Small-Scale CDM Project Development:

Key Issues and Solutions

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Executive Summary

Clean energy equates to development benefits

A clean, reliable source of energy, and access to it, is a key element in supporting sustainable livelihoods. Small-scale renewable energy projects introduced at the community level can reduce the emissions of greenhouse gases relative to their conventional counterparts, and are eligible for carbon financing through the Clean Development Mechanism (CDM).

The Marrakech Accords recognized that high transaction costs would be a significant deterrent for small-scale CDM project development, and instructed the CDM Executive Board to develop simplified procedures for small-scale CDM projects. While the simplified procedures will provide considerable assistance in reducing transaction costs, additional costs remain that would limit the ability of small industries, local governments, NGOs, and small private sector project developers from using the CDM. Unless assistance is provided to project developers such as NGOs and small enterprises in developing countries to prepare sound, low-cost, small-scale CDM project proposals, an excellent opportunity for supporting sustainable development will be lost. Regions such as Africa that already face significant investment barriers will be particularly affected.

Canadian assistance in developing small projects

With the support of both the Department of Foreign Affairs and Trade (DFAIT) and the Canadian International Development Agency (CIDA), the Pembina Institute for Appropriate Development (PIAD) established the Canadian Clean Development Mechanism Small Projects Facility (CDM SPF) in the Fall 2002 to provide financial and technical support to small-scale CDM project developers.

The Facility's initial work was located in India where there is good potential for using the CDM to support small-scale renewable energy and energy efficiency projects. The Facility supported work on business plans for eight small-scale renewable energy and efficiency projects, and provided technical and financial assistance towards the development of CDM Project Design Documents (PDDs). Project developers were also assisted with the financial analysis of the project taking the revenue from carbon financing into account, including allowing for the additional CDM transaction costs. Minimum CER prices that would make use of the CDM worthwhile were also determined and carbon investment summaries prepared for prospective carbon investors.

An important outcome of the Facility's work is that it enabled the UNFCCC simplified procedures to be tested using actual small-scale projects. Gaps in the current procedures were identified, and one new baseline methodology developed.

Lessons learned from testing the UNFCCC Simplified Procedures for small-scale CDM projects

The CDM SPF provided an opportunity to test the UNFCCC simplified procedures for small projects. There were four key lessons learned from the exercise:

1. Some simplified baseline procedures provide standard performance data for baseline technologies that eliminated the need for actual baseline performance measurement.

However, many project types still require assumptions of local baseline performance, requiring either actual measurement or use of previous studies.

2. Simplified monitoring protocols will lead to significantly reduced monitoring and verification costs;
3. Using barrier removal as a test of additionality for small projects will be very helpful for small project developers;
4. Simplified PDDs will reduce the registration process for small-scale CDM projects, but some of the wording remains slightly ambiguous requiring that external assistance in document completion be provided to project developers.

Financial viability of using the CDM for small-scale CDM projects and the CER price that makes the CDM worthwhile

During project development, the project developers undertook an assessment of the value of the sale of CERs from the CDM to the financial viability of the project at current carbon prices, and determined the minimum price at which using the CDM would be worthwhile. Through the CDM SPF, each project developer was provided with the tools to develop a project business plan and to complete financial analysis with and without carbon financing. In completing the financial analysis, the following assumptions for CDM transaction costs were made:

- Project registration fee = US$5,000
- Adaptation fee = 2% of value of CERs produced
- Project validation and verification charges

The results demonstrate that for certain small-scale thermal and mechanical renewable energy such as thermal gasifiers and treadle pumps, as well as energy efficiency projects such as improved brick kilns, a carbon price of US$3 to US$5 per tonne CO_2 would make it worthwhile for the project developer to utilize the CDM as a means of project financing. For solar water heating and micro-hydro, a carbon price in the US$5-$8 per tonne range is necessary to make the CDM worthwhile.

For solar lighting and micro hydro projects, the CDM is not worthwhile at carbon prices below US$8 per tonne for large volume (1.5 MW) projects such as that developed by Sungrace, and at prices of more than US$10 for smaller projects such as IRENet and Market Dynamics.

Identifying the development value of small-scale projects

The Gold Standard introduced by WWF establishes a set of four criteria to identify CDM projects that meet minimum international environmental impact, sustainable development, and additionality criteria[1]. The objective of the Standard is to provide assurances to buyers of CERs generated by CDM projects that have been recognized as Gold Standard that these projects do more than meet the basic CDM requirements as set out in the Marrakech Accords. Buyers of these CERs can be expected to pay higher than market price for CERs generated by high quality CDM projects.

[1] For more information see: www.panda.org/about_wwf/what_we_do/climate_change/what_we_do/business_industry/gold_standard.cfm

The importance of the approach cannot be underestimated as the Gold Standard seeks to ensure the environmental integrity of the CDM, especially in host countries without environmental best practice and sustainable development legislation.

CDM projects must meet four criteria to satisfy the Gold Standard:

1. Reduce emissions through the use of renewable energy or energy efficiency
2. Meet a set of best practices for environmental impact
3. Meet a set of sustainable development criteria
4. Would not have gone ahead without the CDM

Policy recommendations to increase the number of small-scale CDM project

A. Further simplification of the UNFCCC procedures:
- Canada should ask the CDM Executive Board to waive the CDM registration fee for small scale CDM projects,
- Canada should support submissions to the CDM Methodology Panel to approve a new simplified baseline and monitoring methodology for small-scale CDM projects that displace kerosene by solar PV systems,
- Canada should support submissions to the CDM Methodology Panel to modify the Type IA baseline procedure for small-scale CDM projects that produced electricity for the user so that a standard emission coefficients for diesel mini-grids can be used, and,
- Canada should encourage host countries to develop weighted average emission factors for regional power grids for use as baselines for both large and small-scale CDM projects, providing capacity building support where needed;

B. Provision of ongoing capacity building assistance to small-scale CDM project developers;
- Canada should continue to support small-scale CDM project development using the CDM SPF model. Features of the facilities should include sound management structure, partnerships with local– expertise and/or institutions, standardized contracts and procedures, and provision of funding advances.

