings (and many organizations were aware of the impending consultations), but some received invitations later. Adjustments were made to the announced agendas based on the availability of speakers and resource persons.

Benefits and Challenges", "Is there Financing for RE Projects?", "CTF Philippine Investment Plan Update", and "Why the Shift?". Participants discussed progress made in net metering, new climate funds becoming available for renewable energy, the DOE and the ADB's collective commitment to renewable energy, and why the revised CIP reflected a higher priority for sustainable transport and energy efficiency initiatives – including e-trikes.

24. Day 2 of the consultations, entitled "Electrification of Public Transport: Why E-trikes?", was organized by the Clean Air Initiative for Asian Cities (CAI-Asia), the Partnership for Clean Air (PCA) and DOTC in cooperation with DOE and ADB. The consultation was designed to clarify and discuss the rationale for electrification of tricycles using CTF resources. Presentations led by CAI-Asia and PCA included "The Role of Tricycles on Urban Transport in the Philippines", "Plans and Programs of DOTC on Alternative Vehicles (including Electric)", and discussion of the pilot e-trike programs in Mandaluyong and Boracay. Participants discussed the hierarchy of public transportation and the role tricycles play within that hierarchy, lessons from the pilot programs, and electrification and alternative fuel policies being pursued by the DOTC. The DOE also reconfirmed the Government's commitment to the EEEVs project. A brainstorming at the end of the day centered on which project elements seemed most ready to proceed versus those needing further attention to design issues or implementation arrangements.

25. Day 3 of the consultations was hosted by the DOE and the ADB and addressed the subject of "Alternative Fuel Vehicles & Finance and Project Design" to address specific aspects of EEEVs project design and to understand and seek inputs on the proposed financing scheme. The discussion was also used to revisit the question of CTF resources being allocated to renewable energy development versus sustainable transport. Presentations and discussions on the concluding day of the consultations centered on the EEEVs project design, the proposed flow of funds, as well as the DOE implementation plan. A large part of the day was devoted to an open forum question and answer session.

26. Minutes were prepared for each of the 3 days of consultations, and these were distributed to participants for their review prior to finalization. To accommodate additional inputs on documentation discussed during the consultations, a commentary period of one month was provided (no further comments were received). Furthermore, at the request of civil society representatives, interested stakeholders who were not able to attend the consultations were able to submit comments to be included in the consultation minutes through the ADB website (again, none were received). The agendas, participant lists, presentations and minutes of these stakeholder consultations are available at the following links:

https://www.dropbox.com/sh/5q2tobxqsovqp1l/xJkQYjJj90
http://www2.adb.org/Projects/eTrike/events.asp

27. In follow-up to the consultations, it was agreed that there would be further discussions with renewable energy sector and other stakeholders. These were held in a spirit of compromise and problem solving on 28 May and 6 June, ending with a positive note of support for the EEEVs project and a revised proposal for CTF investment in the renewables sector. Dialogue continues with trike drivers and other stakeholder groups, based on the outcomes of these consultations. Five working groups were established, covering the topics of: payment options, driver selection, boundary collection, disposal of old tricycles, and sustainable charging options.

28. Based on more than a year of stakeholder engagement, and as a direct outcome of the consultations held on 21-23 May 2012 and subsequent discussions, a revised Investment Plan for the CTF allocation to be implemented in partnership with ADB, with the outcomes summarized in the table below.

Summary Outcomes Following CTF Stakeholder Consultations

Pre-consultations	Post-consultations
Proposed CTF allocation in partnership with ADB of $125 million as follows: • $101 million for EEEV's project, including $100 million investment and $1 million capacity building grant to support technology transfer • $24 million for Energy Efficient Appliances Project	Proposed CTF allocation in partnership with ADB of $125 million as follows: • $105 million for EEEV's project, including $100 million investment, $1 million grant capacity building grant to support technology transfer, and $4 million grant to support prototype e-vehicles solar charging stations • $20 million for Solar Energy Development Project
Proposed EEEV Project parameters: • Project financing scheme: direct payment to suppliers, funds collected from drivers through LGUs • E-Trikes assumed to be charged from the electricity grid • Selection criteria for LGUs and drivers within LGUs to be decided during implementation • Vehicle design and safety: new e-trike designs were to be made public during bidding • Post-sale: discussions on warranty limited to battery and key parts • Procurement: pre-qualification documents to be obtained at the DOE • Tricycle disposal plan to be completed during implementation	Proposed EEEV project parameters: • Project financing scheme: clarified direct payment to suppliers, E-Trike implementation office to be established in each independent LGU, and collection from drivers may be outsourced, where possible • Solar charging of e-trikes to be piloted and actively promoted as public, private, or public-private-partnership venture (demonstration proposed with $4m grant) • Criteria for both selection of LGUs and drivers within selected LGUs finalized, an application for e-Trike developed, to be finalized after detailed consultation with drivers in each LGU • Vehicle design and safety: competition-based designs confirmed for project support; new e-trike design was made public during the 3-day consultation • Post-sale: Minimum 3-year warranty covers all spare parts and overall performance of the vehicle, with small stand-by fleet to ensure drivers do not lose income in case of vehicle break-down • Procurement: Pre-qualification documents have been posted on both ADB and DOE websites • Material recovery plan complete, taking note of stakeholder concerns; vehicle disposal options broadened, with the ultimate goal of 100% scrapping

Project implementation support arrangements:
 	
• Industry working groups
• ADB project team
• DOE project team
	Project implementation support arrangements:
	
	• Industry and other stakeholder working groups established, covering:
	  ○ payment options,
	  ○ driver selection,
	  ○ boundary collection,
	  ○ disposal of old tricycles, and
	  ○ sustainable charging options.
	• ADB and DOE project teams
	• ADB Advisory Group (representative experts from transport, energy, environment, and urban development communities of practice)

Proposed Solar Energy Development Project parameters: • Withdrawn from original CIP due to concerns over enabling conditions and markets trends: (i) delay in feed-in tariff, (ii) lack of net metering, (iii) cap of 50 MW for solar tied to FIT imposed by DOE; (iv) significant price impact to end consumers from adding higher cost solar power in the energy mix, and (iv) already strong private sector industry and interest in solar power. • Since 200-300 MW solar rooftop power could not be implemented in the next 3 years, no CTF support was proposed	Proposed Solar Energy Development Project parameters: • Proposed $20 million CTF support for project (assuming an $80 million ADB loan, and $20 million GoP counterpart funding) based on: (i) DOE convinced solar panel prices have decreased sufficiently since 2009 to allow for a 60-70MW project to be designed and implemented without any subsidies through feed-in-tariff, (ii) means investment will be outside the DOE 50 MW policy cap • Solar charging for e-Trikes to be piloted at 5 sites (through proposed $4 million grant), each of 200 kW capacity, or 1 MW total, which may be able to provide charging to about 1000 e-trikes.

