Appendix A[1] to the simplified modalities and procedures for small-scale CDM project activities

CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD)
Version 01 (21 January, 2003)

Introductory Note

1. This document contains the clean development mechanism project design document for small-scale project activities (SSC-PDD). It elaborates on the outline of information in appendix B "Project Design Document" to the CDM modalities and procedures (annex to decision 17/CP.7 contained in document FCCC/CP/2001/13/Add.2) and reflects the simplified modalities and procedures (herewith referred as simplified M&P) for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3).

2. The SSC-PDD can be obtained electronically through the UNFCCC CDM web site (http://unfccc.int/cdm/ssc.htm), by e-mail (cdm-info@unfccc.int) or in print from the UNFCCC secretariat (Fax: +49-228-8151999).

3. Explanations for project participants are in italicized font *(e.g. explanation)*.

4. The Executive Board may revise the SSC-PDD if necessary. Revisions shall not affect small-scale CDM project activities validated prior to the date at which a revised version of the SSC-PDD enters into effect. Versions of the SSC-PDD shall be consecutively numbered and dated. The SSC-PDD will be available on the UNFCCC CDM web site in all six official languages of the United Nations.

5. In accordance with the CDM modalities and procedures, the working language of the Board is English. The completed SSC-PDD shall therefore be submitted to the Executive Board in English.

6. Small-scale activities submitted as a bundle, in accordance with paragraphs 9 (a) and 19 of the simplified M&P for small-scale CDM project activities, may complete a single SSC-PDD provided that information regarding A.3 (*Project participants*) and A.4.1 *(Location of the project activity)* is completed for each project activity and that an overall monitoring plan is provided in section D.

7. A small-scale project activity with different components eligible to be proposed[2] as a small-scale CDM project activity may submit one SSC-PDD, provided that information regarding subsections A.4.2 (*Type and category(ies) and technology of project activity*), and A.4.3 (*brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity)* and sections B *(Baseline methodology)*, D *(Monitoring methodology and plan)* and

[1] This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix A to that document. For the full text of the annex II to decision 21/CP.8 please see http://unfccc.int/cdm/ssc.htm).

[2] In paragraph 7 of simplified M&P for small-scale CDM project activities, on clarifications by the Executive Board on small-scale CDM project activities, the Board agreed that in a project activity with more than one component that will benefit from simplified CDM modalities and procedures, each component shall meet the threshold criterion of each applicable type, e.g. for a project with both a renewable energy and an energy efficiency component, the renewable energy component shall meet the criterion for "renewable energy" and the energy efficiency component that for "energy efficiency".

E *(Calculation of GHG emission reductions by sources)* is provided separately for each of the components of the project activity.

8. If the project activity does not fit any of the project categories in appendix B of the simplified M&P for small-scale CDM project activities, project proponents may propose additional project categories for consideration by the Executive Board, in accordance to paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The project design document should, however, only be submitted to the Executive Board for consideration after it has amended appendix B as necessary.

9. A glossary of terms may be found on the UNFCCC CDM web site or from the UNFCCC secretariat by e-mail (cdm-info@unfccc.int) or in print (Fax: +49-228-8151999).

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A. General description of project activity

A.1 Title of the project activity:

Benito Juarez

A.2 Description of the project activity:

(Please include in the description
- the purpose of the project activity
- the view of the project participants on the contribution of the project activity to sustainable development) (max. one page))

The objective of the proposed project activity is to generate renewable electricity using hydroelectric resources and to sell the generated output to Mexican consumer partners (primarily industrial users and municipalities) on the basis of power purchase agreements (PPAs), using the Comisión Federal de Electricidád (CFE) transmission system to wheel the energy. The project activity will generate GHG emission reductions by avoiding electricity generation, and CO_2 emissions, at fossil fuel-fired power plants that would be generating otherwise.

The Benito Juarez project will generate clean electricity in a rural area approximately 25 km north-west of the city of Tehuantepec, in the state of Oaxaca.

The Benito Juarez project has an existing dam at the site. The power plant will have a nominal capacity of 15 MW, using the existing pattern of irrigation flow releases to generate electricity. The existing dam is a rock filled dam with an impervious clay core center and has been built with the intent to construct future hydroelectric plants on-site.

Two diversion tunnels have been constructed at the dam to divert storm water flows during dam construction. One of the diversion tunnels is being utilized to provide irrigation flows downstream from the dam. The diversion tunnel not utilized for irrigation flows will contain the penstock facility to feed the future powerhouse configuration at the site. The hydroelectric facility will be constructed directly downstream from the outlet of the diversion tunnels within an area previously designated for the placement of a hydroelectric facility.

The project serves to impound water mainly utilized for downstream irrigation. It is possible for this project to regulate downstream water volume. The regulating dam can accommodate some degree of varying upstream dam flow releases, thus allowing for increased flexibility in the quantity and the time intervals at which flows are released for hydroelectric generation. Irrigation demand flows will take priority and will not be modified in anyway as a result of the development of the project.