C. Pay higher carbon prices for CERs from Gold Standard projects.
- Canada should encourage the use of the WWF Gold Standard for small-scale CDM projects as carbon brokers can usually obtain a higher carbon price for Gold Standard projects.
- Canada should establish a special national mutual fund dedicated to the purchase of CERs from small-scale CDM projects that meet the WWF Gold Standard. The Fund would pay higher than market prices per tonne of carbon and also provide a partial subsidy to small-scale project proponents to help cover the cost of CDM project registration and validation.

Introduction

A clean, reliable source of energy, and access to it, is a key element in supporting sustainable livelihoods. The application of sustainable energy resources and technologies provided at a community level can:

- ◊ Offer a source of income
- ◊ Provide amenities such as light, heat, motive power, and fertilizers
- ◊ Reduce vulnerability to climate change and other disasters
- ◊ Decrease the outflow of financial resources to pay for fuels and electricity
- ◊ Improve health, and air and water quality
- ◊ Create opportunities for new businesses, especially for women

Small-scale renewable energy projects introduced at the community level can also reduce the emissions of greenhouse gases relative to their conventional counterparts, and are eligible for carbon financing through the Clean Development Mechanism (CDM).

However, there are barriers to the use of the CDM in the form of additional "transaction" costs associated with the development and implementation of a project through the CDM, and the offering of certified emissions reductions (CERs) to Annex 1 country investors. The World Bank Prototype Carbon Fund estimates that the cost of a typical baseline study is US $35,000 and a monitoring and verification protocol about US $30,000[2]. There are additional transaction costs of employing an Operational Entity to validate the project, as well as costs associated with obtaining the required sign offs by the host country and local stakeholders, and verification of the CERs.

The Marrakech Accords recognized that these transaction costs would be a significant deterrent for small-scale CDM project development, and instructed the CDM Executive Board to develop simplified procedures for small-scale CDM projects defined as follows:

- Renewable energy projects less than 15MW
- Energy efficiency projects that reduce energy use by less than 15GWh/yr
- Other projects that reduce emissions by less that 15 ktonnes/yr

In January 2003, the Executive Board published simplified procedures for small-scale projects in the following areas of the CDM project cycle:

- Simplified baseline methodologies, including standardization of baseline parameters and less stringent leakage requirements
- Simplified monitoring methodologies, such as the use of standard equipment performance values and statistical sampling
- Additionality requirements based on proof of barrier removal
- A simplified Project Design Document (PDD)

While the simplified procedures will reduce transaction costs for small CDM projects, significant costs remain that could limit the ability of small industries, local governments, NGOs, and small private sector project developers from using the CDM. These costs include:

[2] Ken Newcombe, PCF, Canadian National Workshop on CDM/JI January 7, 2002, Ottawa

- Learning about the CDM,
- Defining the project (including aggregation of smaller units),
- Choosing the most appropriate business models to implement and finance the project,
- Identifying possible roles for CDM investors or buyers of CERs, and
- Carrying out basic analysis.

Unless assistance is provided to project developers such as NGOs and small enterprises in developing countries to prepare sound, low-cost, small-scale CDM project proposals, an excellent opportunity for supporting sustainable development will be lost. Regions such as Africa that already face significant investment barriers will be particularly affected.

Canada's CDM Small Projects Facility

With the support of both the Department of Foreign Affairs and Trade (DFAIT) and the Canadian International Development Agency (CIDA), the Pembina Institute for Appropriate Development (PIAD) established the Canadian Clean Development Mechanism Small Projects Facility (CDM SPF) in the Fall 2002 to provide financial and technical support to small-scale CDM project developers.

The Facility's initial work was located in India where there is good potential for using the CDM to support small-scale renewable energy and energy efficiency projects. During the course of the project, India has become a focal point of CDM activities in South Asia.

The objectives of the Facility were four-fold:

- To promote small community-based renewable energy and other greenhouse gas reduction projects that qualify under the CDM simplified approval process;
- To increase CDM opportunities in countries and regions with existing investment barriers;
- To support communities, NGOs, SMEs, and other potential project hosts in preparing project documents for small CDM projects; and,
- To link Canadian CDM investors with viable community-based projects from developing countries.

The Facility supported work on business plans for eight small-scale renewable energy and efficiency projects, and provided technical and financial assistance towards the development of CDM Project Design Documents (PDDs). Project developers were also assisted with the financial analysis of the project taking the revenue from carbon financing into account, and allowing for the additional CDM transaction costs. Minimum CER prices that would make use of the CDM worthwhile were also determined and carbon investment summaries prepared for prospective carbon investors. The source of greenhouse gas emission reductions and estimated reductions for the eight projects are summarized in Table 1.[3]

An important outcome of the Facility's work is that it enabled the UNFCCC simplified procedures to be tested using actual small-scale projects. Gaps in the current procedures were identified, and one new baseline methodology developed.

Based on feedback from project developers and analysis of the PDDs and financial summaries for the projects, recommendations were drawn up suggesting improvements to the UNFCCC simplified procedures and other policy initiatives that would increase the number of small-scale CDM projects. Support for these recommendations by Canada and other stakeholders in the CDM would encourage increased use of the CDM by small-scale projects. Without support to these projects, a valuable opportunity to support development through the CDM will be lost.

The paper addresses the following four issues:

[3] More details on each of the 8 projects are available by contacting the Pembina Institute for Appropriate Development.

1. Lessons learned from testing the UNFCCC Simplified Procedures for small-scale CDM projects.
2. Financial viability of using the CDM for small-scale CDM projects and the CER price that makes the CDM worthwhile.
3. Identifying the development value of small-scale projects
4. Policy recommendations to increase the number of small-scale CDM projects including:
    a. Improvements to the UNFCCC procedures that would provide further simplification, and reductions in transaction costs;
    b. Provision of ongoing capacity building assistance to small-scale CDM project developers;
    c. Paying higher carbon prices for CERs from Gold Standard projects.

