Draft PDD

PEÑAS BLANCAS HYDROELECTRIC PROJECT

For the purpose of demonstrating the "CERUPT Dispatch Analysis Methodology for Grid-Connected Electricity Projects"

A. General description of project activity

A.1 Title of the project activity:
Peñas Blancas Hydroelectric Project

A.2. Description of the project activity:

Main objective of the Peñas Blancas project is to contribute to meet Costa Rica increasing energy demand for economic growth through the generation of electricity based on renewable source instead of relying on imported oil, without any aggregate value to the local economy.

The project is fully compatible with local and global environmental priorities such as the national commitment to expand the role of clean sources of energy in the national energy mix. In doing so, Costa Rica is seeking a less carbon intensive development track. ICE recognizes that any power development will have an environmental impact, but considers that Peñas Blancas is an example of seeking alternatives to mitigate the environmental impacts, as it has been demonstrated through the implementation of the Environmental Management Plan of the project.

The Peñas Blancas Hydroelectric project concerns the construction of a 35.4 MW power plant to supply the country's energy demand at a competitive rate of return without the need to rely on thermal power sources. Therefore, the project will also contribute by offsetting greenhouse gas emissions that otherwise would be generated by ICE using thermal power plants, burning high sulphur diesel fuels and bunker oil.

Medium and long-term goals of the project are:

- Contribute to meet the growing demand for electricity to Costa Rica's development needs, based on locally available alternative resources instead of relying on imported oil to fuel thermal power plants without any aggregate value to the local economy;
- Reduce greenhouse gases emissions from the national interconnected electric system (NIS) that otherwise would have occurred in the absence of the proposed project activity and hence contribute to the long-term mitigation of climate change and be eligible for the Clean Development Mechanism (CDM) of the Kyoto Protocol.
- The economic contribution in exchange of Certified Emissions Reductions will improve the financial structure of the project;
- Strengthening the national stock market and provide an attractive and secure investment opportunity to local and foreign investors;
- Provide a "win-win" opportunity where global environmental and national economic benefits can be generated through an integrated and mainstreamed approach to national sustainable development priorities.

A.3. Project participants:

Company Name:	Instituto Costarricense de Electricidad (ICE)
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Zip code + city postal address:	1000- P.O. Box 10032- San José
Country:	Costa Rica

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Date of registration:	January 17, 2001

Local Corresponder Contact's Name and Address:

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Zip code + City address:	Apartado 10104-1000, San José
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Other Project Participants:

Company Name:	Banco Nacional de Costa Rica (BNCR)
Position in the project	Project Financier
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Country:	Costa Rica
	Jorge Arturo Campos
Contact persons:	
Job Titles:	Head, Trustfund Department, BNCR
Tel number:	(506) 221-2223 / (506) 233-2524
Fax number:	(506) 223-6318
Date of registration:	January 13, 2000

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1 Host country Party: Costa Rica

A.4.1.2 Province: Alajuela

A.4.1.3 Town: Alajuela

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

The national energy company in Costa Rica, the ICE, has performed studies for the development of energy resources in the Peñas Blancas River, with the intention of using the river as an additional source of water for the Arenal reservoir, the largest reservoir in the country. The studies are focussed on six project locations which are explored as potential sites for hydro power projects. The design options were also considered. The Peñas Blancas location was finally selected for development on the basis of financial and environmental considerations.

A.4.2. Category(ies) of project activity

Renewable energy / Hydro (category not yet published on http://unfccc.int/cdm)

A.4.3. Technology to be employed by the project activity:

The ICE has ample experience in developing hydro power projects by using the technology from world leading suppliers. The Peñas Blancas project is a run-of-the-river hydropower plant that will have a 49 meter high dam, a daily storage reservoir with a capacity of 2.0 hm3 and one power house with two vertical state-of-the-art Francis type turbine generator units that add up to 35.4 MW of capacity. The used technology is relatively simple, but modern and state-of-the-art compared with existing hydropower plants. A 2 km-long tunnel will form the project's penstock, providing a gross head of 130.5 meters.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

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

In case the project would not be implemented or if the hydro power station does not produce the projected 164 GWh per year, this amount of electricty will be produced by other existing and new power producing facilities that are connected to the Costa Rican electricity grid. The **national expansion plan** (NEP) determines which old and new, thermal and non-thermal power plants will generate this electricity. The NEP is a conservative estimation of the future situation without taking into account the Peñas Blancas project since future new hydro facilities and some natural gas fuelled facilities are included.

A.4.5. Public funding of the project activity:

(In case public funding from Parties included in Annex I is involved, please provide in Annex 2 information on sources of public funding for the project activity, 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.)

In this project no public funding is involved.

B. Baseline methodology

B.1 Title and reference of the methodology applied to the project activity:

CERUPT Dispatch Analysis of Grid-Connected electricity Projects.

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

The chosen methodology is designed specifically for grid connected electricity projects. The methodology is straightforward to apply and is certain to lead to a transparent and conservative estimate of the emission reduction of the project activity.

Within the electricity sector in Costa Rica, there is a surplus of generation capacity with respect to the average demand. Even when there is peak demand, the generation sector should be able to generate surplus electricity. Therefore, the project will not fill a gap between demand and supply. The project is meant to develop sustainable electricity generation, that will accompany the economic development in Costa Rica. However, since the Peñas Blancas project will have very low variable costs, it will be dispatched before more expensive plants are dispatched on the grid. Therefore, the project will reduce emissions from other plants. The use of the CERUPT Dispatch Analysis is therefore appropriate.

B.3. Description of how the methodology is applied in the context of the project activity:

The baseline study for the Peñas Blancas new hydro power project has used the Dispatch Analysis of Grid-Connected electricity Projects.

The Peñas Blancas facility will deliver its electricity to the national grid. The Costa Rican electricity generation mix consists of thermal and non-thermal generation facilities. This mix of capacity is planned and expanded in the assumptions of the National Expansion Plan (NEP) from the Costa Rican Electrican Institute, ICE. The NEP is published by the national government. The information from the NEP has been made available for this project activity by the ICE. The NEP is used to establish the baseline situation (without the project). It provides the basis for the estimation of existing and future emissions from grid connected electricity producers. It is a conservative estimation of future thermal and non-thermal capacity additions and capacity reductions. The Costa Rican government hopes to reduces CO_2 emissions and therefore estimates the development of hydro stations and some gas fuelled facilities. It depends on future financial grounds whether this policy can be executed. The estimation of the CO_2 emissions from the future generation equipment is conservative.

Besides this, the Peñas Blancas facility will be dispatched according to the SDDP models that governs the generation of each electricity generator in Costa Rica. The SDDP dispatch model has been used by this project to estimate the emission reductions.

For the simulations the SDDP (stochastic dual dynamic programming) model is used to calculate the emission reductions at existing and new thermal plants within Costa Rican electricity grid (NIS). The detailed system operations of the NIS given by the ICE expansion plan are optimized with a set of hydrological data that covers the period 1967-1996. Dispatch is based on each plant's "merit order", from lowest to highest marginal generation cost and results are recorded on a plant-by-plant, month-by-month basis. These are expected values based on the results of simulating the operations of the system for each year under the full set of hydrological data.

The table below shows the main information from the NEP.