Attachment 1a: NEDA Board Approval of the EEEVs Project

Official Gazette

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NEDA Board approves e-Trike and hydroelectric power plant upr

A March 26, 2012 press release from the National Economic and Development Authority

The NEDA Board approved on Thursday two energy projects amounting to P24.1 billion. These projects aim to promote sustainable transport, achieve energy efficiency and thus address market transformation in the sector.

The P21.5 billion Market Transformation through Introduction of Energy Efficient Electric Tricycle (e-Trike) Project will reduce fuel consumption of tricycles by 2.8 percent, equivalent to 560,926 oil barrels.

"The project will distribute 100,000 E-Trikes to tricycle operators on a lease-to-own arrangement, replacing their old gas-fed and two-stroke gasoline engine units. This way, we are also able to protect our environment," Socioeconomic Planning Secretary and NEDA Board Vice Chair Cayetano W. Paderanga Jr. said.

During Phase I of the project, 20,000 e-Trikes will be distributed to operators in Metro Manila, Boracay, Puerto Princesa City, Cabanatuan City, and Davao City while 80,000 units will be provided to operators in yet to be determined municipalities/cities during Phase II. The project also aims to promote the establishment and development of new associated electric vehicle support industries such as battery leasing/recycling/disposal, motor supply chain, and charging stations. This Department of Energy (DOE)-proposed project will be financed through a P12.9 billion loan from Asian Development Bank (ADB), P4.3 billion loan and P43 million grant from the Clean Technology Fund (CTF), P860 million Clean Development Mechanism (CDM) facility and P3.397-billion government counterpart funding.

Attachment 1b: List of Organizations Represented During Informal Discussions on Design of the EEEVs Project

1 3C Distributors International Inc
2 Aboitiz Power
3 AETI
4 Aksyon Klima
5 ALCapone Incorporated
6 Almozora Motors Corporation
7 Alternative Energy Trailblazers Inc
8 AMA Group of Companies
9 Amara Chivalry Contractors Inc
10 AMCA SMART Solutions Inc
11 AMEO Makati
12 APPEND
13 Archdiocese of Manila Ministry on Ecology
14 Asian Institute of Management
15 ASSCOM Multi Purpose Cooperative
16 Ateneo School of Government
17 Atin To Development Services
18 Batangas Laguna Autocenter Inc
19 Battery Doctors Phils.
20 Board of Investments
21 Cenro San Juan City
22 Center for Clean and Renewable Energy Development (C-CRED)
23 Center for Community Transformation
24 Chamber of Automotive Manufacturers of the Philippines, Inc.(CAMPI)
25 City Government of Makati
26 Clean Air Initiative-Asia Center
27 Clean Engines Phils. Inc.
28 Clean N Green Energy Solutions
29 Clean Rock Renewable Energy Resources Corp.
30 Climate Change Commission
31 Continental Sales, Inc (CSI)/LGK Grp of Co's
32 Corinthian Trucking
33 Cosmos Cars and Services, Inc. (on behalf of the North 68 group)
34 Cyber Cycling Inc
35 DBP Leasing Corporation
36 De La Salle University
37 Department of Energy
38 Department of Transportation and Communication
39 Design Upholstery
40 Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ)

41 Development Academy of the Philippines
42 Don Bosco College
43 Dow Chemical Pacific Limited
44 Earth Institute Asia Inc.
45 ECOS Foundation
46 Edward Marcs Philippines Inc
47 eJeepney Transport Corporation
48 Elaia Green Vehicles Corp.
49 Electric Vehicle Association Of the Phils.
50 Energy Logics Philippines
51 Energy Regulatory Commission (ERC)
52 Environmental Transportation Solutions (ETS)
53 Enzolutions Inc
54 E-Save Transport Systems, Inc
55 EV Motor Systems
56 Exponential Growth Realty
57 Fabricator Phils Inc
58 Fairways and Bluewater
59 Far Eastern University
60 FDC-PWG
61 FilOil Gas Inc
62 FRAU Electric Vehicles
63 Fundline Finance Corporation
64 GerWeiss Motors Corporation
65 Global Content & Research Ltd
66 Goldbell Philippines Inc
67 Golden eBike Phils Inc
68 Great Treasures Alliances International
69 Green Convergence
70 Green Frog Zero Emission Transport
71 Green Tech EcoCenter (GTE)
72 Green Vector Ventures Inc.
73 Greenpeace Southeast Asia
74 GSD C&T CO., LTD
75 Honda Philippines
76 INAFI
77 Institute for Climate and Sustainable Cities
78 Institutional Sales Engineer-Industrial Battery
79 International Cyber-Cycle Inc.
80 Itochu Corporation
81 JLBTC
82 June A. Yasol Alternative and Renewable Energy Consultancy
83 Korea Trade Center (KOTRA) Manila

84 Kymco Philippines
85 Land Bank of the Philippines
86 LAPOCOF
87 Lucky Garvonbill Trading/Yanhao Partnering China
88 Manila Electric Company
89 Mapua Institute of Technology
90 MCX Motor Phils.
91 MDPPA
92 MERALCO
93 Meralco Energy Corporation
94 METCHEM Business Solutions Inc
95 MH ADXPression Inc
96 Motolite
97 Motor Vehicle Parts Manufacturers Association of the Philippines Inc (MVPMAP)
98 Moving Ecology
99 National Anti-Poverty and Corruption
100 National Anti-Poverty Commission
101 National Renewable Energy Board
102 NCTS
103 NewJec Inc. International Operations
104 NGO Forum on ADB
105 Nito Seiki Manufacturing Corporation
106 North 68 Corporation
107 Oriental and Motolite Mktg. Corp
108 Partnership for Clean Air (PCA) Inc.
109 Philippine Chamber of Commerce and Industry (PCCI)
110 PEMC
111 Phil ETRO EV Inc
112 Philippine Electricity Market Corp.
113 Philippine Social Enterprise Network, Inc.
114 Philippine Solar Power Alliance (PSPA)
115 Philippines Vehicle Utility Inc (PHUV)
116 Pinno Technologies
117 PNOC Renewables Corp.
118 PricewaterhouseCoopers
119 Ramcar Technology
120 REAP
121 Renewable Energy Technology Center
122 Robert Bosch Inc
123 Skysea Energy
124 Solar Electric Company Inc
125 Southern Luzon State University
126 Sustainable Energy and Technology Solutions
127 Technostrat Corporation