Table 1: Project Description, GHG Emission Reductions

Project Proponent	Technology	Description/Benefits	Source of GHG Emissions Reduction	Estimated Emissions Reductions (CO_2 eq)
IDE, Delhi	20,000 Treadle Pumps	A major marketing expansion of IDE's innovative treadle pumps among small and marginal farmers as the most cost-effective means of irrigation for small holders.	The pumps will replace the use of diesel pumps that use up to 1 litre of diesel fuel per hour.	95,600 tonnes over 10 years
Market Dynamics, Calcutta	38,000 Solar Home Systems	Expansion of the PV lighting market in West Bengal with systems ranging from 17 to 72 Wp. The main beneficiaries of the project include remote area households, marginal farmers, and small and marginal micro-enterprises	The lighting systems will replace kerosene and biomass for lighting, and diesel generator sets.	42,000 tonnes over 10 years
Tara Nirman Kendra, Delhi	70 Vertical Shaft Brick Kilns	Improved energy efficient brick kilns and concrete building material technology. This will lower the amount of coal that is burned in brick production and thus pollution levels surrounding the kilns.	The new kilns will reduce the use of coal.	234,000 tonnes over 10 years
Sahyadri Energy Systems, Bangalore	300 micro hydro power units at 5 & 25 kW capacity	Beneficiaries include individual farmers who would benefit from an uninterrupted supply of power for food processing and pumping in remote areas	The hydro schemes will replace existing or planned diesel generators	8,360 tonnes over 7 years
India Rural Energy Network (IRENet). Coordinated by IRENet Secretariat, Delhi	24,572 Solar Lanterns	An India-wide Solar Lantern project involving 20 NGO Members of IRENet. Expansion of the availability of solar lighting to village communities. Project beneficiaries include households, farmers, market stallholders, local suppliers and maintenance shops.	The lanterns will displace the use of kerosene, batteries, and temporary grid connections.	20,600 tonnes CO_2 over 10 years
Sungrace Energy Solutions, Bangalore	159,374 Solar Lanterns	Manufacturing and distribution of PV lighting products to the rural poor throughout India. The solar lanterns and home systems will provide both a source of energy-efficient lighting as well as income generation through rural cooperatives.	The lanterns will displace the use of kerosene, batteries, and temporary grid connections.	92,180 tonnes over 10 years
NAMSI Solar, Bangalore	4695 Domestic Solar Water Heating	This will help end users in Karnataka consume less grid power, saving considerably on their monthly electricity bills, and reducing environmental impacts from coal power generation.	The systems will replace electrical boilers/geysers that use grid electricity.	40,860 tonnes over 10 years
Vijay Engineering, Bangalore	126 Biomass Gasifiers	Market expansion of small waste wood biomass gasifiers for thermal applications — primarily in small industries like textiles, food and metal processing, and hotels	The gasifiers will replace diesel-fuelled boilers used for small industrial thermal applications.	46,400 over 10 years

Lessons Learned from Testing the UNFCCC Simplified Procedures

The UNFCCC simplified procedures for small-scale emission reduction projects enables project developers to use simplified baselines, monitoring protocols, and additionality criteria to prepare a simplified Project Design Document (PDD), and to submit the project for approval. All of the eight projects supported by the CDM SPF qualified to use the simplified procedures.

A summary of the procedures applied to each project is shown in Appendix A, and an analysis of each of the procedures used for the four tested project types (IA, IB, IC and IIC) may be found in Appendix B.

The CDM SPF provided an opportunity to test the UNFCCC simplified procedures for small projects. There were four key lessons learned from the exercise:

1. Some simplified baseline procedures provide standard performance data for baseline technologies that eliminate the need for actual baseline performance measurement. However, many project types still require assumptions of local baseline performance, requiring either actual measurement or use of previous studies.
2. Simplified monitoring protocols should lead to significantly reduced verification costs;
3. Using barrier removal as test of additionality for small projects will be very helpful for small project developers;
4. Simplified PDDs will reduce the registration process for small-scale CDM projects, but some of the wording remains slightly ambiguous requiring that external assistance in document completion be provided to project developers.

Simplified Baselines

The project developers found that, in many cases, the use of the standard baselines in the simplified procedures eliminated the need for individual project baseline studies. However, use of these standard baselines was only possible when there were sufficient background studies available to provide standard performance data for displaced technologies. For example, the coal consumption per brick for the Clamp baseline kiln replaced by the more efficient Vertical Shaft Kiln were based on reported comparative performance studies.

In the absence of sufficient background material with standardized data, baselines had to be established by actual measurement of the replaced fossil fuel system thus negating the benefits of the simplified procedures. As more small-scale CDM projects are reviewed by the Executive Board, standard baselines for the replaced equipment should be readily available thus eliminating the need for back-up studies or actual measurement.

A new baseline was proposed for two of the solar lighting projects that replace kerosene lamps because the current baseline options under Category IA only allow displacement of electricity from a grid or mini-grid power source. In many parts of India, kerosene is the fuel used for lighting, as grid power is either not affordable or extremely unreliable which is likely to remain true for many years. The proposed new standard baseline for kerosene lamps is based on extensive local surveys of kerosene use and matches the baseline equation for PV lighting proposed in 2002 by the special UNFCCC Panel on Simplified Procedures. The solar lighting projects undertaken by IRENet and Sungrace will be good tests for the acceptance of this approach by the CDM Methodological Panel.

The Market Dynamics solar lighting project involves replacement of batteries that are charged using diesel or gasoline generators. While this project can use the simplified baseline for Type IA: Electricity Generation for the User, the allowed default value is only 0.9 kg/kWh. In reality a battery charging station would use a small diesel generator similar to those allowed under category ID: Electricity Generation to a Grid, where the emissions factor of 1.2 kg/kWh can be used for small generators[4]. Category 1A should allow the use of the standard diesel coefficients specified in Category 1D.

The NAMSI solar water heater project displaces grid electricity and is an instance where the simplified procedures offer no help to the small-scale project developer. Unless weighted average grid coefficients are published annually by State and other jurisdictions, or some other standard approach is developed, small scale CDM project developers will have to complete the same complex calculations as other CDM project developers based on dispatch data and fuel mix for their area grid.

Simplified Monitoring Protocols

The simplified monitoring protocols developed for each of the eight (8) projects based on the UNFCCC procedures will significantly reduce the cost of emissions verification by Operational Entities. By developing or using a standard baseline that applies throughout the life of the projects, monitoring consists primarily of ensuring that the systems are operating each year, and measuring or estimating the number of hours of operation each year.