The dam provides storage for interannual regulation of river flows for irrigation districts located downstream. The Benito Juarez project will consist of a hydroelectric plant constructed downstream the point where the water intake tunnel for irrigation exits the dam. The hydroplant will use an existing penstock to feed the turbine. A bypass upstream of the powerhouse will allow irrigation.

In the case of Benito Juárez, two tunnels with a steel pipeline inside each one constitute the existing water intake for irrigation. Both will be used for generation by interconnecting them

through a third tunnel running below the others and tapping from below the water intake pipe lines. A penstock inside this third tunnel will be the feeding line for the hydro 15 MW turbine with a coupled generator. A substation and a 25 km transmission line will interconnect the plant with CFE's electric grid.

The main design characteristics of the Benito Juarez project are summarized in Table1.

Table 1: Main project characteristics

Benito Juarez	
Power (MW)	15.0
Design head (m)	46
Design rate of flow (m^3/s)	76.7
Project efficiency (%)	86.0
Transmission line (Km)	25

The expected total annual average generation output of 69.93 GWh is distributed over the peak, intermediate, and base intervals as follows:

Table 2: Benito Juarez's output profile

Peak	Intermediate	Base
10.10 GWh	25.27 GWh	34.56 GWh
14.5%	36.2%	49.3%

The expected annual distribution of hours of generation over the different intervals is as follows:

Table 3: Benito Juarez: Hours of production per year

Peak (hrs/yr)	Intermediate (hrs/yr)	Base (hrs/yr)
733	1830	2493

The turbines and generators for the project will be made by Alstrom power and VA Tech. They will sign an Equipment/Procurement/Construction (EPC) contract with the project sponsors. Both companies have been manufacturing hydroelectric facilities for decades and have improved the engineering and technology that they use in the design and fabrication of hydroelectric turbines and generators.

The project will assist Mexico in stimulating and accelerating the commercialization of renewable energy technologies and markets at the grid level and under private ownership and operation in order to reduce greenhouse gas (GHG) emissions while responding to increasing energy demand and energy diversification imperatives necessary for sustainable economic growth. Broadened private experience in the development, operation and maintenance of hydropower electricity generation is a significant option for expanding and diversifying Mexico's energy resources, and at the level of the Comisión Federal de Electricidád (CFE), increased experience in accommodating smaller distributed resources that offer potential energy, capacity, and diversification benefit.

A.3 Project participants:

(Please list Party(ies) and private and/or public entities involved in the project activity and provide contact information in annex 1 of this document.)

(Please designate one of the above as the official contact for the CDM project activity.)

Host party:	Mexico
Project proponent:	Impulsora Nacional de Electricidad (INELEC), S.A. de C.V.
Address:	Bosque de Ciruelos 190 Suite A303. Bosque de las Lomas. Mexico, D.F., 11700, Mexico.
Contact persons:	Carlos Jinich Ripstein/Salomón Camhaji Samra
Phone/Fax:	52 55 5596 8924/52 55 5251 6065
E-mail:	carlosjinich@asergen.com.mx scamhaji@asergen.com.mx
Project sponsors:	Corporacíón Mexicana de Hidroelectricidad, S.A. de C.V. Scudder Latin American Power Fund (SLAP)
Project participant/ Contact point :	PCF
Address:	World Bank 1818 H Street, NW Washington, DC 20433 USA
Contact person:	Odil Tunali Payton
Phone/Fax :	(202) 473-6774/(202) 614-0391
E-mail :	otunalipayton@worldbank.org

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

A.4.1.1 Host country Party(ies): Mexico

A.4.1.2 Region/State/Province etc.: North America

A.4.1.3 City/Town/Community etc: Approximately 25 km north-west of the city of Tehuantepec, in the state of Oaxaca.

A.4.1.4 Detailed description of the physical location, including information allowing the unique identification of this project activity *(max one page)*:

The powerhouse will be located at the Benito Juarez Dam which is located in the Municipality of Jalapa del Marqués Southeast of the state of Oaxaca. The dam captures the flow of the Tehuantepec River which irrigates the Tehuantepec district.

The main cities around the project are Santa Maria Jalapa del Marqués, 2 miles from the dam, and Tehuantepec, located around 20 miles southwest of the dam and Salina Cruz, a port located around 10 miles south of Tehuantepec.

The geographic coordinates are 16° 26'44'' North Latitude and 95°23'41'' West length.

Figure 1: Location of the Benito Juarez hydroelectric project.

A.4.2 Type and category(ies) and technology of project activity

(Please specify the type and category of the project activity using the categorization of appendix B to the simplified M&P for small-scale CDM project activities, hereafter referred to as appendix B. Note that appendix B may be revised over time and that the most recent version will be available on the UNFCCC CDM web site.

In this section you shall justify how the proposed project activity conforms with the project type and category selected (for simplicity, the rest of this document refers to "project category" rather than "project type and category").