128 Terra Motors Japan
129 Torrex Consulting
130 Toyota Tsusho Philippines Corporation
131 Unionbank
132 United Nations Development Programme
133 UP Electrical and Electronics Engineering Institute
134 UP SAVER
135 Venture Japan K.K.
136 Vita Verde
137 WINACE Holding Philippines
138 WWF Philippines
139 Yamaha Motors Phils.
140 Yiho Corporation

Appendix 2: Market Transformation with Energy Efficient Electric Vehicles (ADB)

Problem Statement

1. The Philippines transport sector accounted for about one-third of total GHG emissions in 2009 (excluding emissions from land use change and forestry); transport sector emissions have increased by about 6-10% per year since 1990, from about 10 million tons per year carbon dioxide equivalent ($MtCO_2e/y$) in 1990 to about 29 $MtCO_2e/y$ in 2007.[32] Vehicles are one of the dominant sources of urban pollution that threatens both people's health and economic activity. In the Philippines, motorcycles and tricycles comprise more than 52% of vehicle population. Compared to other vehicles, motorcycles and tricycles are less expensive. They are very visible in most cities of the country and play an important role in the transport market particularly used as alternative mode transport for short distances. However, the use of these vehicles contributes to the already declining state of the environment, particularly air quality in urban areas. In an ADB study, transport sector emissions accounted for 30% of air pollution in the Philippines and about 80% of air pollution in Metro Manila.

2. Accounting for the total energy consumed from well to wheel[33], electric vehicles can reduce energy consumption by up to 50% and greenhouse gas emissions by up to 60% compared to internal combustion engine (ICE) vehicles. Electric vehicles will also reduce greenhouse gases and other harmful emissions because: (i) electric vehicles use no electricity while stranded in traffic jams (no air conditioning), (ii) electric motors have higher efficiencies than internal combustion engines, and (iii) transmission and distribution of electricity is more efficient and cost effective than transportation of liquid fuels to the end user.

3. In the Philippines, a typical tricycle driver uses about $5 worth (5 liters) of gasoline to drive 100 km in a day and can save about $4 a day by switching to an electric tricycle: for 100 km, an electric tricycle will consume about 5 kWh of power costing about $1.[34] With large-scale adoption, these individual savings would accumulate to a significant national savings. Replacement of 100,000 gasoline tricycles with electric tricycles at a cost of about $450 million, for example, can generate about $150 million each year from avoided fuel costs (assuming 300 days per year operation). As noted in the main text (paragraph 52), e-trikes are expected to cost at least $1000 more than conventional trikes, but this cost will be more than recovered through reduced operating costs over a nominal 10-year lifetime. <u>Although the daily and life-cycle cost savings favor electric tricycles, there is no ready mechanism to monetize these savings for acquisition and deployment of electric vehicles at fleet scale.</u>

4. The private sector has indicated interest in building and operating solar charging stations for electric vehicles, but investors face a chicken-and-egg dilemma; until a commitment is made for large-scale deployment of EEEVs, private investors will not finance development of a charging network. This first mover barrier can be overcome by including a component for prototype solar charging stations in the EEEVs project, for which CTF grant support is requested.

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[32] CTF Investment Plan for the Philippines, 2009; paragraph 8 and Figure 3.

[33] 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

[34] Assuming cost of electricity of $0.20 / kWh in the Philippines. As noted above, in the Mandaluyong City pilot project, e-trikes were driven about 55 km per day.

Proposed Transformation

5. CTF cofinancing will be utilized to overcome the first-mover risks and cost barriers associated with introducing electric 3-wheelers ("e-trikes") as a first step in electrification of the public vehicle fleet: the proposed project will facilitate deployment of 100,000 e-trikes. This will be the largest known project of this scope implemented in the Asia-Pacific region.[35] The physical investments (project outputs) include: (i) e-trike procurement, (ii) battery leasing, (iii) efficient electric motor supply chain, (iv) public charging stations, (iv) recycling and disposal, and (vi) communication, social mobilization, and technology transfer. CTF funds will be used alongside ADB's loan to amortize up-front capital costs over a longer period than otherwise possible. GoP's strategy is notable in that fleet electrification is to be initiated at the bottom of the transport pyramid, addressing the needs of poorer consumers including last-mile connectivity. Globally, most electric vehicle development is targeting the upper end of the private car market, with vehicles such as the Nissan Leaf which retails for around $30,000.

6. Successful demonstration of the electric vehicles at this scale will facilitate replication and scale up of e-trikes and other public vehicles including jeepneys and buses. Further, development of local battery suppliers and maintenance/service industries will be fostered.

7. The SCS component will deploy rooftop PV arrays [with battery storage] at public transport stations. The electricity produced will be sold at the same price as grid-supplied electricity so that EEEV operators can achieve the cost savings accruing from using electricity as transport fuel, while demonstrating the technological viability of the solar charging systems. The long-term objective is to facilitate scale up of solar charging systems and achieve grid parity, but this requires demonstrate at commercial scale: the stations must support several hundred EEEVs to demonstrate the technology and the business model. In the Mandaluyong pilot test, actual driving of about 55 km per EEEV per day was documented, with consumption of about 3 kWh of energy. Assuming 3-4 hours of generation per day (15% load factor), 1 MW of solar capacity will generate about 3.5 MWh of electricity per day, which is sufficient to support 1000 EEEVs. The solar charging stations are proposed to be initially deployed in Boracay and Puerto Princesa, where the stations can support the majority of EEEVs deployed in the first phase of project implementation.

8. The cost of solar PV has rapidly declined in the last 3 years, and is now at parity with petroleum-fired electricity generation. However, the total cost of the stations will include the solar PV array, battery storage, controllers, etc., and the initial cost of electricity will be higher than current grid-supplied electricity. Concessional financing is needed in order to sell the electricity to EEEV operators at grid parity. In the longer term, as PV costs continue to decline, the electricity is expected to reach grid parity.