Simplified Additionality Criteria

The eight (8) project developers had little difficulty in demonstrating that their CDM projects would assist in the removal of both cost and market barriers to their technologies as per the additionality requirements of the UNFCCC procedures[5]. The most common barriers removed were the higher first cost of the project technologies and low market share. The replaced technologies are less expensive to buy[6] but more expensive to operate and consistently have a very high existing market share.

Simplified PDDs

The simplified PDDs permitted under the UNFCCC procedures for small-scale projects contained some ambiguities – particularly with respect to baseline determination. Guidance and technical assistance is required by project developers to assist them with capacity development in the use of the simplified procedures and preparation of the PDD.

[4] Most battery chargers are small and used only when needed

[5] At the time of writing, small-scale projects are the only CDM projects to have explicit additionality criteria. The CDM Methodological Panel has recommended a clarified definition of additionality for all CDM projects, but this has not yet been accepted by the Executive Board.

[6] The IDE treadle pump is an exception as it costs less that a diesel pump, but it has a low market share and is unfamiliar to farmers.

Financial Viability of Using the CDM for Small-Scale CDM Projects

During project development, the project developers undertook an assessment of the value of the sale of CERs from the CDM to the financial viability of the project at current carbon prices, and determined the minimum price at which using the CDM would be worthwhile. Through the CDM SPF, each project developer was provided with the tools to develop a project business plan and to complete financial analysis with and without carbon financing. In completing the financial analysis, the following assumptions for CDM transaction costs were made:

- Project registration fee = US$5,000
- Adaptation fee = 2% of value of CERs produced
- Project validation and verification charges = 5% of value of CERs produced[7]

Project viability was assessed using various carbon prices between US$5 and US$8 per tonne CO_2. The results are shown in Table 2.

The results demonstrate that for certain small-scale thermal and mechanical renewable energy such as thermal gasifiers and treadle pumps, as well as energy efficiency projects such as improved brick kilns, a carbon price of US$3 to US$5 per tonne CO_2 would make it worthwhile for the project developer to utilize the CDM as a means of project financing. For solar water heating and micro-hydro, a carbon price in the US$5-$8 per tonne range is necessary to make the CDM worthwhile.

For solar lighting and micro hydro projects, the CDM is not worthwhile at carbon prices below US$8 per tonne for large volume (1.5 MW) projects such as that developed by Sungrace, and at prices of more than US$10 for smaller projects such as IRENet and Market Dynamics.

[7] The expected cost of hiring an Operational Entity to validate small-scale CDM projects and verify emissions reductions is expected to be lower than for large-scale projects because of the use of standardized baselines (no baseline study), and simplified monitoring procedures but no less significant a cost to small projects. However, in calculating this cost, there is no experience to draw on. The first small-scale projects will not be registered or implemented until later in 2004. The 5% of the value of CERs was used as an interim estimate – mainly to demonstrate to developers that this an important transaction cost.

Table 2: Value of CDM to Small Scale Projects and Required Price per Tonne

Project Proponent	Technology	Estimated Emissions Reductions (CO_2 eq.)	Impact on Project Viability @ US 5 per tonne CO_2	Minimum price per tonne CO_2 to make CDM Worthwhile
IDE, Delhi	**20,000 Treadle Pumps**	**95,600 over 10 years**	**IRR doubled**	**$3-$5 per tonne**
Market Dynamics, Calcutta	**45,000 Solar Home Systems**	**42,000 tonnes over 10 years**	**Less than 2% increase in IRR**	**>$10 per tonne**
Tara Nirman Kendra, Delhi	**70 Vertical Shaft Brick Kilns**	**234,000 tonnes over 10 years**	**Sufficient increase in revenue to make project viable**	**$3-$5 per tonne**
Sahyadri Energy Systems, Bangalore	**750 kW remote area micro hydro power schemes**	**8,360 tonnes over 7 years**	**Marginal improvement in IRR**	**>$8 per tonne**
India Rural Energy Network (IRENet)	**10,000 Solar Lanterns**	**20,600 tonnes CO_2 over 10 years**	**Less than 1% reduction in Debt Service Coverage Ratio**	**>$10 per tonne**
Sungrace Energy Solutions, Bangalore	**159,374 Solar Lanterns**	**92,180 tonnes over 10 years**	**<10% increase in IRR**	**$8-$10 per tonne**
NAMSI Solar, Bangalore	**1500 Domestic Solar Water Heating**	**40,860 tonnes over 10 years**	**20% increase in IRR**	**$5-$8 per tonne**
Vijay Engineering, Bangalore	**126 Biomass Gasifiers**	**46,400 over 10 years**	**20% increase in IRR**	**$3-$5 per tonne**

Identifying the Development Value of Small-Scale Projects

The World Wildlife Federation (WWF) has announced a "Gold Standard" which can be used to identify CDM projects that meet minimum international environmental impact, sustainable development, and additionality criteria[8]. The objective of the Standard is to provide assurances to buyers of CERs generated by CDM projects that have been recognized as Gold Standard that these projects do more than meet the basic CDM requirements as set out in the Marrakech Accords. Buyers of these CERs can be expected to pay higher than market price for CERs generated by high quality CDM projects.

The importance of the approach cannot be underestimated as the Gold Standard seeks to ensure the environmental integrity of the CDM, especially in host countries without environmental best practice and sustainable development legislation.

CDM projects must meet four criteria to satisfy the Gold Standard:

1. Reduce emissions through the use of renewable energy or energy efficiency
2. Meet a set of best practices for environmental impact
3. Meet a set of sustainable development criteria
4. Would not have gone ahead without the CDM

The baseline and additionality requirements as outlined in the UNFCCC simplified procedures for small-scale CDM projects meet most of these conditions by definition. Thus, most small-scale renewable energy or energy efficiency CDM projects if developed in accordance with the simplified procedures, meet the proposed Gold Standard. All of the 8 projects supported by the CDM SPF meet the Gold Standard.