If your project activity does not fit any of the project categories in appendix B, you may propose additional project categories for consideration by the Executive Board, in accordance with paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The final SSC-PDD project design document shall, however, only be submitted to the Executive Board for consideration after the Board has amended appendix B as necessary.)

(This section should include a description of how environmentally safe and sound technology and know-how is transferred to the host Party, if such a transfer is part of the project.)

Type I: Renewable Energy Projects
Category I.D.: Renewable Electricity Generation for a Grid

The Benito Juarez hydroelectric project conforms with the project type and category selected, as it is a project activity which involves renewable energy generation from the installation of a new small-scale hydroelectric plant whose output will be fed into the national electricity grid, thus displacing generation from fossil fuel-fired plants.

A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:

(Please state briefly how anthropogenic greenhouse gas (GHG) emission reductions are to be achieved (detail to be provided in section B.) and provide the estimate of total anticipated reductions in tonnes of CO_2 equivalent as determined in section E. below.)

Applying the methodology approved for small-scale on-grid renewables projects (described in section B.2) shows that the implementation of the Benito Juarez hydroelectric plant in the Mexican electricity system will generate a total reduction of 856,153 tons of CO_2 over 21 years (Table 4). This reduction is the result of the displacement of generation from fossil fuel-fired plants that would have otherwise delivered electricity to the CFE interconnected grid.

Table 4: Benito Juarez ERs, 21 years, 2001 CEF

Crediting period	tCO_2
Year 1	40,769
Year 1-7	285,384
Year 1-14	570,769
Year 1-21	856,153

In each crediting period, the amount of ERs generated by the project will vary directly with the metered net generation output from Benito Juarez. The estimations in Table 4 are based on a grid emission rate of 0.583 tCO_2equiv/MWh and an expected 69,930 MWh of electric-energy output annually. The emission rate is computed from the most recent (i.e. 2001) official information on the Mexican electric power sector.

In order to increase precision and to establish the baseline conservatively, the emission rate for the electricity grid will be recalculated at the end of the 1st and 2nd crediting period by using the methodological steps and equations given in section E.

A.4.4 Public funding of the project activity:

(Indicate whether public funding from Parties included in Annex I is involved in the proposed project activity. If public funding from one or more Annex I Parties is involved, please provide information on sources of public funding for the project activity in annex 2, including an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of those Parties.)

There is no public funding involved in the proposed project activity.

A.4.5 Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

(Please refer to appendix C to the simplified M&P for the small-scale CDM project activities for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity.)

According to the simplified M&P for small-scale CDM project activities, a small-scale project is a debundled component of a larger project if there is a registered small-scale activity or an application to register another small-scale activity:

- With the same participants
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The Benito Juarez project is the first hydroelectric plant to be sited on the Tehuantepec river mentioned in section A.4.1.4. Since Benito Juarez is not overlapping any small-scale project within 1 km of its project boundary which is already registered or in the process of applying for registration as a small-scale CDM project, it is not a debundled component of a larger hydroelectric project activity.

B. Baseline methodology

B.1 Title and reference of the project category applicable to the project activity:

(Please refer to the UNFCCC CDM web site for the most recent list of the small-scale CDM project activity categories contained in appendix B of the simplified M&P for small-scale CDM project activities.)

Type 1: Renewable energy project.
Category 1.D: Renewable Electricity Generation for a Grid.

B.2 Project category applicable to the project activity:

(Justify the choice of the applicable baseline calculation for the project category as provided for in appendix B of the simplified M&P for small-scale CDM project activities.)

Appendix B of the simplified M & P for small-scale CDM project activities gives two options that can be applied to the proposed project category:

"The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner as:

(a) The average of the "approximate operating margin" and the "build margin", where:

(i) The "approximate operating margin" is the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system,

excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) The "build margin" is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system, defined as the lower of most recent 20% of plants built or the 5 most recent plants;

OR,

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix".

Option (a) is selected for the proposed project activity. The Benito Juarez project will displace a portfolio of thermal generation units in the Mexican electrical system. The expansion plan which the CNE produced in 2002 indicates that hydro-power's share of the total generation will drop from about 15% in 2001 to about 10% by 2011. Although hydroelectric resources constitute a sizeable portion of the total installed capacity, hydroelectric plants have low generating costs and will be dispatched regardless of the generation from the Benito Juarez project. The chosen baseline methodology thus represents the more realistic of the two options available.

B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity *(i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)*

(Justify that the proposed project activity qualifies to use simplified methodologies and is additional using attachment A to appendix B of the simplified M&P for small-scale CDM project activities.)

(National policies and circumstances relevant to the baseline of the proposed project activity shall be summarized here as well.)

According to the attachment A to the simplified M&P for small-scale CDM projects, project participants shall provide an explanation showing that the project activity would not have occurred anyway due to at least one of the following barriers:

A. "Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
B. Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
C. Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
D. Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher".