Year	Demand				Supply
	Energy (GWh)	Growth (%)	Power (MW)	Growth (%)	Generation Projects
2001	6750		1174		
2002	7128	5.6	1237	5.4	Tejona Wind Power (20 MW) CNFL Gas Turbine TP (2 X 36 MW) Cote HP (6.3 MW)
2003	7512	5.4	1299	5.0	Upgrade Garita HP (10 MW) Chocosuela II and III (20 MW)
2004	7921	5.4	1366	5.2	Upgrade Cachí HP (10 MW) Miravalles V GP (19 MW) Chorotega Wind Power (8.4 MW) Vara Blanca Wind Power (9.6 MW) BOT HP (89 MW)
2005	8343	5.3	1435	5.1	Combined Cycle Barranca I (60 MW)
2006	8845	6.0	1516	5.6	Combined Cycle Barranca II (60 MW) P.H. Cariblanco (75 MW) Phase-out Barranca TP (30 MW)* Phase-out San Antonio TP (30 MW)* Phase-out Moín TP (26 MW) Phase-out Colima TP (14 MW) Demand Mangement P. (9.5 MW)
2007	9356	5.8	1599	5.5	Pirris HP (128 MW)
2008	9888	5.7	1685	5.4	Wind Power P. (1x20 MW)
2009	10448	5.7	1775	5.3	Las Pailas GP (1 x 55 MW)
2010 2011	11035 11652	5.6 5.6	1870 1969	5.4 5.3	Pacuare HP (156 MW) Wind Power P. (1x20 MW) MSDM TP (1 x 20 MW)
2012	12300	5.6	2072	5.2	Boruca HP (832 MW)
2013	12981	5.5	2180	5.2	*
2014	13696	5.5	2293	5.2	*
2015	14446	5.5	2412	5.2	Toro 3 HP (50 MW)
2016	15234	5.5	2536	5.1	MSDM TP (1 x 20 MW) Gas Turbine TP (1x35 MW)
HP – Hydroelectric TP – Thermal GP – Geothermal					

Table 1 National Expansion Plan

Dispatch Model

The application of the methodology that follows is a summary of the information provided in the baseline study for the project (Annex 5). In case the text requires more background information please refer to Annex 5.

The project activity was analyzed in the Dispatch model together with two other new projects. This was done due to costs savings of the required calculation time. The results for this project activity shall be made explicit at the end of the analysis. The projects that were analyzed in the dispatch model are listed below. Also the projected GWh's on electricity generation per year are shown. The Peñas Blancas project is proposed to generate an estimated 165 to 170 GWh per year. These data result from simulations with the SDDP model.

Year	El Encanto	Peñas Blancas	Rio Azul	TOTAL GWh
2003		154,2	19,3	173,5
2004		164,9	19,8	184,7
2005	39,6	168,3	19,6	227,5
2006	39,8	175,5	20,3	235,6
2007	39,8	171,6	20,5	231,9
2008	40,2	176,5	21,1	237,8
2009	39,9	174,8	21,8	236,5
2010	39,8	174,8	21,4	236
2011	40,2	176,3	22,4	238,9
2012	37,8	162,1	19,4	219,3
2013	38,3	170,5	20	228,8
2014	38,7	174,5	21,2	234,4
TOTAL	394,1	2044	246,8	2684,9

Table 2 Expected dispatch of Costa Rican new hydro projects

Model without project

At first the emissions of the Costa Rican electricity sector will be calculated by the SDDP model. The model incorporates the National Expansion Plan, legislative development, fuel prices, availability and rain models.

The baseline scenario concerns the ex-ante-projected emissions based on the performance of current and future thermal power plants additions to the NIS during the 10-year crediting period. The baseline emissions factor will be given by the weighted-average of current and future thermal power plants operation at the NIS as shown in Table 3 below. Under this scenario the baseline emissions will be based only on operational thermal plants. This is a realistic approach and the baseline scenario to be applied needs at least reflect this factor.

Year	Cycle	Motor 1	Motor 2	Turb 1	Turb 2	Total (10^3 ton CO_2)
2003	0	0	70	156	10	236
2004	0	0	59	283	18	360
2005	135	0	0	249	14	397
2006	287	0	0	235	0	522
2007	278	0	0	274	0	552
2008	311	0	0	360	0	671
2009	327	0	0	420	0	747
2010	298	0	0	369	0	667
2011	276	46	0	435	0	757
2012	110	18	0	104	0	232
2013	130	21	0	131	0	282
2014	259	46	0	297	0	602
TOTAL	**2.409**	**131**	**129**	**3315**	**42**	6026

Table 3 Total emissions of existing and future electricity generators without project – model run 1

Model with project

Hydropower plants do not produce significant amounts of GHG emissions "per se" during construction and operation. In this case, the emissions from construction or methane are considering insignificant (less than 1% of total baseline emissions).

Since the electricity produced by the project will be fed into the grid and undoubtedly the presence of the project will change the patterns of energy dispatched to the NIS, shifts in production is considered a source of ERs indirectly attributed to the project activities. Table 4 below shows the results for the generators that are affected in their generation by the project activity.

YEAR	CYCLE	MOTOR 1	MOTOR 2	TURB 1	TURB 2	TOTAL (10^3 ton CO_2)
2003	0,00	0,00	46,15	83,32	3,82	133,28
2004	0,00	0,00	49,06	245,96	16,75	311,76
2005	86,54	0,00	0,00	161,41	5,94	253,88
2006	226,95	0,00	0,00	173,95	0,00	400,90
2007	213,85	0,00	0,00	214,13	0,00	427,98
2008	293,54	0,00	0,00	314,74	0,00	608,27
2009	280,60	0,00	0,00	324,81	0,00	605,41
2010	265,47	0,00	0,00	279,78	0,00	545,24
2011	244,30	39,39	0,00	339,53	0,00	623,22
2012	84,85	11,18	0,00	76,57	0,00	172,60
2013	113,56	17,42	0,00	76,00	0,00	206,98
2014	220,40	36,79	0,00	239,21	0,00	496,40
TOTAL	2030,06	104,78	95,21	2529,38	26,50	4785,92

Table 4 Total emissions with project – model run 2

Energy substituted by the project activity as shown in the above table must be translated to ERs by the use of carbon emission factors for each of the displaced thermal plants given in the table above. These factors depend on the technology used for the thermal transformation, its conversion efficiency and the characteristics of fuels utilized. The calculation of this factors can be found in Annex 5. The ex-ante estimated ERs in tons of CO_2 per year is summarized in Table 5 below:

YEAR	CYCLE	MOTOR 1	MOTOR 2	TURB 1	TURB 2	TOTAL (10^3 ton CO_2)
2003	0,00	0,00	23,64	72,68	6,57	102,89
2004	0,00	0,00	9,73	37,53	1,38	48,63
2005	48,14	0,00	0,00	87,31	7,63	143,08
2006	59,97	0,00	0,00	60,80	0,00	120,77
2007	64,44	0,00	0,00	59,38	0,00	123,81
2008	17,23	0,00	0,00	45,70	0,00	62,92
2009	46,05	0,00	0,00	95,67	0,00	141,72
2010	32,19	0,00	0,00	89,49	0,00	121,68
2011	31,67	6,70	0,00	95,67	0,00	134,03
2012	25,35	6,96	0,00	27,27	0,00	59,57
2013	16,07	3,58	0,00	55,39	0,00	75,03
2014	38,22	8,78	0,00	58,14	0,00	105,14
TOTAL	379,32	26,00	33,37	784,99	15,58	1239,26

Table 5 Estimated Emission reductions for all new hydro power projects.

The *ex-ante* ERFs (Emission Reduction Factors), for a given year, can then be calculated as the ratio between the total CO_2 ERs for that particular year and the energy generated by the group of projects for that particular year. The result of this exercise provides the ERFs (tons CO_2/MWh) for each year within the period 2003-2014. The calculation of the ERF is conservative in the sense that, to avoid any possible overestimation of the ERs, the ERF are calculated assuming all the projects are competing for ERs. The resulting ERFs are summarized in Table 6 below.

The *ex-ante* ERFs, for a given year, applicable to the CERUPT group of projects can then be calculated as the ratio between the total CO_2 ERs for that particular year and the energy generated by the group of projects for that particular year. The result of this exercise provides the ERFs (tons CO_2/MWh) for each year within the period 2003-2014. As explained, the calculation of the ERF is conservative in the sense that, to avoid any possible overestimation of the ERs, the ERF are calculated assuming all the projects are competing for ERs. ERFs thus represent conservative values that, when applied to actual generation of the CERUPT group of projects, would ensure that ERs are duly credited without causing any overestimation.