[8] For more information see:
www.panda.org/about_wwf/what_we_do/climate_change/what_we_do/business_industry/gold_standard.cfm

Policy Recommendations to Increase the Number of Small-Scale CDM Projects

The following key findings related to the expected number of small-scale CDM projects are the result of experience gained through the development of the CDM SPF:

- Developers of small-scale CDM projects need significant assistance with respect to baseline selection, completion of the PDD, and assessment of the financial viability of using carbon financing through the CDM.
- Small-scale CDM projects would benefit from higher carbon prices. The current market price of US$3-5 per tonne CO_2 is somewhat artificial since there are currently only two buyers of potential CERs[9], both of which have established a maximum price around this value. The new World Bank Community Development Carbon Fund promises to pay up to US$5 per tonne initially with a maximum of US$7 per tonne. This price would improve the benefits of the CDM to small-scale thermal and mechanical CDM projects, but would not be high enough for all small-scale technologies – especially renewable electricity projects such as solar and micro-hydro.

In order to ensure that small scale CDM projects with significant sustainable development value benefit from the CDM, it is recommended that Canada and other Annex I countries provide on-going assistance to the developers of small-scale CDM projects identified in the following policy recommendations:

A. Further Simplify the UNFCCC Procedures for Small-Scale CDM Projects:

A. 1 Canada should support additional means to reduce the transaction costs for small-scale CDM projects such as waiving payment of the CDM registration fee. Experience has demonstrated that the US$5000 registration fee for small-scale projects, when coupled with the costs associated with project verification, would reduce the financial viability of the CDM for many small projects at current market prices of carbon.

A. 2 Canada should also recommend that the CDM Executive Board Methodological Panel develop a new simplified baseline procedure for a small-scale project type covering the displacement of kerosene by solar PV systems. The baseline procedure currently allowed for a renewable energy technology that provides an electrical service to a user (Type IA – Electricity Generation by the User) is not suitable for solar home systems or lanterns that displace kerosene.

A.3 Canada should also ask CDM Executive Board Methodological Panel to modify the baseline procedure for Type IA - Electricity Generation for the User to permit the use of the standard emissions coefficients for diesel mini-grids used in Type ID – Renewable Energy Generation for a Grid (Table I.D.1), when the baseline technology is battery charging. The current baseline of an adjacent mini-grid does not reflect the actual baseline in this case.

A.4 Finally, Canada should assist host countries with the development of weighted average grid emissions factors that can be used by small-scale (and large) CDM project developers. It is not practical to expect small-scale project developers to develop grid

[9] The World Bank Prototype Carbon Fund and the Dutch CERUPT program

emission factors for each project, and the coefficients will be the same for all CDM projects implemented on same grid. Annual weighted average factors should be published for each region or grid network.

B. Provide On-going Capacity Building Assistance to Small Scale CDM Project Developers.

B.1 Canada should continue to provide capacity building and project development assistance through CDM Small Projects Facilities serving the regions of South Asia, Africa and Latin America/Caribbean. The pilot CDM SPF, jointly sponsored by DFAIT and CIDA, provided a sound, working model for these programs. Further implementation of the SPF model in other regions will encourage shared learnings among CDM project developers beyond country borders. Two prospective partners, the Kenya Manufacturers Association and BEA International, who are already very familiar with the CDM, have expressed interest adopting the CDM SPF model in Kenya.

Based on lessons learned in the pilot CDM SPF, new SPFs should have the following features:

- The management structure used to disburse the funding grants, to provide capacity building and technical assistance, and to administer the pilot SPF worked well and should be retained. The average cost of technical assistance and administration by the Secretariat in a new CDM SPF should be lower than those incurred in the pilot phase and is estimated at approximately 30% of the total cost of the Facility including grants disbursed.
- Partnering with local institutions and experts to solicit project development proposals, monitor progress, and organize training workshops, etc. was particularly useful and should also be retained.
- The contracts and procedures developed under the pilot phase of the CDM SPF should be used for all future applications of the model as they have been proven successful. Using these standard contracts and procedures developed in the pilot phase will streamline and reduce administrative costs.
- Future CDM SPFs should be financed using only advance contribution funds for both project developer grants and Secretariat costs. The SPF concept can only work on a larger scale if SPF financing is in the form advance contributions for both grant disbursements and expenses incurred in providing capacity building and administration.

C. Offer Higher Carbon Prices for CERs from Small-Scale Projects to Reflect the Sustainable Development Value of these Projects

C.1 Canada should encourage the use of the WWF Gold Standard for small-scale CDM projects as carbon brokers can usually obtain a higher carbon price for Gold Standard projects.

C.2 Canada should establish a special national mutual fund dedicated to the purchase of CERs from small-scale CDM projects that meet the WWF Gold Standard. The Fund would pay higher than market prices per tonne of CO_2 (US$10 per tonne is recommended), and also provide a partial subsidy to small-scale project proponents to help cover the cost of CDM project registration and validation. The Fund would be

financed by the Federal Government and those industries interested in paying above market prices for a portfolio of projects with high development value.

In the Climate Change Action Plan for Canada (2002), the Federal Government committed to purchase up to 10 Mt of international emissions reductions by direct purchase through the CDM and JI processes in cooperation with Canadian industry. The Government of Canada also committed to purchase credits from large industrial emitters if costs of domestic emissions reductions rise above CAD$15 per tonne. A Canadian mutual fund paying up to US$10 per tonne for small scale CDM CERs and defraying the cost of CDM participation would cost Canadian taxpayers less than buying credits from Canadian industry, while, at same time, enabling Canada and interested companies to build up a diverse portfolio of carbon offsets to meet their Kyoto commitments.