The analysis presented below demonstrates that the barriers hindering the proposed project activity in the base case are related primarily to institutional issues and the structure of the electricity market and the power sector in Mexico. These types of barriers are covered under the barrier classes C and D stipulated for small-scale CDM projects above.

PROJECT BARRIERS AND THE IMPORTANCE OF CARBON FINANCE

In general, the barriers to this type of investment in Mexico typically involve (a) transaction costs of identifying and negotiating with multiple power off-takers and maintaining supply-demand balance, (b) payment risks associated with the off-takers, (c) legal deficiencies inherent in the self-supply scheme, and hence lack of legal remedies in the event of unilateral termination, and, in consequence, (d) difficulties in securing financing, especially long-term debt financing, for such developments. The requirements with respect to permits, authorizations and contract are identical for small and large hydro projects, resulting in significantly higher transaction or development costs for smaller projects.

Similar to Chilatán and the Trojes hydroelectric projects, which also are included in the INELEC Projects Umbrella and are being proposed as small-scale projects under the CDM, Benito Juarez is one of the first small-scale hydro project to be allowed as an auto-generator in Mexico. Being one of the first of its kind, securing sufficient financing of the project has been difficult and has delayed the development of the project. Some of the concerns of potential investors have stemmed from the legal and institutional framework in Mexico. Importantly, the financial sector in Mexico has been reluctant to provide the loans for the project and obtaining the concessionary rights have proven to be very time-consuming. It has not been possible to obtain the necessary loans without having the concessions needed to operate the Benito Juarez hydro plant and all the necessary PPAs with the consumer partners. This has resulted in a delay of 2 years of the project.

The project sponsor took carbon finance into account before construction work commenced in January 2002. In discussions on financing with the equity partner, Scudder Latin America Power Fund, the sponsor was advised of carbon finance opportunities in mid-2001. Based on this advice, the sponsor commissioned a study on carbon finance options and on how these could benefit the project financing. The study also examined how baselines would be determined and how ERs would be calculated. A report prepared by an external consultant was completed in November 2001. The first inquiry about carbon finance by the PCF was made on November 27, 2001.[3]

The generated output from the project will be sold to industrial users and municipalities in Mexico at a lower price than the CFE's price. Municipalities who become partners will reduce their costs of street light electricity, and industry partners will reduce their electricity consumption costs relative to the CFE tariff. This could expose the project to market and regulatory risks. The CFE could reduce their electricity price(s) in order to stimulate consumers to switch from Benito Juarez/INELEC back to CFE. Moreover, the CFE could increase the wheeling tariffs, or other costs, incurred by the Benito Juarez project.

Importantly, carbon finance will make it possible for the project to sell electricity at a lower price than it could otherwise. Carbon finance makes it possible to reduce the electricity price so that it is sufficiently attractive and competitive compared to CFE's tariffs. Without carbon finance, the return on the investment would not be attractive enough to justify the investment in the project.

The reluctance and concerns of investors and consumer partners regarding the Benito Juarez project should be understood in the light of the state-controlled Mexican electric power sector, the CFE tariff structure that is currently in place, the dominance of the state-owned utility CFE

[3] The documentary evidence is available for inspection by a designated operational entity.

within the power sector, and the lack of private entities with experience with the operation of hydroelectric plants.

The involvement of the World Bank in this project has in several ways been critical to attract project financing, which is only possible in the Bank's role as the Trustee for the PCF, which develops projects under the CDM. The World Bank cannot be involved in any other way, because there is no World Bank lending operation associated with this project. First, the Bank's involvement has created confidence among investors that the consumers would pay for their electricity consumption. The support and participation of the PCF convinced other investors that they would not be exposed to payment risks associated with the off-takers. Second, the participation of the PCF may often be seen as 'a seal of approval'—i.e., as a guarantee that the project finances were thoroughly checked prior to approval. Other investors, who have less analytical capacity and are less sophisticated technically, have evidently found comfort in the fact that the PCF is involved in the Benito Juarez project and the INELEC Projects Umbrella. Accordingly, they have been more willing to invest in the project.

SECTOR BACKGROUND

General structure and organization

In 2001, Mexico had 42,410 MW of installed capacity. The public sector contributed 38,519 MW, or around 85%, of the total capacity, while auto-generators (2,232 MW), co-generators (1,136 MW) and other producers (524 MW) contributed the balance. The total generation was 209,716 GWh in that year. Oil-fired steam power plants and IC plants together supplied 46.1%; hydroelectric resources generated 14.4%; combined cycle plants 12.9%; coal 9.4%; dual (fuel-oil and coal) 7.2%; nuclear 4.4%; geothermal and wind 2.8%; and gas turbines 2.8% of the total generation.