Year	El Encanto	Peñas Blancas	Rio Azul	TOTAL GWh	TOTAL (10^3 ton CO_2)	ERF (tonCO2/MWh)
2003		154,2	19,3	173,5	102,89	**0,59**
2004		164,9	19,8	184,7	48,63	**0,26**
2005	39,6	168,3	19,6	227,5	143,08	**0,63**
2006	39,8	175,5	20,3	235,6	120,77	**0,51**
2007	39,8	171,6	20,5	231,9	123,81	**0,53**
2008	40,2	176,5	21,1	237,8	62,92	**0,26**
2009	39,9	174,8	21,8	236,5	141,72	**0,60**
2010	39,8	174,8	21,4	236	121,68	**0,52**
2011	40,2	176,3	22,4	238,9	134,03	**0,56**
2012	37,8	162,1	19,4	219,3	59,57	**0,27**
2013	38,3	170,5	20	228,8	75,03	**0,33**
2014	38,7	174,5	21,2	234,4	105,14	**0,45**
TOTAL	**394,1**	**2044**	**246,8**	**2684,9**	**1239,27**	**0,46**

Table 6 Yearly Emissions Reduction Factors (ERF) at the NIS

Using the *ex ante* ERFs given in table 6 above and assumptions about the energy provided to the grid by the three CERUPT projects, the expected ERs for each project can be projected for the 10-year crediting period. The yearly ERs for the CERUPT group of projects is summarized in Table 7 below.

Year	El Encanto	Peñas Blancas	Rio Azul	TOTAL (10^3 ton CO_2)
2003		91,44	11,45	102,89
2004		43,42	5,21	48,63
2005	24,91	105,85	12,33	143,08
2006	20,40	89,96	10,41	120,77
2007	21,25	91,62	10,94	123,81
2008	10,64	46,70	5,58	62,92
2009	23,91	104,75	13,06	141,72
2010	20,52	90,13	11,03	121,68
2011	22,55	98,91	12,57	134,03
2012	10,27	44,03	5,27	59,57
2013	12,56			12,56
2014	17,36			17,36
TOTAL	184,36	806,80	97,85	1089,02

Table 7 Estimated emission reductions of each new hydropower project

For the specific case of the Peñas Blancas Hydroelectric project the total ER is calculated at about 806,800 ton CO_2 during the 10-year crediting period (2003-2012).

B.4. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity
(i.e. explanation of how and why this project is additional and therefore not the baseline scenario)

The application of the methodology to this project as described in B3 shows that the emissions with this project are lower than the emission without this project. The baseline scenario is based on the National Expansion Plan. This is considered conservative because it includes several proposed renewable energy projects. In fact, the NEP assume that the capacity mix, which is dominated by hydro, will not change significantly over time.

Costa Rica will have to rely on CDM income to finance its NEP, particularly the high capital investments such as renewable hydro. The cost of capital has increased significantly in the last few years because it has become more difficult to borrow from multilateral development banks after the Asian financial crisis of 1997. In fact, to finance Peñas Blancas, ICE had to rely on the domestic financial market where capital is scarce and expensive. Thus, without the relying on income from the sale of CERs, Costa Rica will likely develop less renewable electricity and thus ultimately generate more CO_2 emissions.

B.5. Description of how the definition of the project boundary related to the baseline methodology is applied to the project activity:

The project boundary is defined by the emissions targeted or directly affected by the project activities, construction and operation. It excludes emissions from activities beyond the control or influence of the project. Project boundaries also apply for the baseline scenario.
To achieve consistency in defining the project boundaries, two principles are respected.

- The principle of control, which implies that the project boundaries should be set in a way that they comprise all relevant emissions sources that, can either be controlled or influenced by the project participants and that are reasonably attributable to project activities.
- The second principle is that case, the relevant impacts on GHG emissions related to activities one step downstream and one step upstream of the project should be included within its boundaries

A short summary of the project boundaries of this project is summarized below. A more detailed description can be found in Annex 5:
Besides the power generation at the Peñas Blancas power plant, the electricity delivered to the grid at the Peñas Blancas connection system (one step downstream) as well as the dam and reservoir (one step upstream) are within the control of the projects activity.

B.6. Details of baseline development

B.6.1 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*: 01/06/2003

B.6.2 Name of person/entity determining the baseline: Mr. Manso

Company Name:	Oficina Costarricense de Implementación Conjunta (OCIC)
Address:	Edificio CINDE, La Uruca
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Postal Address:	P.O. Box 7170
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Country:	Costa Rica
Contact Person:	Mr. Paulo Manso
Job Title:	General Manager
Tel number:	(506) 290-1283
Fax number:	(506) 290-1238
e-mail:	ocicgm@racsa.co.cr

C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

(For a definition by the Executive Board of the term "starting date" , please refer to UNFCCC CDM web site. Any such guidance shall be incorporated in subsequent versions of the CDM-PDD. Pending guidance, please indicate how the" starting date" has been defined and applied in the context of this project activity.)

August 2000, contract signed by construction consortium and ICE.

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)*

40y

C.2 Choice of the crediting period and related information: *(Please underline the appropriate option (C.2.1 or C.2.2.) and fill accordingly)*

(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 paras. 12 and 13 of decision 17/CP.7 and through 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 period)***

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

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

C.2.2.1. Starting date *(DD/MM/YYYY)*: 01/04/2004
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):*

10 y

D. Monitoring methodology and plan

(The monitoring plan needs to provide detailed information related to the collection and archiving of all relevant data needed to
- estimate or measure emissions occurring within the project boundary;
- determine the baseline; and;
- identify increased emissions outside the project boundary.
The monitoring plan should reflect good monitoring practice appropriate to the type of project activity. Project participants shall implement the registered monitoring plan and provide data, in accordance with the plan, through their monitoring report.

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 and its quality with regard to accuracy, comparability, completeness and validity, taking into consideration any guidance contained in the methodology.

Please note that data monitored and 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, whatever occurs later.)

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

(Please refer to the UNFCCC CDM web site for the name and reference as well as details of approved methodologies. If a new methodology is proposed, please fill out Annex 4.)
(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.)

CERUPT Monitoring Methodology for Grid-connected Electricity Projects.

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

The chosen methodology provides for a simple monitoring of the emission reductions. When using this methodology , it is more likely that the emission reductions will be underestimated than overestimated.

D.3. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived

(Please add rows to the table below, as needed)

ID number *(Please use numbers to ease cross-referencing to table D.6)*	Data type	Data variable	Data unit	Will data be collected on this item? (If no, explain).	How is data archived? (electronic/paper)	For how long is data archived to be kept?	Comment
1	numbers	electricity	GWh	yes	electric meter at the substation where the electricity generated by the project is feed into the national grid	two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.)	Metering at the substation will exclude any parasitic loads. Data obtained for the purpose of calculating ERs must be consistent with the data used for billing purposes

For each year, the operator measures and records the electric power that the project supplies to ICE or to some other buyer who would otherwise buy power from ICE. To calculate the emission reductions for this year the operator must multiply the lower of either of the metered generation or the project expected generation figure for this year with the baseline carbon emission factor as determined.

The project operator must install an electric meter at the substation where the electricity generated by the project is feed into the national grid or sold to a buyer that would otherwise purchase power from ICE. Metering at the substation will exclude any parasitic loads. The project operator will install the electric meter in such a way that only electricity produced by the project as described in the relevant project documents will be metered: electricity not produced by the project must be excluded. Data obtained for the purpose of calculating emission reductions must be consistent with the data used for billing purposes.

Existing commercial meters can be used provided these are:

- certified electronic meters of precision class 0.2%, placed at the SP's substation at the delivery point (downstream from any own consumption);
- able to integrate the instantaneous sum of the power of the whole plant;
- able to record electricity supplied to the grid (in GWh) on a daily or at least monthly basis.

The project operator must read the meter and record the metered data at appropriate intervals, but at least at the end of each month. The meter should be able to record daily data, ideally in electronic form that can be automatically processed and reported.

A workbook will be used to record monthly generation data and calculate monthly emission reductions.. The tool should be integrated with the metering and reporting system.

The workbook contains the following fields:

Project Name, Year: To be completed when a new worksheet is started.
Baseline carbon emission factor Records the baseline carbon emission factor (in tons of CO_2 per GWh) as include in Baseline Study.
Energy Output: Records of the electricity output in GWh/year as reported by the project operator
Metered Electricity Supply: Records monthly net electricity (in GWh) supplied by the project as measured and reported by the operator.
Emission Reductions: Calculates the ERs (tons of CO_2) achieved yearly by the project.
Signature and Date: These fields are to be completed after every entry into the worksheet.