APPENDIX A: Application of Simplified Procedures

Project Proponent	Technology	Simplified Procedure Category	Baseline Option	Monitoring Protocol
IDE, Delhi	**Treadle Pumps**	**IB: Mechanical Energy for the User**	**Option b): Equivalent diesel fuel consumption times hours used per year times IPCCC emissions coefficient**	**Annual check that a sample of systems are operating + hours of operation of sample**
Market Dynamics, Calcutta	**Solar Home Systems**	**IA: Electricity Generation by the User**	**Option a): kWh used to charge batteries with fossil fuel generator (<15 kW used when needed)**	**Annual check that a sample of systems are operating + hours of operation of sample**
Tara Nirman Kendra, Delhi	**Vertical Shaft Brick Kilns**	**IIC; Demand Side Energy Efficiency for Specific Technology**	**Standard fuel consumption of replaced fossil fuel device times hours of operation times operation times IPCCC emissions coefficient**	**Hours of operation of VSB kiln**
Sahyadri Energy Systems, Bangalore	**Micro hydro**	**IB: Mechanical Energy for the User**	**Option a) Power requirements times hours of operation times standard diesel emissions coefficient**	**Metered output of micro hydro systems**
India Rural Energy Network (IRENet)	**Solar Lanterns**	**IA: Electricity Generation by the User**	**Fuel consumption of replaced kerosene lanterns (40 ml per hour) - NEW BASELINE**	**Annual check that a sample of systems are operating + hours of operation of sample**
Sungrace Energy Solutions, Bangalore	**Solar Lanterns**	**IA: Electricity Generation by the User**	**Fuel consumption of replaced kerosene lanterns (40 ml per hour) - NEW BASELINE**	**Annual check that a sample of systems are operating + hours of operation of sample**
NAMSI Solar, Bangalore	**Solar Water Heating**	**IC: Thermal Energy for the User**	**Annual power consumption of equivalent electric water heater times weighted average grid emissions coefficient**	**Annual check that a sample of systems are operating + hours of operation of sample**
Vijay Engineering, Bangalore	**Biomass Gasifiers**	**IC: Thermal Energy for the User**	**Fuel consumption of replaced fossil fuel device times hours of operation times IPCCC emissions coefficient**	**Measurement of replaced fossil fuel device + hours of operation of gasifier**

APPENDIX B: Testing Simplified Procedures for Small-Scale CDM Projects

The following analysis addresses the simplified baseline, monitoring and additionality procedures for four of the project types included in Simplified Modalities and Procedures for Small Scale CDM Project Activities - UNFCCC January 2003.

Type IA – Electricity Generation By the User.

Three projects supported under the pilot CDM SPF involved solar photovoltaic (PV) home or small business power systems. One replaces kerosene lamps, batteries charged with diesel generators, and unreliable grid power with 40-75Wp solar home systems. Two others replace kerosene lanterns with 5-10Wp solar lanterns.

Market Dynamics Solar Home System Project

The project proposes to install 2.2 MW of solar home and lighting systems in 38,000 households in the three districts of Darjeeling in North Bengal, Midnapore in South-East Bengal and Sunderbans in South Bengal over the next 10 years. The systems will have peak power outputs that range from 40 Wp to 72 Wp with battery back up. The primary market will be households and small market stallholders that use solar PV systems for household applications as domestic lighting and reading, as well as commercial applications such as lighting for processing grain, sorting of betel leaf, tailors, shopkeepers, private tutoring, cycle and electronic repairs.

The project proposes to replace the use of kerosene lamps, diesel charged batteries, or unreliable grid power. The primary benefits are clean, pollution free and assured supply of power for households, and power to adopt and operate micro-enterprises in the region, thereby promoting sustainable development.

The project qualifies as a small-scale CDM renewable project less than 15 MW. However, the current simplified procedures for small-scale CDM projects do not include a project type where kerosene or battery charging is displaced by renewable energy. The simplified procedures most closely matching this type of project is Type IA – electricity generation by the user. This allows the use of a simplified energy baseline that is based on either the electricity consumed by the same consumers in the closest diesel mini-grid times, or the electricity output from the PV system itself. In either case the emissions coefficient of the fuel displaced is used to estimate the baseline emissions.

Market Dynamics is proposing to use the simplified baseline procedure for Type IA assuming that the electricity displaced is the diesel power used to charge batteries. However, Type 1A allows use of a default coefficient for diesel generation of only 0.9 kg CO_2 equivalent per kWh. On the other hand, Type ID - Electricity generation for a grid, allows a coefficient of 1.2 kg/kWh for diesel generators <15 kW used only when needed – precisely the duty cycle used to charge batteries. The latter coefficient was therefore used to estimate baseline emissions by Market Dynamics.

The proposed monitoring protocol follows the simplified procedure allowed for Type IA systems, and consists of checking that a representative sample of the systems installed up to the monitoring date are actually operating, and of carrying out regular measurement of the hours of use in a sample of systems. This simplified protocol eliminates the need to meter or check all systems and their diesel equivalents – a significant savings.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. The first cost of solar PV systems is much higher than the current market technologies – kerosene and batteries. The innovative financing provided by Market Dynamics plus the hard currency from the sale of CERs will help to remove market barriers to solar PV.

IRENET Solar Lighting through Micro-credit (SLiM) Project

This project will involve the installation of 24,572 solar lanterns in several states in India over a 5-year period using micro financing and a revolving fund. Two sizes will be installed, 19,058 10Wp module/5W lamp lanterns and 5,514 5Wp module/3W lamp lanterns.

The Indian Rural Energy Network (IRENet) is a network of more than 50 NGOs located in about 14 states. Utilization of self-help groups (SHGs) formed by the member NGOs to extend credit facility for solar lanterns and collection of repayments is the key feature of the project. It is envisaged that, with this mechanism, the financing required for 10,000 solar lanterns would enable the repayments from customers to be used in a revolving fund for disseminating an additional 14,000 to 15,000 lanterns in five years.

Financing from the sale of CERs through the CDM will be used to remove some of the long standing barriers to the sale of solar lanterns by covering some of the annual costs of marketing, management of the micro-credit program though the SHG, and provision of maintenance services.

As mentioned above, the current simplified procedures for small-scale CDM projects do not include a project type where kerosene is displaced by renewable energy. Type IA – electrical energy by the user, allows the use of a simplified energy baseline that is based on either the electricity consumed by the same consumers in the closest diesel mini-grid times, or the electricity output from the PV system itself.