The Federal Electricity Commission (CFE) and Luz y Fuerza Centro (LFC) are Mexico's two state-owned electricity companies. CFE has enjoyed a monopoly in the electric power sector for decades, although reforms instituted in 1992 allow independent power producers (IPPs) and co-generators limited involvement. In 2002, CFE generated about 91% of Mexican electricity. LFC contributes about 1%, with most of its customers in Mexico City. Petroleos Mexicanos, or Pemex, generates 2%, while the remainder was generated by the private sector.

Electricity demand growth in Mexico during the period 2002-2011 is expected to be strong and greater than the growth rate of GDP. The base case scenario using a GDP growth rate of 4.5% estimates that electricity consumption will grow at an annual rate of 5.6%. Government estimates indicate that it will be necessary to increase capacity by 30,300 MW during the 2002-2011 period, of which 14,228 MW are already committed or under construction (Table 5).

Table 5: Capacity additions (MW): 2002-2011

	Under construction or committed	Not committed	Total	% share
Combined cycle	10,744	62	10,806	37.4
Repowering	257	-	257	0.9
Hydro	1,686	1,325	3,011	10.4
Dual	700	2,800	3,500	12.1
Geothermal	107	-	107	0.4
Turbogas	217	-	217	0.8
Internal combustion	48	10	58	0.2
Wind	-	50	50	0.2

Undefined	469	10,387	10,856	37.6
Total	14,228	14,634	28,862	100.0

Source: Secretaría de Energía, 2002: *Prospectiva del Sector Eléctrico 2002-2011*, p. 69.

Given the current regulatory framework, self-supply and cogeneration projects are expected to account for only 1,438 MW of the total capacity addition requirements, a reduction of 3,424 MW compared to the projection made in the 2001 expansion plan. The planning scenario also considers retiring 4,168 MW of capacity (mostly older oil-fired thermal) during this period. Mexico's industrial energy policy calls for conversion of many oil-fired power plants to natural gas and most new power plants will run on natural gas.

Given their relative efficiency and fuel price projections, the majority of capacity built or contracted by the public sector during the 2002-2011 period is likely to be met with combined cycle gas turbines. This trend could result in CCGT-based generation accounting for 52.8% of total generation by 2011—an increase of almost 40% relative to 2001—while conventional thermal generation (fuel oil based) will reduce its contribution from 46.1% to 12.8%. Renewable energy sources could represent around 12.1% of the energy additions—with 9.8% delivered by hydro. A low rate of capacity retirement resulting from government budgetary and financing restrictions is expected to persist (in the past decade only 816 MW of capacity was retired) and will leave numerous inefficient oil thermal and open-combustion gas units in operation.

Sector policy/strategy

Deregulation of the electricity sector remains a contentious issue in Mexico. President Fox made privatization of the industry a top priority after entering into office in 2000. However, electricity sector reform initiatives currently underway are not expected to proceed in their originally proposed form; specifically, partial unbundling and the creation of a wholesale electricity market are not expected to occur in the near future. More likely, a measure will be passed to codify or solidify private sector participation in generation so as to address ambiguities in the 1992 legislative reforms. There are also opportunities for reforms that will expand opportunities for renewable energy development, as these appear to enjoy support across a range of political interests.

IPPs are allowed to build and own power generation facilities, and the power can be sold to industrial companies or sold under long-term contracts to the public utilities. A small amount of excess power can be sold to CFE. IPPs also can gain permits to build larger plants for electricity sales to groupings of municipal or industrial firms, who typically pay relatively high CFE tariffs. These ‘off-taker’ customers can qualify as ‘self-generators’ by purchasing at least one share in an IPP operation.

Electricity prices in Mexico vary significantly across different consumer groups. The price structure is generally characterized by cross-subsidies between consumer groups and rate distortions. High consumption users generally subsidize low-consumption user; agricultural users are considerably subsidized by other rate categories. The increasing number of plants built for self-consumption is evidence of the high prices and the insufficient service that CFE is currently providing.

The Mexican government provides subsidies to the CFE and Luz y Fuerza of more than US$ 7 billion per year. Given the financial commitments and demands that the Mexican government has to meet, it is very unlikely that electric tariffs will be reduced.

B.4 Description of the project boundary for the project activity:

(Define the project boundary for the project activity using the guidance specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)

The physical, geographical site of the Benito Juarez project defines the project boundary.

GHG emissions during on-site construction work are negligible and will not be accounted for. Similarly, emissions associated with transportation of construction material will be ignored, and so will emissions related to plant electricity consumption when the plant is not in operation. Finally, emissions associated with the production of parts, supplies and machinery for the construction of the plant will not be accounted for either. This is in accord with the simplified modalities and procedures for small-scale CDM projects as defined in Appendix B.

B.5 Details of the baseline and its development:

B.5.1 Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

The 7th meeting of the CDM EB, held in January 2003, agreed on two methodology options for on-grid renewables project as described above in section B.2. The methodology used for the proposed project activity corresponds fully with option (a) (confer section B.2).