Project Name:						
Year:			Months			Year
	Unit	Equation	1	…	12	Sum
cef	t CO2 / GWh	A				--
Metered Energy Supply	GWh/month	C				
Emission Reductions	1,000 ton CO_2	D = A * C				
Signature / date	-	-				

The project operator must complete the worksheet depicted in the table above. Each workbook must be saved with a unique name reflecting the year for which monitoring has been carried out. Paper or electronic records such as meter output and monthly energy billings must be kept available for inspection; the monthly recording must tally with the monthly billings.

The monthly workbooks together with the project database and monitoring record form the "paper trail", which is essential for verification. These yearly workbooks will be a transparent record of electricity supplied and emission reductions.

D.4. Potential sources of emissions which are significant and reasonably attributable to the project activity, but which are not included in the project boundary, and identification if and how data will be collected and archived on these emission sources.

(Please add rows to the table below, as needed.)

ID number *(Please use numbers to ease cross-referencing to table D.6)*	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

As shown in the baseline study, the occurrence of leakage is not likely. Data on this will therefore not be collected.

D.5. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHG within the project boundary and identification if and how such data will be collected and archived

(Depending on the methodology used to determine the baseline this table may need to be filled. Please add rows to the table below, as needed.)
Given the baseline methodology that has been used, the baseline carbon emission factor will be fixated and will not be monitored.

D.6. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored. *(data items in tables contained in section D.3., D.4. and D.5 above, as applicable)*

Data *(Indicate table and ID number e.g. D.4-1; D.4-2.)*	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
1	low	yes	

In order to ensure the credibility and verifiability of the emission reductions achieved, the project must have a well-defined operational system. It is the obligation of the project operator to put such a system in place. The system includes:

Data handling:

- The establishment of a transparent system for the collection, computation and storage of data, including adequate record keeping and data monitoring systems is required. The system should allow automated recording and reporting of data. The project operator must develop and implement a protocol that provides for the above functions and processes, which must be suitable for independent auditing.
- For electronic and paper based data entry and record keeping systems, there must be clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made, so that compliance with requirements can be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, must be outlined and used in the event of, and to provide for, the possibility of system failures. The record keeping system must provide a paper trail that can be audited.

Reporting:
- The project operator must prepare reports as needed for verification purposes.

Training:
- The project operator will ensure that the required capacity is made available to its operational staff to enable them to undertake the tasks required by this MP.

Preparation for operation:
- The management and operational system and the capacity to implement this MVP must be put in place before the project can start generating ERs.

The table below summarizes the responsibilities of the project operator with regard to the monitoring system for the SP.

	Project Operator
Monitoring system	Review MP and suggest adjustments if necessary Develop and establish operation system Establish and maintain monitoring and reporting system and implement MP Prepare for verification
Data Collection	Establish and maintain data measurement, collection and record keeping systems for power supply Check data quality, collection and record keeping procedures regularly
Data computation	Complete workbook Or develop and use equivalent recording, calculation and reporting tool for ERs
Data storage systems	Implement record maintenance system Store and maintain records (paper trail) Implement sign-off system for records and completed worksheets

	Project Operator
Monitoring and reporting	Analyze data and compare project performance with project targets Prepare and forward annual report and worksheets to verifier
MP capacity building	Develop and establish monitoring protocol skills review and feedback system Ensure that operational staff is enabled to meet the needs of this monitoring protocol
Quality assurance, audit and verification	Establish and maintain quality assurance system with a view to ensuring transparency and allowing for verification Prepare for, facilitate and co-ordinate audits and verification process

D.7 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.)

Company Name:	Oficina Costarricense de Implementación Conjunta (OCIC)
Address:	Edificio CINDE, La Uruca
Zip code + City address:	1000, Segundo Piso Edificio CINDE, La Uruca, San José
Postal Address:	P.O. Box 7170
Zip code + city postal address:	1000, P.O. Box 7170, San José
Country:	Costa Rica
Contact Person:	Mr. Paulo Manso
Job Title:	General Manager
Tel number:	(506) 290-1283
Fax number:	(506) 290-1238
e-mail:	ocicgm@racsa.co.cr

E. Calculation of GHG emissions by sources

E.1 Description of formulae used to estimate anthropogenic emissions by sources of greenhouse gases of the project activity within the project boundary: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

Not applicable, as it is determined there will be no significant emissions from the project.

E.2 Description of formulae used to estimate leakage, defined as: the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and that is measurable and attributable to the project activity: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

Since the electricity produced by the project will be fed into the grid, the project will undoubtedly change the patterns of energy dispatched at the grid. These shifts in production will however be monitored within the project boundary and are therefore not considered leakage. .

E.3 The sum of E.1 and E.2 representing the project activity emissions:

The project activities are estimated at 0 ton CO_2 / MWh.

E.4 Description of formulae used to estimate the anthropogenic emissions by sources of greenhouse gases of the baseline: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

The formulae used to estimate the emissions from electricity generators that form the baseline for the Costa Rican grid are mentioned in the answer of B3 and in Annex 3, paragraph 3.As described, no significant emissions occur from the project construction or activity itself.

E.5 Difference between E.4 and E.3 representing the emission reductions of the project activity:

See E.6.

E.6 Table providing values obtained when applying formulae above:

Year	Peñas Blancas
2003	91,44
2004	43,42
2005	105,85
2006	89,96
2007	91,62
2008	46,70
2009	104,75
2010	90,13
2011	98,91
2012	44,03
2013	
2014	
TOTAL	806,80

Projected Emissions Reductions for Peñas Blancas during 10-year crediting period

F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including trans-boundary impacts *(Please attach the documentation to the CDM-PDD.)*

ICE completed an EIA for the Peñas Blancas Hydroelectric project that was approved by the National Environmental Secretariat (SETENA), the technical competent authority responsible for overseeing the integrity of the environment. SETENA operates within the Ministry of Environment and Energy, the rector entity in the sector.
The outcome of the EIA was that the project would cause relatively few adverse impacts. Furthermore, it was concluded that the positive socio-economic impacts of the project would outweigh the adverse local impacts. The main negative impacts are temporary in nature, as they will take place during the construction phase. Construction is already in an advanced stage, and commissioning is expected for the second half of 2002, reducing considerably the risk of opposition.
In order to mitigate the remaining negative impacts, an environmental management plan has been conceived and will be monitored. Throughout the operation of the project, SETENA requires periodic reports by an independent environmental auditor who is responsible for overseeing the compliance with the established environmental management plan of the project.

For further information please see Annex 5.

F.2. If impacts are considered significant by the project participants or the host Party: *please provide conclusions and all references to support documentation of an environmental impact assessment that has been undertaken in accordance with the procedures as required by the host Party.*

-

G. Stakeholders comments

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

Public consultation has been an important part of the Peñas Blancas project development. Since ICE has followed a consultative process with stakeholders at various stages, the local communities backed the project from the outset. The very mission of ICE, which is contribute to the social and economic development of the country, is interpreted internally, to provide social support to the communities surrounding their projects. ICE is perceived as a responsible environmental entity by the greater Costa Rican society, including those segments of stakeholders living in the area of influence of its projects.

G.2. Summary of the comments received:

No comments have been received.

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

(Please copy and paste table as needed)

Company Name:	Banco Nacional de Costa Rica (BNCR)
Position in the project	Project Financier
Postal Address:	P.O. Box: 10015-1000, San José
Zip code + city address	Sección Fiduciaria del BNCR. Av.1 era, calles 2 y 4, San José 1000
Country:	Costa Rica
Contact persons:	Jorge Arturo Campos
Job Titles:	Head, Trustfund Department, BNCR
Tel number:	(506) 221-2223 / (506) 233-2524
Fax number:	(506) 223-6318
Date of registration:	January 13, 2000

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

See A.4.5: In this project no public funding is involved.