IRENet is proposing to use a new simplified baseline procedure for Type IA, assuming that the kerosene and solar lanterns are used for 1200 hours per year and kerosene lanterns use an average of 40 ml per hour based on several local surveys. The UNFCCC standard emissions coefficient for kerosene is 2.55 kgCO2/litre, so that the annual baseline emissions per lantern is 122 kg CO2. This compares closely with the 115 kg/yr estimated using the baseline formula of 75 + 0.4 Wp kgCO2/yr, originally proposed for solar PV systems by the special UNFCCC panel in 2002.

As with Market Dynamics, the proposed monitoring protocol follows the simplified procedure allowed for Type IA systems, and consists of checking that a representative sample of the systems installed to date are actually operating, and also carrying out regular measurement of the hours of use in a sample of systems. This simplified protocol eliminates the need to meter or check all systems and their diesel equivalents.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. The first cost of solar PV systems is much higher than the current market technologies – kerosene and batteries. The soft loan from a financing agency plus the hard currency from the sale of CERs, and innovative financing provided through SHGs will help to remove market barriers to solar PV.

Sungrace Solar Lighting Project

The project proposes to install 159,374 households over ten years in the states of Jharkhand, Chattisgarh, Bihar, Kerala, Orissa, Andhra Pradesh, parts of Karnataka, Gujarat, Madhya Pradesh and Maharashtra.

The lanterns will use an 8-10 Wp PV module, a 12V-7 Ah sealed maintenance free (SMF) lead acid battery, and a 5 W compact fluorescent lamp. The unit also has a low watt LED night light. The primary market will be households and small businesses that currently use home made or commercial kerosene lanterns.

As mentioned above, the current simplified procedures for small-scale CDM projects do not include a project type where kerosene is displaced by renewable energy. Type IA – electrical energy by the user, allows the use of a simplified energy baseline that is based on either the electricity consumed by the same consumers in the closest diesel mini-grid times, or the electricity output from the PV system itself.

Like IRENet, Sungrace is proposing to use a new simplified baseline procedure for Type IA, assuming that the kerosene and solar lanterns are used for 1200 hours per year and kerosene lanterns use an average of 40 ml per hour based on several local surveys. The UNFCCC standard emissions coefficient for kerosene is 2.55 kgCO2/litre, so that the annual baseline emissions per lantern is 122 kg CO2. This compares closely with the 115 kg/yr estimated using the baseline formula of 75 + 0.4 Wp kgCO2/yr, originally proposed for solar PV systems by the special UNFCCC panel in 2002.

The proposed monitoring protocol follows the simplified procedure allowed for Type IA systems, and consists of checking that a representative sample of the systems installed to date are actually operating, and also carrying out regular measurement of the hours of use in a sample of systems. This simplified protocol eliminates the need to meter or check all systems and their diesel equivalents.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. The first cost of solar PV systems is much higher than the current market technologies – kerosene. The innovative financing provided by Sungrace plus the hard currency from the sale of CERs will help to remove market barriers to solar PV.

Type IB – Mechanical Energy for the User.

Two projects supported under the pilot CDM SPF involved the displacement of diesel water pumping with a renewable energy source. One project uses treadle pumps to replace direct drive diesel irrigation pumps, the second uses micro-hydro generators to supply electric irrigation pumps, displacing small local diesel generators.

IDE Treadle Pump Project

Under the proposed project, the International Development Enterprises India (IDE-I) will facilitate the installation of 20,000 low cost irrigation treadle pumps in rural areas of Eastern Uttar Pradesh and Bihar over a two-year period. IDE will utilize a supply chain, involving manufacturers, wholesalers and retailer. The primary target market will be small and marginal farm families.

The IDE treadle pump is a foot-operated device that uses a bamboo, a PVC or flexible pipe for suction to pump water from shallow aquifers (no deeper than 25 feet from the ground level) or surface water bodies. It performs best at a pumping head of 3.0-3.5 m delivering 1-1.2 litres per second. Treadle pumps can replace diesel operated irrigation pumps that are prevalent in the region for irrigating small and marginal land holdings. A typical treadle pump has been shown to save 0.38 litres of diesel fuel per hour when delivering the same quantity of water.

The 20,000 unit project qualifies as a small-scale CDM renewable project less than 15 MW equivalent, and for CDM project Type IB of the simplified procedures for small-scale CDM projects – mechanical energy for the user. This allows the use of a simplified baseline that uses the measured fuel consumption of a diesel generator (or direct drive engine) meeting the same load. For a pump operated for 640 hours per year (the normal irrigation requirement), the baseline energy use was estimated to be 243 litres per year per pump. The use of the simplified baseline does not eliminate the cost of a baseline study to measure the performance of the replaced diesel pumps, but sufficient documentation existed to provide the required information.

The proposed monitoring protocol consists of a sampling protocol that confirms that a significant number of pumps are operating each year, and measuring the hours of operation of the units checked. The emissions reduction for all 20,000 pumps is based on this sample. This simplified protocol eliminates the need to meter all units and their diesel equivalents.

The project also meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. While ODA funds have been used to support the development of the IDE pump and finance its commercialization, no donor funds or subsidies will be used in the mass marketing undertaken by this project. While cheaper than diesel pumps, treadle pumps are still unfamiliar to many farmers who are also skeptical about their performance. The project also has to invest in setting up a comprehensive new supply chain.

Sahyadri Energy Systems Micro Hydro Project

Sahyadri Energy Systems (SES) Private Limited is a consulting and manufacturing firm specializing in micro hydro energy sector. SES provides turnkey services – from design to implementation – to various clients such as planters, farmers, estate owners, etc., in implementing micro hydro projects in remote areas. Coffee farmers in the Western Ghats often have energy shortages and are unable to meet their demands because of unreliable grid power. Therefore, they use diesel generators for their power needs, and spend anywhere between Rs.500-Rs.2000 per day (during processing period) on diesel fuel. The generators on the coffee estates are used for two primary purposes:

- Post harvest processing like pulping of coffee seeds before sending them on to the curing works; and
- Pumping water to an overhead tank to be used for drip irrigation.

The proposed project will install 300 micro hydropower units (of 5kW and 25 kW capacity) over three years for a total of 875 kW.