The key steps in establishing the baseline

1. Information on annual electricity generation and annual fuel consumption by all plants (excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation) delivering to the CFE interconnected grid as well as all recent capacity additions is obtained from Sener (Secretaría de Energía), especially the annual *Prospectiva del sector eléctrico*.
2. CO_2 emissions due to electricity generation are calculated from data on generation, fuel consumption, energy content of fuels, and fuel CO_2 content. Standardized fuel CO_2 content information is obtained from the IPCC, and CO_2 emission factor for CCGTs is obtained from the IEA.
3. The baseline CO_2 emission rate is computed by dividing the sum of CO_2 emissions (in tonnes) from all relevant power plants by the total generation (in GWh) from such plants.
4. The CO_2 emission rate for the electricity grid will be re-calculated over the project's crediting life as described in section E.1.2.

See section E for the details on the methodological steps to be followed when computing the baseline.

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*: 18*/06/2003.*

B.5.3 Name of person/entity determining the baseline:
(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)

Lasse Ringius for the PCF, with input from Donald Hertzmark. The PCF is a project participant in the project.

Contact information:
Prototype Carbon Fund
The World Bank
1818 H Street, N.W.
Washington, DC 20433 U.S.A.
Mail Stop: (MC4-414)

C. Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

(For a definition of the term "starting date", please refer to the UNFCCC CDM web site).

The construction work on the Benito Juarez project will start in September 2004.

The Benito Juarez project will start generating electricity in June 2006.

C.1.2 Expected operational lifetime of the project activity: *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*

50y.

C.2 Choice of the crediting period and related information: *(Please underline the selected option (C.2.1 or C.2.2) and provide the necessary information for that option.)*

(Note that the crediting period may only start after the date of registration of the proposed activity as a CDM project activity. In exceptional cases, the starting date of the crediting period can be prior to the date of registration of the project activity as provided for in paragraphs 12 and 13 of decision 17/CP.7 and in any guidance by the Executive Board, available on the UNFCCC CDM web site.)

C.2.1 Renewable crediting period *(at most seven (7) years per crediting period)*

C.2.1.1 Starting date of the first crediting period *(DD/MM/YYYY)*:

01/06/2006

C.2.1.2 Length of the first crediting period *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*: *7y.*

C.2.2 Fixed crediting period *(at most ten (10) years)*:

C.2.2.1 Starting date *(DD/MM/YYYY)*:

C.2.2.2 Length (max 10 years): *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*

D. Monitoring methodology and plan

(The monitoring plan shall incorporate a monitoring methodology specified for the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities and represent good monitoring practice appropriate to the type of project activity.

The monitoring plan shall also provide information on the collection and archiving of the data specified in appendix B of the simplified M&P for small-scale CDM project activities to:
- Estimate or measure emissions occurring within the project boundary;
- Determine the baseline, as applicable;
- Estimate leakage, where this needs to be considered.

Project participants shall implement the registered monitoring plan and provide data, in accordance with the plan, through their monitoring reports.

Operational entities will verify that the monitoring methodology and plan have been implemented correctly and check the information in accordance with the provisions on verification. This section shall provide a detailed description of the monitoring plan, including an identification of the data to be collected, its quality with regard to accuracy, comparability, completeness and validity, taking into consideration any guidance contained in the methodology, and archiving of the data collected.

Please note that monitoring data required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

An overall monitoring plan that monitors performance of the constituent project activities on a sample basis may be proposed for bundled project activities. If bundled project activities are registered with an overall monitoring plan, this monitoring plan shall be implemented and each verification/certification of the emission reductions achieved shall cover all of the bundled project activities.)

D.1 Name and reference of approved methodology applied to the project activity:

(Please refer to the UNFCCC CDM web site for the most recent version of the indicative list of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)

(If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.)

No name and reference is suggested for the monitoring methodology at the UNFCCC CDM web site at this time.

The monitoring methodology to be used by the proposed project activity is identical with that which is prescribed for category I.D. projects, i.e., “monitoring shall consist of metering of the electricity generated by the renewable technology.

D.2 Justification of the choice of the methodology and why it is applicable to the project activity:

(Justify the choice of the monitoring methodology applicable to the project category as provided for in appendix B.)

As determined in the simplified modalities and procedures for small-scale CDM projects, monitoring shall consist of metering the electricity generated by the renewable technology.

D.3 Data to be monitored:

(The table below specifies the minimum information to be provided for monitored data. Please complete the table for the monitoring methodology chosen for the proposed project activity from the simplified monitoring methodologies for the applicable small-scale CDM project activity category contained in appendix B of the simplified M&P for small-scale CDM project activities.

Please note that for some project categories it may be necessary to monitor the implementation of the project activity and/or activity levels for the calculation of emission reductions achieved.

Please add rows or columns to the table below, as needed)

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1	Net generation by the Benito Juarez hydroelectric plant	---	MWh	Measured	Continuous	All	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data source: Project Implementer and CFE.

D.4 Name of person/entity determining the monitoring methodology:

(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)

Lasse Ringius for the PCF, with input from Donald Hertzmark. The PCF is a project participant in the project.