Implementation Readiness

9. The E-trikes project is at the appraisal stage and is scheduled for presentation to ADB's Board of Directors in August 2012. The GoP is working on an electric vehicle policy[36], which among others will exempt importation of all electric vehicles and components free of taxes for 9

[35] A detailed presentation on the proposed project is available online at: https://www.dropbox.com/s/g56m7lnjgdr1m6m/SH%20Presentation%20-%20Meralco%20EV%20summit.pdf

[36] Senate Committee Report No. 44 on Senate Bill No. 285–Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2011.

years. In addition there will be other incentives to set up electric vehicle businesses in the Philippines.

Rationale for CTF Financing

10. Electric vehicle deployment is both constrained and favored by several factors:

- Commercial development and deployment of electric vehicles will increase Philippines's energy security, save foreign exchange, and protect against global price fluctuations by using non-tradable domestic energy sources, including renewable electricity.
- Fleet-scale electric vehicle projects are at the pioneer stage and face additional costs and risks which are not being covered by conventional project financing. Creative financing approaches, including the use of concessional funds, are needed overcome first-mover risks and mainstream large-scale vehicle fleet financing.
- Carbon finance can provide some financial support, but is not sufficient to overcome the cost and risk barriers noted above.
- In order to realize the fuel cost savings expected for EEEVs, the SCS component will require grant support so that the electricity can be sold at grid parity at the outset.
- CTF can provide a catalytic role in reducing or eliminating first mover risk for fleet-scale projects, and foster accelerated replication and scale-up in the near term.
- The replication potential for e-trikes alone is more than 20 to 1. A substantial learning curve has already been overcome during the pilot project.
- GHG reductions and cost-effectiveness are comparable to or better than the original CIP (as discussed in the main text).

Financing Plan

Source	Amount (US $ million)
GoP	99
ADB	300
CTF (loan)	100
CTF (grant) [a]	5
Total	**504**
Carbon Finance [b]	0

[a] A CTF grant of $1 million is requested for fine-tuning of technology options, technology transfer, local industry support and capacity building (implementation support, including monitoring and evaluation activities will be financed by the ADB loan).
[b] No provision has been made for the carbon finance risks associated with post-2012 uncertainties. Carbon finance is not expected to contribute to upfront project co-financing.

Project Preparation Timetable

Milestone	Date
ADB Project Identification	May 2011
Appraisal / Negotiations	June 2012
ADB Board Consideration (Approval)	August 2012
Project Completion	August 2016

Additional Notes on GHG Calculations and Electric Vehicle Eligibility for CTF

GHG Reduction Estimates

11. ADB's carbon fund team has reviewed the proposed EEEVs project for potential CDM registration (independently of the ADB project team). As the pilot-tested EEEVs have reduced energy consumption as well as higher passenger capacity than conventional trikes, potential GHG reductions have been estimated on a per vehicle basis as well as a per passenger-kilometer basis. The range of estimates and assumptions are shown below in Table A2.1. As noted in the main text, the base case with reductions on a per vehicle basis applied to 100,000 vehicles yields estimated GHG reductions of 0.27 million tCO_2e per year. Table A2.1 also shows estimated reductions based on the 2010 generation output ("grid mix"), with an emissions factor of 0.52 tCO_2e/MWh, and scenarios of 100% RE-based electricity and 100% coal-based electricity: net reductions are achieved in all scenarios. The grid emissions factor of 0.52 tCO_2e/MWh is at the mid-range of emissions factors used for several recently registered Clean Development Mechanism (CDM) projects in the Philippines.[37]

Table A2.1: Emissions Reduction Estimates (tCO_2e/year)

Case	Reduction on Per Vehicle basis	Total Reductions	Reduction on Per Passenger Basis	Total Reductions	Grid Mix
Optimistic	3.634	363,400	6.361	636,100	100% RE
Base	2.698	269,800	5.425	542,500	Current mix
Worst case	1.834	183,400	4.561	456,100	100% coal

Source: ADB carbon fund team
Assumptions:

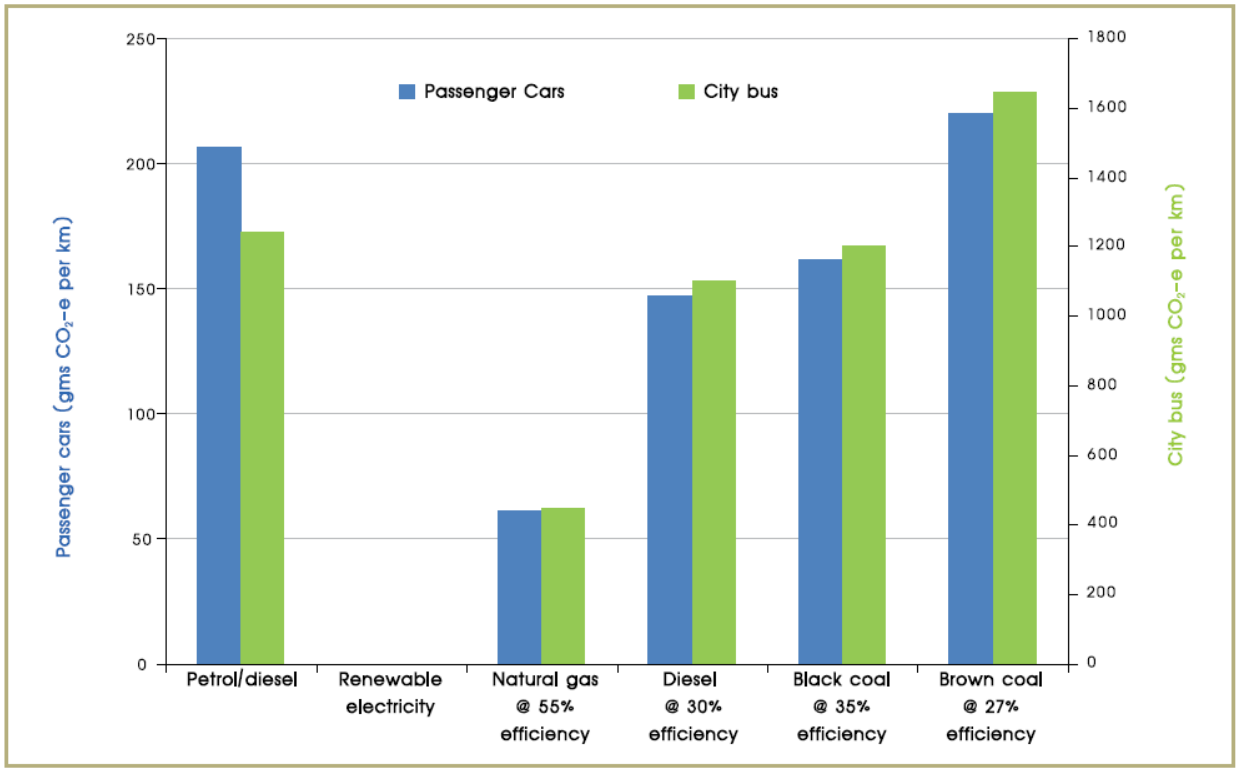
Vehicle operation / day	80	km / day
Passengers in the conventional vehicle	4	
Passengers in Etrike	7	
Vehicle milage	15	km / lit
Vehicle operation	300	days / year
Etrike electricity consumption	6	kWh / day
Emission factor of grid	0.52	tCO2e / MWh
Emission factor of petrol	2.271793	kg CO2e / lit