Annex 3

NEW BASELINE METHODOLOGY

In establishing possible future trends, the CERUPT Dispatch Analysis of Grid-connected Electricity Projects provides for consistent and thorough analyses, and subsequent systematic elaboration of elements or factors which may affect the CO_2 and other greenhouse gas emissions. The CERUPT Dispatch Analysis is applicable to electricity projects adding capacity to a grid. Dispatch Analysis is a scenario analysis, providing for the calculation of the most reliable and most cost effective production of electricity by a group of power producers, which are inter-connected through a grid. Running the dispatch model for this group of power producers, once with and once without the proposed project activity, will result in an accurate indication how much capacity of each of the power producers will be displaced by the proposed project activity, assuming power demand will remain unchanged The CO_2 emissions reduction can be calculated by comparing the CO_2 emissions of the displaced capacity to the CO_2 emissions of the proposed project activity. A dispatch analysis is particularly useful in those cases where a National Expansion Plan (NEP) exists, or where otherwise a high degree of certainty exists of what the capacity and generation mix of a grid will be during the forecast horizon.

In a dispatch analysis, a very detailed model-based calculation will be made to determine which power of existing and future facilities will be displaced by the proposed project. If possible, the project developer must use the official National Expansion Plan as input for the model. If this is not possible, this document provides detailed guidance how to fill the model.

CO_2 emissions are calculated by multiplying the established carbon emission factor and the project level activity. One of the distinctive features of the CERUPT Dispatch Analysis is that the baseline carbon emission factor is considered fixed for the crediting period, only the project activity level and project carbon emission factor must be monitored. This feature will lead to less variance in the baseline calculation, while lowering monitoring costs and efforts.

1. Title of the proposed methodology:

CERUPT Dispatch Analysis Methodology for Grid-connected Electricity Projects
(hereafter the CERUPT Dispatch Analysis)

2. Description of the methodology:

2.1. General approach

This introductory chapter starts with a brief summary of applicable approaches and methodologies and clarifies why certain methodologies are considered appropriate and hence chosen and why others are rejected as being less appropriate.

According to paragraph 48 of the Marrakech accords the following three approaches shall provide the basis for the baseline methodology:

a. Existing actual or historical emissions, as applicable;
b. Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;

c. The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 percent of their category.

Selection and application of these approaches is described hereafter.

The CERUPT Dispatch Analysis is primarily based on a combination of the first two approaches described in paragraph 48: it uses paragraph 48 (a) as a starting point to describe actual and historical emissions, and uses para. 48 (b) to develop a scenario in which future emissions profile of the electricity sector is developed by incorporating, where applicable, technologies that represent an economically attractive course of action, taking into account barriers to investment.

The combination of the two “Marrakech approaches” 48(a) and 48(b), including application of scenario analysis, is consistent with further paragraphs and Annexes of Decision 17/CP.7 of the Marrakech accords, including paragraph 45 (e) which states that “A baseline shall be established … taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector.”

Irrespective of which approach is taken as point of departure, in all cases the most likely and credible prediction of the future baseline emissions has to be established. In predicting possible future trends, an applied methodology shall always provide for careful analysis, and subsequent systematic elaboration of elements or factors which may affect the greenhouse gas emissions. Those are defined as the so called **Key factors** (see section 2.2), which constitute the backbone of the CERUPT Dispatch Analysis.

To determine the most likely scenario that would occur, a straightforward **investment analysis** could be used. This means that possible future scenarios (including the proposed project) are defined with equal likeliness. For each alternative the IRR or NPV is calculated, not taken into account any CER-revenues. The baseline scenario is than the scenario with the highest IRR. If a straightforward investment analysis is used, it should be substantiated why the financial market can be considered as a “perfect market”, and why no other significant barriers to the investment exists.

The CERUPT tender, which was executed on behalf of the Netherlands’ Ministry of Housing, Spatial Planning and the Environment by implementing organisation Senter, allowed the use of this type of analysis. However for most – if not all – CDM projects, implemented in the frame of CERUPT, the Key Factor analysis showed, that not only financial motives determine the most likely scenario (usually in situations where markets operate imperfect). In such cases an investment analysis would not provide a realistic answer. Basically this leads us to the conclusion that non-economic constraints are the predominant factors for a future development. In many developing countries this is the case, as there is no adequate access to the capital market, pricing is not based on marginal costs, or market and pricing information is not public available or transparent.Since a straightforward investment analysis has so far not been selected as appropriate by any project developer, this CERUPT Approach as described here, does not elaborate on this investment analysis more in detail, but rather focuses on application of the **scenario analysis**.

The third “Marrakech approach” 48(c) is based on “the average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 percent of their category.

The CERUPT tender allowed the use of this approach, providing two possible practical interpretations:

- Application of the **control group method,** based on defining and finding a comparison group that is not offered the opportunity to sell CERs and analysing this group’s CO_2 emissions.

- Application of the **expert opinion method (= peer review)**, being an alternative to the control group method. This expert opinion method to a large extent depends on availability of fully independent experts, who are not biased towards the proposed CDM project.

It is the project developer's responsibility to select the most appropriate of the three approaches and substantiate this choice. So far, application of this third approach appeared to be quite complex, due to:
- unclear definitions of the wording of paragraph 48(c) (what is exactly meant by "similar" and by "performance"?),
- (lack of) availability of information. In many cases the relevant information is either not available or extremely difficult to collect.

Since this third approach has so far not been selected as appropriate by any CERUPT-project developer, this CERUPT Dispatch Analysis as described here, while not inconsistent with the third approach, does not elaborate on it in further detail. The CERUPT Dispatch Analysis is, therefore, not recommended for project developers who have deliberately chosen for the third approach.

In the methodology described here, Key Factors, applied in an appropriate way in a scenario analysis, shall safeguard a credible and conservative determination of the baseline. For an ex-post check on correct application of the Key Factors at least 5 specific questions are developed. These 5 questions are to be applied by the project developer, but also by the validator. As soon as one of the questions is answered with "yes" the baseline should be rejected, or - when the baseline is equal to the project - the number of CERs from the project is equal to zero.
The relevant questions are:

1. Would legally binding (and enforced) obligations or other (e.g. safety) requirements impede the baseline scenario from ever be realized? (Check on Key Factors local rules and legislation)
2. Would local physical obstructions impede the baseline scenario from ever be realised? (Check on Key Factors available fuel, local technology, skills and knowledge)
3. Would the proposed baseline scenario be unrealistic from a financial perspective, in other words, would appropriate capital never be available to make execution of the proposed baseline scenario possible? This is relevant in case the proposed project represents the least-cost option. (Check on Key Factors capital availability and economics)
4. Would (in)sufficient local support impede the baseline scenario from ever being realized? (Check on Key Factors social effects and local support)
5. Would other inevitable factors imply that the baseline scenario would be equal to the project itself? This could be the case if the project itself, without revenues of CERs, is already extremely economically viable, so the project – and hence the baseline - could be considered as "business-as-inevitable" (Check on Key Factor economics)

2.2. Overall description (other characteristics of the approach):

This new baseline methodology is based on the "Operational Guidelines for Baseline Studies, Validation, Monitoring and Verification of Clean Development Mechanism Project Activities", which was used in the CERUPT tender. A revised document, called "Operational guidelines for Baseline Studies for grid-connected electricity projects" is presented in Annex 3.2. The numbers in the overall description below refer to the chapters in this document. Step 4 and 5 are worked out in further detail in Section 3 of this Annex.

1. The baseline study starts with a description of general project characteristics.

2. The project boundaries are determined. Within the project boundaries, the emissions sources of greenhouse gases are identified (for the baseline situation and for the with-project situation).
3. A description of the current situation (power sector) that is affected by the project is given. A description of the power sector organisation is given (eg how is power dispatched?). Also, information on the current available capacity, production, efficiency and emissions level per plant is given. The description is accompanied with a flowchart.
4. As the project is determined by a variety of project-, geographic- or sector specific factors, crucial Key Factors are determined. Key Factors can be distinguished at two levels: (a) External (off-site) Key Factors and (b) Project-specific (on-site) Key Factors. These are described in Section 3.
5. A description is given of how the Key Factors will most likely develop. Based on this analysis, input for the CERUPT Dispatch Analysis is evaluated, resulting in a description of the future situation (baseline scenario). For the CERUPT Dispatch Analysis the quantification of the Key Factors is given for the crediting period. To ensure a conservative application of the CERUPT Dispatch Analysis, if for a specific Key Factor a range of values is probable, the Key Factor value leading to the lowest baseline carbon emission factor (CEF) is selected. Combining the data results in baseline carbon emission factor for each year. Baseline emissions per year (expressed in kton CO_2 equivalent/yr) are calculated by multiplying the baseline carbon emission factor times the activity level of the project.
6. Project emissions are estimated based on the project activity level and project emission level.
7. The estimated emission reductions are calculated.