Contact information:
Prototype Carbon Fund
The World Bank
1818 H Street, N.W.
Washington, DC 20433 U.S.A.
Mail Stop: (MC4-414)

E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

(In E.1.1 please provide the formula used to calculate the GHG emission reductions by sources in accordance with the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.

In case the applicable project category from appendix B does not indicate a specific formula to calculate the GHG emission reductions by sources, please complete E.1.2 below.)

E.1.1 Selected formulae as provided in appendix B:

(Describe the calculation of GHG emission reductions in accordance with the formula specified for the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)

No formula is provided in Appendix B of the simplified M&P for small-scale CDM project activities for renewable electricity generation projects for a system where some but not all generating units use fuel oil or diesel oil.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

Emissions by sources are zero since the project activity utilizes a hydroelectric power plant, i.e. a non-emitting renewable energy technology.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

It is required to estimate leakage only if the renewable energy technology is transferred from another activity. The Benito Juarez project does not involve a transfer of equipment, however.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

It follows that the sum of E.1.2.1 and E.1.2.2. is zero GHG emissions.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities: *(for each gas, source, formulea/algorithm, emissions in units of CO_2 equivalent)*

The proposed project uses the combined margin methodology to compute the baseline emission rate, which reflects the proposed project's effects on both the operating margin (affecting the operation of current and/or future power plants) and the build margin (delaying or avoiding the construction of future power plants). The baseline emission rate is thus:

$$BaselineEmissionRate(gCO_2/kWh) = \frac{OM + BM}{2} \qquad \text{(E.1.2.4.1)}$$

where OM = the calculated operating margin value factor (in grams CO_2/kWh), and
BM = the calculated build margin value factor (in grams CO_2/kWh).

Emissions of CO_2 for the CFE generation mix can be calculated directly from Mexican government data, as provided in the annual Sener (Secretaría de Energía)*, Prospectiva del sector eléctrico* (http://www.energia.gob.mx/work/appsite/publicaciones/PROS_ELECT1.pdf). Total emissions, E, are given as the sumproduct of the fuels used in generation multiplied by the specific CO_2 emission rate for that fuel.

$$E(tonCO_2/year) = \sum_j E_j \qquad \text{(E1.2.4.2)}$$

Where Ej = CO_2 emissions per year in tons for fuel j.

For each E_j, the emissions are calculated as:

$$E_j = Q_j * F_j \qquad \text{(E.1.2.4.3)}$$

Where Q_j = quantity of fuel j in year, and
F_j = CO_2 emissions per unit for each fuel j.

Thus E can be calculated directly as the following sumproduct:

$$E = \sum_j Q_j * F_j, \text{ for all j} \qquad \text{(E1.2.4.4)}$$

The Operating Margin Emissions are defined as the generation-weighted average emissions per electricity unit (g/kWh), excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation and are derived from the following equation:

$$OM = \sum_j E_j \div K_j \qquad \text{(E.1.2.4.5)}$$

Where K_j = electricity generation from fuel j, and generation by source is listed in the *Prospectiva* (p. 70). For the year 2001, this value for OM was 766 g/kWh.

The Build Margin Emissions are defined as the lower (in MW) of the emissions from the 5 most recent plants built or the most recent 20% of the generating units built. For this project the 5 most recent plants approach will be used (but see discussion below). In Mexico, the five most recent plants are gas-fired CCGT units. 400 gCO_2/kWh is used as a standardized emission factor value for gas-fired CCGT plants in Mexico.[4]

[4] IEA, *Greenhouse Gas Emissions from Power Plants* (http://www.ieagreen.org.uk/)

Using E.1.2.4.1 gives a CM as follows: $BaselineEmissionRate(gCO_2/kWh) = \frac{766+400}{2} = 583$

At the present time, the value of BM is the same whether one uses the most recent 20% of plants or the 5 most recent additions. Until 2006 most of the units to be added to the system will be CCGT plants (Sener*, 2002: Prospectiva del sector eléctrico, 2002-2011*, p. 64). After that time CFE will add peaking large hydro plants, replacements for aging combustion turbines as well as gas-fired CCGTs. At that time, equation E1.2.4.6 may be required to compute the build margin.

$$BM(tCO_2/MWh) = \frac{\sum_{j=1}^{m} e_j \times G_j}{\sum_{j=1}^{m} G_j} = \frac{e_1 \times G_1 + e_2 \times G_2 + \ldots + e_m \times G_m}{G_1 + G_2 + \ldots + G_m} \qquad \text{(E.1.2.4.6)}$$

where G_j = the generation (MWh) from unit j,
e_j = the emission rate (in tons CO_2/MWh) for unit j, and
j = individual plants included among the lesser (in MW) of most recent 20% or the 5 most recent (over 15 MW) units built.[5]

The project sponsor shall re-calculate the baseline emission rate at the end of the 1st and 2nd crediting period using the same equations but the most recent data on the Mexican electricity sector, unless the CDM EB has altered the simplified M&P for the proposed project activity. In the latter case, the baseline emission rate shall be re-calculated using the revised M&P. In either case, a designated operational entity shall determine and confirm that the baseline emission rate has been updated in accord with internationally agreed M&P.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Following the baseline methodology, and because step E.1.2.3 equals zero GHG emissions, the emission reductions due to the Benito Juarez project will be calculated by using formulae (E.1.2.4.1) through (E.1.2.4.5) only, as explained in section E.1.2.4 above.