12. The grid mix scenarios shown in Table A2.1 are consistent with other analyses illustrated in Figure A2.1 below which shows the potential reductions of electric depending on the fuel used for grid-supplied electricity. [Note that Figure A2.1 is based on analysis of 4-wheel vehicles (cars and buses) and does not represent the local conditions in the Philippines.] Obviously, 100% RE-based vehicle charging provides the largest GHG reductions, and as noted above, the EEEVs project includes a component for prototype solar charging stations to demonstrate the technological viability and commercial potential of RE-based charging. In 2010, grid supplied electricity output was about 27% from geothermal, hydropower and other RE, and

[37] E.g., see Project Design Document for "ANAEROBIC DIGESTION SWINE WASTEWATER TREATMENT WITH ON-SITE POWER PROJECT (ADSW RP2024)," registered on 7 January 2011. The Project Design Document was accessed online on 14 November 2011 at:
http://cdm.unfccc.int/filestorage/S/2/Z/S2ZGB9RM5FO7D6W0E4PL3INVQCK8TH/2010.pdf?t=RFR8bHVvMXd5fDDh1GRICO3d4xwrYQ2HbisL

gas-fired power accounted for another 29% of output: the effective "all Philippines" grid emissions factor for 2010 is estimated to be 0.517 tCO2e/MWh, which is roughly equivalent to natural gas-fired electricity. According to the analysis shown in Figure A2.1, if "brown coal @ 27% efficiency" is used to provide the incremental power needed to charge the EEEVs, there would be no GHG reductions. However, Figure A2.1 is relevant for cars and buses in Europe, but does not provide an "apples to apples" comparison with local conditions in the Philippines. The existing 3-wheel vehicles in the Philippines have much higher emissions than that for cars and buses referenced in Figure A2.1. Also, emissions from EEEV charging are based on the Philippines grid mix because it is not possible to know precisely the source of incremental electricity used for battery charging. Because charging times will vary and the marginal capacity on the grid changes with season and time of day, and also because the additional amount of electric generation required for the proposed EEEVs fleet is minimal (only 0.22% of 2010 generation output), using the average grid emission factor is the best approximation.

Figure A2.1: Relative Greenhouse Gas Emissions for Petroleum vs. Electric Vehicles



Source: United Nations Environment Programme, Risoe Centre, 2011. *Technologies for Climate Change Mitigation, Transport Sector*. TNA Guidebook Series. March 2011. Available online at: http://tech-action.org/Guidebooks/TNA_Guidebook_MitigationTransport.pdf
Emissions are calculated using vehicle data cited for the Renault Fluence Z.E. and Tindo electric bus combined with fuel carbon intensities published in the Australian National Greenhouse Factors, July 2010, available at: http://www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-factors.aspx

Projected Changes in Grid Emissions Factors

13. The Philippines Department of Energy *Power Development Plan 2009-2030* reports that near-term generation expansion comprises 1338 MW of committed capacity, of which 1200 MW is coal-fired, 70 MW is geothermal, 51 MW is hydropower, and 17.5 MW is biomass (see Table

A2.2, below). Projecting beyond the current commitments is difficult, as the generation mix will be affected by the renewable portfolio standard and feed-in tariffs discussed in the main text. Table A2.3 presents grid emission factors for three expansion scenarios assuming (i) generation output for 2010 and (ii) current commitments shown in Table A2.2, (iii) a doubling of coal-fired capacity on top of 2010 generation output, and (iv) a 10-fold increase in coal-fired capacity on top of 2010 generation output. Of these 3 expansion scenarios, the first is considered to be firm, the second is considered to be plausible, and the third is considered to be unlikely. As noted in the main text, the incremental demand posed by 100,000 EEEVs is 0.22% of 2010 generation output. Replication and scale up to 2 million EEEVs would represent 4.4% of 2010 generation output, but the actual share of future grid output would be lower given the programmed capacity additions.

14. The third scenario presented in Table A2.3 presents a grid emissions factor which is well below the calculated emissions factor for the current fleet of gasoline-powered tricycles (see further discussion below at paragraphs 15-19). Alternatively stated, with expansion of coal-fired power 10 times beyond current level, with no additional RE capacity additions, the grid supplied power would still be less carbon-intensive than the gasoline-fired ICE vehicles being replaced. This conclusion is consistent with independent estimates prepared by ADB's carbon fund team shown above in Table A2.1.