The micro-hydro project qualifies as a small-scale CDM renewable project less than 15 MW, and for CDM project Type IB of the simplified procedures for small-scale CDM projects – mechanical energy by the user. This allows the use of a simplified baseline that uses either the

measured fuel consumption of a diesel generator (or direct drive engine) meeting the same load, or the emissions coefficient for a standard diesel generator used for the same number of hours per year. The latter option was used for this project assuming a plant load of 1440 hours per year.

The simplified procedures for Type IB allows the use of an emissions coefficients for the standard diesel generator included in Type ID – renewable energy generation for a grid (Table I.D.1). A standard coefficient of 1.2 kg CO_2 equivalent per kWh was used for a diesel generator less than 15 kW and used only when needed. The use of the simplified baseline eliminates the cost of a baseline study to measure the performance of the replaced diesel units.

The proposed monitoring protocol consists of metering the electricity output from a sample of 5kW and 25kW micro-hydro units. Again this simplified protocol eliminates the need to meter all units and their diesel equivalents.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. Diesel generators are currently the technology of choice by farmers for cost, availability and familiarity. Without the CDM, micro-hydro would not easily compete with them.

Type IC - Thermal Energy for the User.

Two projects supported by the pilot CDM SPF involved the provision of thermal energy from renewable sources. One project uses solar water heaters to displace grid electricity generated primarily from coal, while the second uses thermal gasified fuel by a sustainable source of biomass to provide heat in small-scale industries – displacing diesel fuelled boilers.

Namsi Solar Water Heating Project

This project proposes to install 4965 solar water heaters in the cities of Bangalore and Mysore, Karnataka State, India, using a network of franchise agents, promotional tools, and creative financing to make the solar water heaters affordable and attractive for even low-income group families. The systems would have a capacity in the range of 100-500 litres per day of hot water (average 160 litres/day).

The sale of CERs is expected to help bring down the interest rate on customer loans that is proposed to be offered through schemes other than that offered by the Ministry of Non-Conventional Energy Sources (MNES). CDM credits can be used to effectively reduce the interest rate for lending to customers to around 9%, thus making the credit package attractive.

The project is eligible to use the UNFCCC simplified procedures renewable energy projects - Type IC thermal energy for the user. The proposed baseline methodology for the project is based on the amount of grid electricity displaced for heating the same volume of water per year. A standard electric water heater uses about 40 watt hours per litre of hot water produced. The baseline assumed a weighted average emissions coefficient of 0.38 kg CO_2 per kWh for the Karnataka grid estimated by standard methods from annual dispatch data. Assuming 300 days per year operation, and a 20% line loss, the baseline for a 160 litre/day electric water heater is 0.942 tonnes/CO_2 per year.

The project also qualifies to use a simplified monitoring protocol. The annual emissions reduction used to generate CER's would be determined by an annual check of a random stratified sample of 20% of the system sold. The sample will be stratified on the basis of the size of the systems sold.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. The first cost of solar water heating systems is much higher than the electric heaters. The innovative financing provided by NAMSI plus the hard currency from the sale of CERs will help to remove market barriers of solar water heaters.

Vijay Engineering Enterprises Biomass Gasification Project

The project includes, installation of biomass gasifiers for thermal applications in small-scale industries to replace the ovens using fossil fuels such as diesel, furnace oil, kerosene. A total of 126 gasifiers will be installed in hotels, silk and cotton dyeing, lead melting, and food processing in Bangalore in the state of Karnataka; Erode, Salem, Tiruppur and Coimbatore in the state of Tamil Nadu.

The gasifiers use a sustainable source of biomass fuel such as wood processing waste that would otherwise decompose, therefore all emissions from the burning of fossil fuels in conventional ovens are eliminated.

The project is eligible to use the UNFCCC simplified procedures renewable energy projects - thermal energy for user. The proposed baseline methodology for the project is based on the kg per hour of LPG or diesel fuel used by the oven displaced by the gasifier. The annual hours of use per year and the standard emissions coefficients for LPG and diesel fuel are used to estimate the annual baseline emissions.

The project also qualifies to use a simplified monitoring protocol. The hourly fuel consumption of each fossil fuel gasifier replaced will be measured before it is removed, and then the hours of operation of each gasifier will be recorded each year.

The project also meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. Biomass gasifiers are unfamiliar to most small industries and at slightly higher cost.

Type IIC – Demand Side Energy Efficiency Programs for Specific Technologies

One project supported by the pilot CDM SPF involved the use of a high efficiency technology in place of the current less efficient technology.

TARA Nirman Kendra Vertical Brick Kiln Project

The Vertical Shaft Brick Kiln (VSBK) is an energy efficient technology for fired clay brick production originally developed in China. It essentially consists of one or more rectangular, vertical shafts within a kiln structure. Rectangular arrays of dried green bricks and crushed fuel (coal) are carefully stacked into batches, which are continuously loaded into the top of the shaft. At the bottom of the shaft, batches of fired clay bricks are continuously removed. TARA Nirman Kendra is proposing to establish 70 VSBK in the states of Uttar Pradesh (Bundelkhand) Chatisgarh, Madhya Pradesh (Malwa), Rajasthan (Kota) over a two-year period.

The VSBK technology requires 7 tonnes of coal to produce 1 lakh numbers of bricks (100,000). The baseline technology being proposed is the Clamp Type Brick kiln that uses 17 tonnes of coal

to produce the same number of bricks. The 70 VSBK kilns will produce 140 million bricks per year for an annual saving over the baseline of 14,000 tonnes of coal.

The project involves the installation of a group of similar energy efficient technologies in several different locations. The project therefore qualifies for CDM project Type IIC of the simplified procedures for small-scale CDM projects – demand side energy efficiency programs for specific technologies. This procedure allows the use of a simplified baseline that uses the standard energy consumption of the baseline technology that provides the same service. The use of the simplified baseline eliminates the cost of a baseline study to measure the performance of the Clamp Kilns.

The proposed monitoring protocol consists of documenting the coal consumption by a sample of VSBK units and using the standard performance of the baseline technology and standard coal emissions coefficients to estimate emissions reductions. Again this simplified protocol eliminates the need to monitor all units and their Clamp equivalents.

The project meets the simplified barrier removal test for additionality allowed for small-scale CDM projects. VSBK technology is currently more expensive than Clamp Kilns and is still unfamiliar in most regions of India.