E.2 Table providing values obtained when applying formulae above:

The following table summarizes the numerical results from the equations listed above. The table presents data, data sources and the underlying computations that are available in the excel-spreadsheet attached to the PDD:

[5] The simplified M&P do not identify the comparator (i.e., lesser in terms of MW? CO_2 emissions?). Moreover, it is not clear whether all new capacity additions count, irrespective of capacity size.

Table 6: Numerical results from the equations

Table	Calculated results	How Calculated	Source
1	38,519 MW Installed generating capacity	Number for 2001 taken from p. 45.	Sener, *Prospectiva del sector electrico, 2002-2011,* (p.45)
2	4,369 TJ/day Fuel consumption in generation	No calculation in this table.	Sener, *Prospectiva del sector electrico, 2002-2011,* (p.71)
3	1,594,685 TJ/y Fuel consumption in generation	No calculation in this table.	Table 2, annualized
4	119,310,664 t CO2/y emitted by electricity conversion	Formula is 3.7 * TJ_x * emission $factor_x$, where x stands for fuel type. 3.7 is the conversion factor for C to CO_2. This yields the total CO_2 by fuel type per year.	Table 3 and IPCC Carbon Emission Factors (CEF)
5	155,812 GWh generated by thermal plants	No calculation in this table.	Sener, *Prospectiva del sector electrico, 2002-2011,* (p.70)
6	766g gCO_2/kWh	Total CO_2 fossil fuel-based emissions divided by total thermal generation	Tables 4 and 5
7	OM = 766 gCO_2/kWh BM = 400 gCO_2/kWh CM = 583 gCO_2/kWh	OM = total CO_2/total GWH using fuels, where Table 5 gives generation by fuel type and Table 4 gives CO_2 by fuel type; BM = emissions from gas-fired CCGT, as per IEA data; CM = (OM + BM)/2	Table 6 and IEA standardized emission factor

F. Environmental impacts

F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity: *(if applicable, please provide a short summary and attach documentation)*

The project will not have major environmental impacts. The areas that might have relevant environmental effects include:

1. Hydrology: The main impact will be generated by variations in discharge flow due to the peak hour operation of the plant. These variations may affect (i) the stream bed and surrounding ecosystem, and (ii) the agricultural irrigation. These impacts will be mitigated by (i) establishing and maintaining a minimum flow (ecological flow) to preserve the ecosystem, and (ii) the irrigation patterns will not be modify. The developer has established a legal agreement with CNA in this regards. To technically comply with this agreement, the developer will increase the level of the regulating reservoir.

2. Flora and Fauna: The host environment is semi-arid, being the vegetation of the area secondary and homogenous in terms of species. There are mainly scrubs, bushes, mainly Huizache (acacia sp), and a limited amount of herbaceous vegetation. As a result of the dam construction fish native species are not abundant in the river downstream. There are fishing activities only in the reservoir of foreign species. There are neither critical natural habitats, nor threatened species in the area of the project. As a result of these facts, and due to the project characteristics, there will be no relevant impact in terms of flora and fauna.

3. Transmission Lines: The design of transmission lines was done in such a way that no resettlements will be necessary. The lines will essentially pass through agricultural lands. The Rights Of Way (ROW), where necessary, have already been negotiated and granted. The minimum vegetation to be affected will be manually removed.

G. Stakeholders comments

G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:

Meetings are still underway, so as to explain to the local fishers that neither the reservoir nor the fisheries will be negatively affected. The developer has been requested to include NGOs in the communication campaign but no relevant NGO were identified.

G.2 Summary of the comments received:

The EIA has been officially approved by Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) and the developer is currently designing a web-site to inform the public about the EIAs and the INELEC Projects Umbrella.

G.3 Report on how due account was taken of any comments received:

An agreement was reached in term of the transmission lines design. No other issues were identified.

Annex 1

CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

(Please repeat table as needed)

Organization:	Administración y Servicios de Generación Eléctrica S.A: de C.V.
Street/P.O.Box:	Bosques de Ciruelos
Building:	190 – 303 A
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Postcode/ZIP:	11700
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FAX:	52 55 52 51 60 65
E-Mail:	jmekler@asergen.com.mx
URL:	
Represented by:	
Title:	Director General
Salutation:	
Last Name:	Camhaji
Middle Name:	
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Organization:	World Bank Prototype Carbon Fund
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the proposed project activity.

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