Table A2.2: Near-term Generation Expansion

Grid	Project Name	Capacity (MW)	Target Completion	Location	Proponent
Luzon	2x300MW Coal-Fired Power Plant	600	4th Qtr. Of 2012	Mariveles, Bataan	GN Power
	Sub-total Luzon	**600**			
Visayas	3x80MW CFB Power Plant Expansion Project	240	Unit I-March2010 Unit II-June 2010 Unit III-Jan 2011	Brgy. Daanlungsod, Toledo City, Cebu	Cebu Energy Development Corporation (Global Business Power Corp.)
	2x100MW Cebu Coal-Fired Power Plant	200	Unit 1-Feb 2011 Unit 2-May 2011	Naga, Cebu	KEPCO SPC Power Corporation (KSPC)
	17.5MW Panay Biomass Power project	17.5	2011	Brgy. Cabalabaguan, Mina, Iloilo	Green Power Panay Phils., Inc.
	Nasulo Geothermal Plant	20	2011	Nasuji, Valencia, Negros oriental	Energy development Corporation
	2x80MW CFB Power Plant	160	Unit I-Sep 2010 Unit II-Dec 2010	Brgy. Ingore, La Paz, Iloilo	Panay Energy Development Corporation (Global Business Power Corp.)
	Sub-total Visayas	**638**			
Mindanao	Sibulan Hydroelectric Power (Unit I-16.5MW) (Unit II-26MW)	43	Unit I-Feb2010 Unit II-Apr 2010	Sta. Cruz, Davao del Sur	Hedcor Sibulan, Inc.
	Cabulig Mini-Hydro Power Plant	8	June 2011	Plaridel, Jasaan, Misamis oriental	Mindanao Energy Systems,Inc. (MINRGY)
	Mindanao 3 Geothermal	50	July 2014	Kidapawan, North Cotabato	Energy Development Corporation
	Sub-total Mindanao	**101**			
Total Philippines		**1,338**			

Note: Mindanao 3 Geothermal Plant was moved to 2014 from its original target year of 2010

Source: Philippines Department of Energy, *Power Development Plan 2009-2030*; Table 4.

Table A2.3: Grid Emissions Factor Scenarios

Source	Output in GWH	% of grid mix	Emissions Factor (t/MWh)	Total Emissions (t/y)
Base Case: generation output in 2010				
Oil-based	7101	10%	0.6	4260600
Hydro	7803	12%	0	0
Geothermal	9929	15%	0	0
Other RE	90	0%	0	0
Coal	23301	34%	0.9	20970900
Natural gas	19518	29%	0.5	9759000
Total	67742	100%	0.517	34990500
Expansion Scenario 1: Current Generation Expansion shown in Table A1.2; no other renewable energy is added. Grid factor increases to 0.553 tCO_2e/MWh.				
Source	**Output in GWH**	**% of grid mix**	**Emissions Factor (t/MWh)**	**Total Emissions (t/y)**
Oil-based	7101	9%	0.6	4260600
Hydro	8026	10%	0	0
Geothermal	10420	14%	0	0
Other RE	213	0.3%	0	0
Coal	31711	41%	0.9	28539900
Natural gas	19518	25%	0.5	9759000
Total	76989	100%	0.553	42559500
Expansion Scenario 2: Coal output expanded by 2x; all others fixed at 2010 output. Grid emissions factor would be slightly higher than gasoline emissions factor @ 40% thermodynamic efficiency of 0.605 tCO_2e/MWh.				
Source	**Output in GWH**	**% of grid mix**	**Emissions Factor (t/MWh)**	**Total Emissions (t/y)**
Oil-based	7101	8%	0.6	4260600
Hydro	7803	9%	0	0
Geothermal	9929	11%	0	0
Other RE	90	0%	0	0
Coal	46602	51%	0.9	41941800
Natural gas	19518	21%	0.5	9759000
Total	91043	100%	0.615	55961400
Expansion Scenario 3: Coal output expanded by 10x; all others fixed at 2010 output. Grid emissions factor would approximately equal gasoline emissions factor @ 30% thermodynamic efficiency of 0.807 tCO_2e/MWh.				
Source	**Output in GWH**	**% of grid mix**	**Emissions Factor (t/MWh)**	**Total Emissions (t/y)**
Oil-based	7101	3%	0.6	4260600
Hydro	7803	3%	0	0
Geothermal	9929	4%	0	0
Other RE	90	0%	0	0
Coal	233010	84%	0.9	209709000
Natural gas	19518	7%	0.5	9759000
Total	277451	100%	0.806	223728600

Source: ADB staff estimates, based on Philippine Power Statistics, 2010.
Note: Estimates of generation output assume that the additional biomass, coal, and geothermal run at 80% output; and that additional hydropower runs at 50% output.

Comparison of ICE Emissions vs. Grid Emissions Factors

15. As noted in the main text, conversion from ICE to EEEVs will save energy, as the energy losses in ICE vehicles are typically 70–80% versus 5–15% in EEEVs. A brief discussion follows to illustrate how current ICE efficiencies compare to the emissions scenarios presented in Table A2.3, and whether improvements in ICE efficiencies and sustainable renewable fuels could achieve the same GHG reductions envisioned in the proposed EEEVs project.

16. The energy and CO_2 content of gasoline expressed in terms of carbon intensity, analogous to a grid emissions factor, is calculated as follows:

Gross energy content of gasoline: 34.2 Megajoule (MJ) / liter (L)

Converted to kWh: 34.2 MJ / L x (1 kWh / 3.6 MJ) = 9.5 kWh / L

Theoretical Carbon intensity: (2.3 kg CO_2e / L) / (9.5 kWh / L) = <u>0.2421 kg CO_2e / kWh</u>

17. This theoretical carbon intensity of gasoline, which assumes 100% thermodynamic efficiency, is much lower than the grid emissions factor estimated for 2010 generation output (the Base Case shown in Table A2.2 and Table A2.3). In practice, thermodynamic efficiencies of motorcycle/tricycle engines are probably on the order of 20%. Automobiles with internal combustion engines have typical efficiencies of about 25%. The Toyota Prius equipped with an Atkinson cycle engine has efficiency of 34% at peak power output of 52 kW.[38] Table A2.4 shows these efficiencies in terms of carbon intensity, compared with the emissions scenarios shown in Table A2.3.

Table A2.4: ICE Efficiencies vs. Grid Emissions Scenarios

Vehicle / ICE Efficiency	Carbon Intensity	Comparison to Emissions Scenarios in Table A1.3
3- and 2-wheelers / 20%	(0.2421 kg CO_2e / kWh) / 0.2 = **1.21 kg CO_2e / kWh**	More than 2.3 times as "dirty" as current grid mix and about 50% "dirtier" than Scenario 3.
Light duty vehicle / 25%	(0.2421 kg CO_2e / kWh) / 0.25 = **0.97 kg CO_2e / kWh**	"Dirtier" than Scenario 3. *Roughly equivalent to 100% coal-fired electricity.*
Toyota Prius / 34%	(0.2421 kg CO_2e / kWh) / 0.34 = **0.712 kg CO_2e / kWh**	The Prius engine is "dirtier" than the 2010 grid mix and Scenarios 1 and 2, but cleaner than Scenario 3.