3. Key parameters/assumptions (including emission factors and activity levels), and data sources considered and used:

General:

Dispatch Analysis provides for the most accurate calculation of the electricity displaced by the proposed project activity. While performing a Dispatch Analysis, a future situation is simulated using a model of the electricity sector in a certain region. It is determined which power plants will be dispatched in case the proposed project activity will not be executed, and which power plants will be displaced in case the project activity will be build. Combining these differences with the expected emissions for each power plant will result in the expected emission reductions as a result of the proposed project. Dispatch analysis is particularly useful in those cases where a National Expansion Plan (NEP) exists, or where otherwise a high degree of certainty exists of what the capacity and generation mix of a grid will be during the forecast horizon.

Goal of the analysis is to asses how many electricity of which particular power plants will be displaced by the proposed project activity. Input data, like the thermal efficiency of power plant, capacity factors and the carbon content of the fuel used must be used. A reasonable forward price curve for alternative fuels, such as oil, diesel oil, coal price forecasts must be developed. The results of the Key Factor analysis will determine these input assumptions. Key Factor data used must be based on, or consistent with, official statistics or studies, and be publicly available information, if possible.

Dispatch analysis can be carried out with either a computer simulation model, often used by utilities or another entity which is responsible for planning, or a spreadsheet model. Often such models require a high degree of expertise to be able to evaluate input, throughput and output. While the simulation remains an approximation of reality, by using conservative assumptions regarding thermal efficiencies, forward price curves of fuel prices, and electricity demand growth and other Key Factors, a conservative baseline will be established

This section is an elaboration of step 4, and 5 of section 2.2 and provides detailed instructions and formulae how to implement the CERUPT Dispatch Analysis, and how Key Factors are evaluated during each aspect of the routine. In general, a Dispatch Analysis is a simulation of the supply and demand for electricity in a defined grid.

Step 4: Key factors

The backbone of the CERUPT Dispatch Analysis are the Key Factors that influence the development of the emissions profile of the baseline. Key Factors can be distinguished at two levels: (a) External (*off-site*) Key Factors and (b) Project-specific (*on-site*) Key Factors. The CERUPT Dispa tch Analysis requires that the following off-site key parameters are at least considered to be able to determine the baseline carbon emission factor:

1. legislative development
2. sectoral reform projects
3. economic growth, socio demographic factors, the economic situation in the power sector and resulting power demand
4. fuel prices and availability
5. capital availability (investment barrier)
6. rate of return different alternative projects
7. available local technology, skills and knowledge; availability BAT in the future
8. social effects and local support
9. national expansion plan for the electricity sector

Project-specific factors to be considered are directly related to how the project is operated. All factors directly affecting the activity level are to be considered, e.g. maintenance hours per year as basis for the determination of plant availability. The output of step 1 (description of project characteristics) is used as input for this step

The remainder of this section describes how these Key Factors determine the input for the CERUPT Dispatch Analysis, and how the emission reductions are calculated.

Step 5: Key factor Analysis, determining baseline scenario and baseline emissions

The Key factor Analysis is important for the determination of the input of the Dispatch Model. The output of the dispatch analysis is the baseline scenario: which plants will be dispatched with the project? The next step is to determine from which plants how many electricity will be displaced. This determines the baseline emissions.

Output of step 2 and 3 (determination of project boundary and description of the power sector) is used as input for this step.

Step 5.1 Define Electricity grid

Goal is to determine the size of the grid in which the proposed CDM project will be operating. Often the electricity grid size stays within the political boundary of the country in which the project is located. However, this is not always the case. In case the grid would be extended beyond the countries boundaries the proposed project cannot claim credits from displacing electricity in another country than where the project will be located. If more than one electricity grid within one country exist, the transmission constraints between the grids must be calculated. User can claim credits from multiple grids, if they are located in the same country.

If there are existing verifiable long term import or export contracts, they can be included in the model if they are dispatched at zero costs, since it is assumed that they can not be displaced by the proposed project activity

Step 5.2 Determine Demand for Electricity.

Growth assumptions for electricity and capacity demand must be made for each year the Dispatch Analysis will be conducted and the emission reduction is calculated,. Demand for electricity will be expressed in Gigawatt hours (GWh) and demand for capacity will be expressed in Megawatt (MW).

Starting point must be conform the actual data in the first year of the analysis. This information must be verifiable. Demand growth rates must be based on official growth rates where possible. A combination of historical and forecasted growth rates should be used, if this leads to a lower growth rate, which is less optimistic than the official growth rate. If demand growth rates is linked to predicted population and/or economic growth rates, this information must be based on official statistics where possible.

Step 5.3. Determine key factor values for determining Merit Order of Individual Plants.

A dispatch analysis is basically a simulation of the system operations for each load segment in which the dispatch of each plant is based on its "merit order", from lowest to highest variable generation costs. Thus, for each load segment a supply curve is calculated in which each plant is dispatched according its variable costs.

The variable cost of fossil fired power plant is a function of the thermal efficiency of the plant, the cost of its fuel, and variable O&M costs. It is possible to describe the thermal efficiency of a power plant or the heat content of fuel in different units of measure. Standard conversion rates would then apply. The variable cost can be calculated as follows:

$$VC = E * FC * 3.6 * 10^6 + O\&M$$

In which:

VC = variable costs per unit electricity produced [EUR/MWh]

$FC = \frac{FP}{HC}$ = Fuel price per kJ [EUR/kJ]

FP = Fuel price per weight unit [EUR/ton]

HC= heat content of fuel [kJ/ton]

E= Thermal efficiency of individual power plant. [%/100]

O&M= variable Operation and maintenance costs, such as water use, chemical use, and maintenance

[EUR/$MWh_{Variable\ O\&M}$]

$3.6*10^6$=conversion factor [kJ/MWh]

- **<u>Thermal Efficiency (E)</u>**
  First, the thermal efficiencies of the individual power plants must be determined. Step 4 will describe what to do in case new capacity will be added to the grid during the forecast horizon. Generally, the thermal efficiencies of the individual plants should be known by the grid operator. The thermal efficiencies must be verifiable. In case such information is not available, it will not be possible to use dispatch analysis.
- **<u>Fuel costs (FC)</u>**
  Fuel costs are the single largest component of the variable costs of a power plant. It is

difficult to accurately forecast fuel prices. Therefore, the forecast must be conservative. The following issues must be taken into account:

- **What are the historical fuel prices for each fuel. Generally such data is available.**
- **Are there, or is it likely that, new laws or regulations will be enacted that will either promote or limit the use of a particular fuel. For example, it is possible that a pending environmental tax will increase the cost of bunker oil in the future.**
- **What other off-site Key Factors may influence the fuel market. For example, local social conditions, technological improvements, and political factors.**
- **Most centrally organised electricity grids use a fuel market analysis for their own planning purposes. If possible, the same fuel price forecast must be used.**

· **O&M**
This is often a small component to account for a part of maintenance costs, and the use of water and chemicals.

For each load segment a supply curve can be constructed. The demand in each load segment will determine which plant will be the marginal plant. As the proposed CDM project will displace this plant, it can be calculated how much CO_2 is displaced using the formulae in Step 5.7.

Step 5.4 Determine future investments.

A Dispatch Model generally has a forecast horizon of more than the crediting period, which is either 7 years or 10 years. In many electricity grids, particularly in those countries in which the electricity market has not been deregulated, the grid operator utilises a National Expansion Plan. The National Expansion Plan must form the basis of the Dispatch Analysis. The National Expansion Plan is based on several factors, like forecasted demand, economic situation etc. It is possible that credible announcements regarding new investments by the national utility, Independent Power Producers, or other entities can compliment or substitute for the official National Expansion Plan.