Source: ADB staff estimates

18. An ICE would need to achieve 47% efficiency to have an emissions factor equivalent to the 2010 grid mix, calculated as follows:

(0.2421 kg CO_2e / kWh) / (0.517 kg CO_2 e / kWh) = 47%

[38] Source: David J.C. MacKay. 2009. *Sustainable Energy Without the Hot Air*;" page 262. Available on line at: www.withouthotair.com.

19. This calculation shows that the current trikes would require upgrading to or replacement with ICEs with 47% efficiency to achieve the same emissions reductions expected from the proposed EEEVs project. ***However, after more than 100 years of ICE technology development, there is no engine on the market with 47% efficiency that could be deployed at scale.*** Further, the current push by the world's major automobile manufacturers towards EEEVs suggests that there is no expectation of such an efficiency breakthrough in the near future. If such a breakthrough does occur, a converted fleet would need to be powered by sustainable renewable fuels in order to achieve the GHG reductions and the non-climate benefits associated with EEEVs.

Electric Vehicle Eligibility

20. CTF guidance acknowledges the realities of building 100% RE-based charging infrastructure in advance of electric vehicle (EV) deployment: EVs are being marketed worldwide in advance of RE-based charging networks, and there is no country pursuing a 100% RE-based charging objective at present. Therefore, ***CTF guidance does not require that EVs be powered with RE.*** The CTF Investment Criteria for Public Sector Operations, 9 February 2009; footnote 6 to paragraph 6 (b) (iv) states:

> "Plug-in electric vehicles would be considered only when the energy systems from which they draw the power are less carbon intensive than the emissions from a stand-alone electric hybrid."

21. In this case, the pilot-tested e-trikes are considered to be "plug-in electric vehicles." However, to the best of ADB and GoP knowledge, "stand-alone electric hybrid" trikes or motorcycles have not been marketed and pilot-tested, so an "apples-to-apples" comparison is not possible. The calculations presented above are intended to demonstrate that the EEEVs project meets the CTF eligibility criteria. Until a stand-alone electric hybrid 3-wheeler appears on the market so that an apples-to-apples comparison can be made, the foregoing calculations and discussions indicate that the proposed EEEVs project meets the CTF eligibility requirement.

Appendix 3: Solar Energy Development (ADB)

1. The rooftop solar project concept presented in the original CIP is being retained, but given the rapidly changing landscape for solar PV development, the detailed scope remains to be identified and developed. GoP is requesting to reallocate $20 million of CTF cofinancing to support total investment of $120 million, which would finance an estimated 40 MW of new solar PV and/or other RE capacity.

Problem Statement

2. In keeping with the long-term objectives for energy security and economic development, GoP is committed to developing indigenous RE resources in a manner which protects consumer interests. RE development typically entails higher up-front capital costs, but lower operating and maintenance costs, and in most cases zero fuel costs (which is the case for solar power).[39] The incremental upfront costs may be thought of as advance payments for renewable "fuel", which are amortized and depreciated over the lifetime of RE systems [alternatively stated, the fuel may be free, but the conversion to useful energy is not]. Policy support via FITs is designed to eliminate the upfront cost barrier, but in the absence of an operational FIT and RPS, there is a need for concessional financing to support RE development.

3. New RE development is being constrained because feed-in tariffs (FITs) and other regulations pursuant to the Renewable Energy Act of 2008 have not been finalized, and may not be in place for another 2 years (as noted in the main text). Private sector developers are keen to take advantage of the FIT regime, but new investment is in suspense because the FIT regulatory framework is not final. This uncertainty is compounded by consumer concerns that that the cost of the FITs will ultimately result in higher retail electricity tariffs, which average around US$0.20 / kWh -- the highest in Asia. This is of specific concern to public transport operators who are being encouraged to adopt EEEVs to replace conventional ICE vehicles. At the macro-economic level, the cost of the FIT program will be offset by avoided costs of imported fuels for power generation, but the economic benefits cannot be readily monetized and passed on directly to consumers.

4. The proposed FIT support will be limited to only 50 MW of ground-mounted solar installations, but the potential envisioned in the low-carbon development scenario is 2000 MW[40]. Solar PV systems have good load-following generation output, which reduces stress on the grid during afternoon demand peak. Space for ground-mounted solar power plants in Manila and other cities is limited or non-existent; the obvious prospect for urban area solar PV development is in rooftop installations.

5. Rapidly declining costs for solar PV systems suggest that policy support may not be necessary for commercial development. However, the market reality is that private investors are reluctant to move forward on new investments until the RE regulatory framework is finalized, especially the RPS and net metering provisions. In the absence of this policy support, purely voluntary solar PV investment will require concessional financing.

6. Against this policy and regulatory backdrop, ADB has supported 2 noteworthy solar energy projects. In June 2012, ADB commissioned a 570 kW rooftop solar PV system at its Manila headquarters which is the largest PV project in the Philippines to date. The installed

[39] An exception is biomass power, where feedstock is normally not free.
[40] See original CIP, Figure 8 and Table 2.

cost is well below that noted in the CIP in 2009, suggesting that there is scope for rooftop solar PV development outside the envelope of the FIT (which is limited to ground-mounted installations). [This rooftop solar project has been implemented in parallel with an expansion of ADB headquarters, which has been designed to achieve state-of-the-art green building certification.] Earlier in 2012, ADB supported the Boni Tunnel lighting project to demonstrate the feasibility of solar PV and lithium-ion battery technology for large-scale street lighting applications. This project comprises 59 square meters of solar panels which provide power to 94 light-emitting diodes (LEDs) with 22-watt capacity each. This project provides about 19% of the tunnel power demand, but achieves 51% energy savings compared to the old lighting system. These projects are demonstrating the technological viability of solar PV and aiding in price discovery.