If an official National Expansion Plan does not exist, and the total amount of megawatts of the existing facilities is not enough to meet demand for the total forecast horizon, the Dispatch Model must be filled with additional facilities. To determine these additional facilities a detailed key factor has to be applied:

- Question 1. What is the dominant type of power plant in the current capacity mix?
  For example, if the capacity mix is dominated by coal plants and diesel generators, it is likely that the next investment will also be either a coal plant or diesel generator.
- Question 2. What are the most recent types of power plants that have been added to the capacity mix?
  For example, if the capacity mix is relatively diverse, with an equal mix of hydro, diesel generators, oil/gas steam plants, and coal plants, and the most recent additions have been diesel generators, it is likely that this will influence the next power plant investment.
- Question 3. What is the least cost option, considering the demand profile and the cost and availability of capital? For example, if the demand in an electricity grid is base loaded; a sufficiently large company exists that can take on a capital intensive investment; coal is cheaply and readily available; and technology to build coal plants is locally available, a coal plant will likely be the least cost investment option. Alternatively, if the demand is driven by consumer demand and only peaks in the afternoon when people return from work; the grid is dominated by small electricity producers; and the cheapest available fuel is bunker oil or diesel, the least cost investment option is likely to be a small diesel or oil generator.

- Question 4. Are available fuel options likely to change over time?
  For example, a government may have plans to promote the use of natural gas in the medium to long term, even though the cheapest available fuel in the near term is coal. To be conservative, the user of the Dispatch Model must use a natural gas fired power plant to fill the balance of the data base.
- Question 5. Does the government have a policy to promote renewable energy?
  If the government has a policy to promote renewable energy, for example by requiring that 10 percent of all generation must come from renewable electricity, this 10 percent must be included in the data base. Also if the government does not have the policy yet, but will likely have the policy in the future, the renewable energy must be taken into account.

Together these answers, which greatly depend on each specific situation, must provide the most likely new investments in the grid. The user must apply conservative assumptions.

Step 5.5. Running the Model

The final step is to run the model with all current and future facilities. By using the formulae of step 5.3.

The model should generally be run twice: once without the proposed CDM project and once with the proposed CDM project. Run 1 without the proposed CDM project will give the baseline scenario, the predicted amount of electricity per thermal generator per year without the project. . Run 2 will determine which plants will be dispatched for how many electricity per year if the project will be build.
Distracting the result from run 1and run 2 will give per thermal generator the amount of electricity that is displaced by the project activity per year. Summing these differences will thus lead to the total electricity generated by the project activity per year.

Step 5.6 Determine the average carbon emission factor of the dispatched thermal power plants

The average carbon emission of each thermal generator must be calculated as follows:

$$cef_i = F * HI$$

$$HI = \frac{3.6 * 10^6}{E}$$

cef_i = carbon emission factor of individual thermal generator[ton CO_2/GWh].
F = fuel carbon emission factor [ton CO_2eq/MJ]. To determine the carbon emission factor for fuels, data from recent IPCC publications[1] must be used where possible.
HI = Heat input per unit power produced [MJ/GWh]
E= Plant efficiency [%]

Step 5.7. Calculate the baseline emissions.

The baseline emissions are calculated by summing the displaced emissions per plant:

$$\text{baseline emissions} = \sum_n cef_i * A_i$$

In which
Baseline emissions: Emissions in baseline situation [ton CO_2eq/yr]
cef_i = carbon emission factor of individual thermal generator[ton CO_2eq/GWh].

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[1] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, 1997

A_i= displaced output of individual thermal generator [GWh/yr]

The baseline emissions can change every year because demand and supply is dynamic: electricity demand increases, some units retire, other units are added. Because the baseline carbon emission factors are fixed for the crediting period, once the carbon emission factors have been established no monitoring of the baseline is necessary.

4. Definition of the project boundary related to the baseline methodology:

According to the Marrakesh accords, the project boundary shall encompass all greenhouse gases emissions under the control of the project participants that are significant and reasonably attributable to the project activity. The project activity is the measure, operation or action that aims at reducing greenhouse gases emissions.

Similar project boundaries should be used for both the calculation of the baseline emissions and monitoring of the project emissions.

First, the boundaries are set in such a way that they contain at least relevant emission sources that are (1) reasonably attributable to the project activity and are (2) under control of project participants (principle of control).

Second, the boundaries are extended so that all sources of greenhouse gas emissions related to the activities one step up and one step down of the physical project are included. This means off-site emissions, e.g. emissions resulting from the transport of fuels, can be included as well.

In principle, all greenhouse gases included in Annex A of the Kyoto Protocol are to be included in the boundary if significant emissions occur. Greenhouse gas emissions from a source are considered to be significant if they account to at least one percent of the total baseline emissions expressed in kton CO_2 equivalent. Determining the significance is therefore an iterative process. All sources of greenhouse gases are mentioned in the baseline study, as well as the assessment of significance.

The project boundary is demonstrated with a flow chart, showing the actions relating to the project boundary and the boundary selected.

Example 4.1:
If the physical project is a CHP fuelled with biomass, project activities and relating sources of greenhouse gas emissions are

- Growing of trees	Sink: removal of GHGs from atmosphere
- Logging of trees	Use of fuels for electrical saws
- Transport of biomass to plant	Use of gasoline for trucks
- Operating plant	Use of biomass/ other fuels
- T & D of heat/power to grid/consumer	

If the project participants purchase biomass from different sources, emissions or emission reductions from the growing of trees, logging of trees and transport of biomass is not under control of the project participants. In such case a convincing assumption based on relevant public available data should be used. If transport is an activity only one-step up from the activities directly under control, use of gasoline should be taken into account when significant.

For the baseline emissions, equal boundaries should be selected. If the baseline scenario is the situation where consumers use oil for heating of he houses and diesel for generating electricity, emissions resulting from production and transport of these fuels are also not taken into account.

The project has as baseline scenario the situation where consumers use oil for heating of the houses and diesel for generating electricity. For example, in total 30 kton CO_2 equivalent per year are emitted for the baseline scenario.
A source to be taken into account for the project emissions are the transport emissions (see example before). It is calculated that due to the transport roughly 0.030 kton CO_2 equivalent per year is emitted. This is less than one percent of the baseline emissions; therefore transport emissions are not taken into account and not monitored after all.

The project boundary from this example is shown in a flow chart in figure 1 for the project scenario and the baseline scenario.

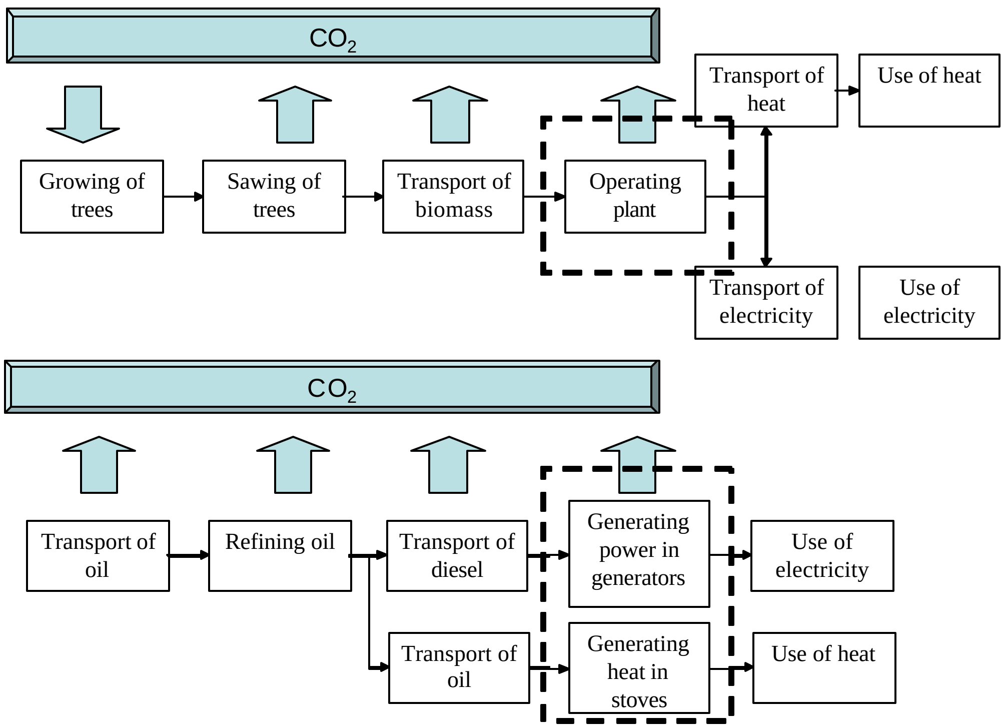

Figure 1 Example of Flowchart and boundaries

5. Assessment of uncertainties:

The future emissions profile of a given electricity grid depends on several variables, which the CERUPT Dispatch Analysis methodology addresses in its Key Factor analysis. These variables are described in paragraph 3.