7. The technical benefits of rooftop solar PV are substantial: (i) the system generates power at the point of consumption, reducing the need for centralized generation and avoiding the transmission losses associated with centralized generating plants; (ii) solar PV has reasonably good load-following characteristics, generating maximum power output at times of peak demand in buildings (mainly for space cooling); and (iii) with eventual implementation of net metering, building owners will be motivated to implement EE measures to maximum net electricity sales to the grid. In theory, carbon finance and/or a FIT could monetize these technical benefits, but the proposed solar FIT will be limited to ground-mounted installations, and carbon finance is not readily delivered as upfront project cofinancing. In the current regulatory environment, the financial viability of rooftop solar will be dependent on savings associated with avoided costs of grid-supplied power, rather than revenue from sale of electricity. Therefore, some other form of concessional finance is needed to facilitate investment at the scale required for market transformation. [A key lesson learned from the ADB rooftop and Boni Tunnel projects is that for large buildings and facilities like the Boni Tunnel, the space available for solar arrays results in solar power output below the total demand of the building or facility. For these types of installations it is not clear that net metering will provide a meaningful contribution to financial viability (although the economic benefits via avoided fossil fuel consumption are obvious). Net metering should provide a more meaningful incentive for private residential buildings, where available rooftop area may be sufficient to cover most of the demand (from lighting, refrigeration, TVs, and space cooling).]

Proposed Transformation

8. The legal framework and the economic incentives provided by high energy cost have not been sufficient for adoption of clean energy and energy efficiency by ordinary citizens and businesses. The proposed project will incorporate lessons learned the Philippine Energy Efficiency Project and other initiatives, in particular: (i) *economy of scale through* bulk procurement of at least 40 MW of new solar PV systems; and (ii) *improve technology credibility* through actual operations of rooftop systems at ADB headquarters and the Boni Tunnel lighting system.

9. The Philippines Renewable Energy Law with its RPS and Feed-in Tariffs with net metering[41] is a pioneering framework for the entire ASEAN region. This Law also provides for establishing a voluntary market for Renewable Energy Certificates. These provisions will not bring any fruit without appropriate investments in the sector. ADB will support this market

[41] "Net Metering" refers to a system, appropriate for distributed generation, in which a distribution grid user has a two-way connection to the grid and is only charged for his net electricity consumption and is credited for any overall contribution to the electricity grid; (Source: Section 4 (gg), Philippine Renewable Energy Act of 2008)

creation opportunity with a Government-led project that will quantify the benefits of solar technology to consumers, establish product quality benchmarks in the market and develop secondary supply and maintenance chains. Currently the specialized electronic meters (that can record electricity flow in both directions) and solar panel are not readily available in the retail market in the Philippines, and are controlled by a small number of technology vendors and service providers. A large scale project will bring in more players and choices to the market and improve sector efficiency.

10. CTF resources are proposed to enhance the investment project design as follows:

- CTF investments will bring down the cost of these technically proven projects through bulk procurement and public awareness "packaging" (described above) to be financially and technically viable in the Philippines, reduce pay-back period for the customers, and increase credibility of the technology by maintaining (or improving) standards and providing direct incentives to try the new technology
- CTF resources will cover part of the additional up-front costs of solar PV [details to be determined]. Financing instruments such as partial credit guarantees, contingent financing, and other output-based assistance will be evaluated during project design to determine an optimum use of CTF cofinancing. Different business models will also be considered, e.g., rent-to-own and other supplier credit approaches, and virtual rooftop projects where poorer communities build a common ground-mounted PV facility to avoid rooftop load structural limitations of residential buildings.
- CTF resources will improve the "depth" of the ADB project by increasing the economies of scale and scope for high-cost investments, which will shorten the pay-back period and increase the financial rates of return.
- The proposed market transformation initiative would cover at least 40 MW of new capacity installed at commercial, government offices, and/or large residences. It will encourage other building owners and electricity customers to switch, as the market transforms and the prices fall. The replication potential is at least 10 to 1, which is quite conservative considering the low-carbon development scenario of 2000 MW solar capacity by 2030.

Implementation Readiness

11. The implementation of the project will be led by DOE in partnership with other stakeholders including private sector investors, and local government units as appropriate. DOE has sufficient expertise to manage the ADB investment project, and project management support will be included in the scope, including capacity building for participating financial institutions and service companies. The project is at the identification stage and is expected to be prepared and presented for ADB Board consideration in 2013.

Rationale for CTF Financing

12. Solar energy development is constrained by several factors:

- Accelerated introduction of solar energy systems will increase Philippines's energy security, save foreign exchange, and protect against global price fluctuations by using non-tradable domestic energy sources, but these economic advantages cannot be readily monetized to support investment in solar energy projects.

- Although the installed cost of solar PV systems has rapidly declined in the past 2-3 years, and is projected to continue declining, the capital cost of rooftop PV remains a barrier in the absence of net metering or other policy support. Creative financing approaches, including the use of concessional funds, are needed to cover additional up-front capital costs to consumers.
- Management and technical expertise to identify and implement rooftop solar opportunities is limited in the Philippines.
- Perceived financial risk, i.e., payback periods on large capital investments may be in the range of 7-8 years or longer versus less than 3 years desired by building and plant owners.
- Commercial financing for candidate investments is not readily available, and as such private developers are unable to finance solar energy projcets.
- The investment project to be supported by CTF is replicable and scale-able without long-term concessional financing. As the more building owners' enterprises gain comparative advantage, intra-sector competition will help drive replication. Commercial financing of solar energy will also increase as banks and other financial institutions gain experience on the CTF-supported project, and as government-sponsored RE funds are replenished through taxation mechanisms.

13. At least 40 MW of rooftop solar PV operating at 15% load factor will deliver net reduction of about 0.03 million tCO_2e per year assuming grid emissions factor of 0.52 tCO_2e/MWh. With 15 year lifetime total GHG reductions are about 0.4 million tCO_2e. Replication and scale-up potential is at least 10 to 1. The cost-effectiveness is calculated as follows: CTF$20 million / 0.4 tCO_2e = CTF$49 / tCO_2e, declining to CTF$4.87 / tCO_2e with replication and scale-up of 10 to 1.

14. The indicative financing plan and preparation timeline are shown below.

Financing Plan

Source	Amount (US $ million)
GoP	20
ADB	80
CTF	20
Total	**120**
Carbon Finance[a]	n/a

[a] Carbon finance estimate is not expected to provide upfront project cofinancing.

Project Preparation Timetable

Milestone	Date
ADB Project Identification	Q3 / 2012
Appraisal / Negotiations	Q2 / 2013
ADB Board Consideration (Approval)	Q3 / 2013
Project Completion	Q3 / 2016

Q2=second quarter, Q3=third quarter