In order to estimate the future emissions profile all Key Factors need to be quantified. If it is not possible to determine the development of the Key Factor before hand, a range is provided, substantiated by evidence. Wherever applicable, statistical indicators are applied, e.g. 95% confidence ranges. A conservative Key Factor value (leading to the most conservative baseline scenario) is selected.

Example 5.1:
The project is developing a wind energy park. One of the Key Factors to determine the baseline scenario in time is the development of legislation which promotes renewable energy in the host country. A law is being prepared that makes it mandatory to generate at least 5 percent of electricity from renewable energy resources. This law will be

implemented at the earliest in 2007 and at the latest in 2009 (within a 95 percent confidence range). The most conservati ve Key Factor value is selected, so 2007. The baseline scenario will describe a Renewable Portfolio Standard as of 2007. This will lead to a lower baseline carbon emission factor per year.

6. Description of how the baseline methodology addresses the calculation of baseline emissions and the determination of project additionality:

Paragraph 43 of the Marrakech accords describes how to determine whether the project is additional: A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

Based on this, the CERUPT Dispatch Analysis methodology assumes that if the baseline carbon emission factor is higher without the proposed project than with the proposed project, the emission reductions are additional. This is the case if the electricity generated by the proposed project has a lower carbon emission factor than the baseline carbon emission factor.

In addition, the user of this methodology must answer the five questions described in the chapter 2.1 of this Annex.

7. Description of how the baseline methodology addresses any potential leakage of the project activity:

Leakage relates to emissions that are not under control of the project developer and are therefore not taken into account within the project boundaries. Leakage sources are identified before hand. Two possible leakages effects are considered:

Rebound effect: A project could for instance result in a lower cost price for the consumer. A possible leakage source is increase in demand. This leakage effect will be shown in a higher than predicted activity level. The activity level will be monitored.

Example 7.1
If the project is adding an efficient power plant to the grid, it may result in a lower electricity price. As the population is used to a certain expense level, they might be less careful in eg. switching off lamps, resulting in a higher use of electricity per year from the total grid than expected. This is monitored by measuring the total increase of electricity use of the total grid. of use of electricity for lighting at a control group.

Increased emissions off-site: A project could reduce the on-site emissions, but increase the emissions elsewhere. It is examined if this effect is likely to occur. If so, off-site emissions will be monitored.

Example 7.2
After the implementation of a project biomass will be used as fuel for a power plant instead of coal. If the local population used the biomass before to heat their houses using stoves, people might start using other fuels which emit more greenhouse gases. Examined is what the most likely option in this region is, given availability and pricing of other fuels. It is determined that gas will be used. Included in the monitoring plan is the measuring of increased gas consumption in the region.

8. Criteria used in developing the proposed baseline methodology, including an explanation of how the baseline methodology was developed in a transparent and conservative manner:

The CERUPT Dispatch Analysis methodology was developed to capture as closely as possible how the emissions profile of a given electricity grid would develop over time. Central to the CERUPT Dispatch Analysis methodology is the use of Key Factors which can be considered as variables that influence how an electricity grid develops.

In order to be transparent, this methodology requires that the data and assumptions underlying the baseline and project carbon emission factor calculation is based official, and where possible publicly available information. The data and assumptions must be verifiable by third parties. If in any case, an assumption must be made which can result an outcome that can either increase or decrease the amount of emission reductions, the assumption that leads to the lower outcome must be used.

9. Assessment of strengths and weaknesses of the baseline methodology:

The following strengths of the methodology are identified:

- Because the baseline emissions are determined in a conservative manner, the baseline carbon emission factors are fixed, leading to static carbon emissions factors (*fixed* per year). Monitoring efforts and costs are reduced by this.
- The methodology results in just one –realistic, credible and probable - baseline scenario.
- Determining additionality is easy, once the baseline scenario and related baseline carbon emissions factor have been set.

The following weaknesses of the methodology are identified:

- Not all Key Factors identified can be quantified within a 95 percent confidence range.. Until now, conservativeness is assured by choosing the Key Factor value leading to the most conservative baseline carbon emission factor.
- Different reports might be available, reflecting different visions and opinions of experts. This will make it more difficult to determine the range for a Key Factor value within a 95 percent confidence range. The DOE has a role in assessing the data provided.

10. Other considerations, such as a description of how national and/or sectoral policies and circumstances have been taken into account:

The CERUPT Dispatch Analysis methodology's Key Factors considers how national and /or sectoral policies affect the emissions profile of a country as a core component of its analysis. This is consistent with the approaches described in paragraph 48 (a) and (b) and further paragraphs and Annexes of Decision 17/CP.7 of the Marrakech accords, including paragraph 45 (e) which states that "A baseline shall be established … taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector."

Annex 3.1 Glossary of terms

Activity level:
Output level per year of the proposed project, expressed in eg GWh/yr.

Additionality:
A project activity is additional if greenhouse gas emissions with the project activity are lower than those hat would have occurred in the absence of the proposed project activity

Baseline:
The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity. A baseline shall cover emissions from all gases(of gases), sectors and source categories listed in Annex A (of the Kyoto Protocol) within the project boundary. A baseline shall be deemed to reasonably represent the anthropogenic emissions by sources that would occur in the absence of the proposed project activity if it is derived using a baseline methodology referred to in paragraphs 37 and 38 of the CDM modalities and procedures.

Baseline approach:
A baseline approach as described in para. 48 MA is the basis for a baseline methodology.

Baseline carbon emission factor (cef):
Greenhouse gas emissions per output unit in a certain year that would occur in the absence of the proposed project activity, usually expressed in kton CO_2eq/kWh (or other unit of output)

Baseline emissions
Greenhouse gas emissions per year that would occur in the absence of the proposed project activity, usually expressed in kton CO_2eq/yr.

Baseline methodology
A methodology is an application of an approach or a combination of approaches as defined in paragraph 48 of the CDM modalities and procedures, to an individual project activity, reflecting aspects such as sector and region.

Fixed carbon emission factor
A baseline carbon emission factor that is not recalculated during the crediting period. The level of the carbon emission factor can vary over time, so fixed does not mean constant.

Global warming potential
The ratio of global warming from one unit mass of a greenhouse gas to that of one unit mass of carbon dioxide over hundred years

Key Factor
Those factors that significantly influence the future situation within a sector/country/project, thus determining the baseline scenario

Leakage:
Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity.

Measurable and attributable
In an operational context, the terms measurable and attributable in paragraph 51 (project boundary) of the CDM modalities and procedures should be read as “which can be measured” and “directly attributable”, respectively

Monitoring of a CDM project activity:
Monitoring refers to the collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases within the project boundary of a CDM project activity and leakage, as applicable.

Off-site
Not on the physical location of the project

On-site
On the physical location of the project

Project activity:
A project activity is a measure, operation or an action that aims at reducing greenhouse gases emissions. The Kyoto Protocol and the CDM modalities and procedures use the term “project activity” as opposed to “project”. A project activity could, therefore, be identical with or a component or aspect of a project undertaken or planned.

Project boundary:
The project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the CDM project activity.

Scenario
An account or synopsis of a possible course of action or events.

Significant
Greenhouse gas emissions from a source are considered to be significant if they account to at least one percent of the total baseline emissions expressed in kton CO_2 equivalent.

Small Scale Project electricity project:
Renewable energy project activities with a maximum output capacity equivalent of up to 15 MW (or an appropriate equivalent)

Transparent and conservative:
Establishing a baseline in a transparent and conservative manner (paragraph 45 (b) of the CDM modalities and procedures) means that assumptions are made explicitly and choices are substantiated. In case of uncertainty regarding values of variables and parameters, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of emission reductions attributable to a CDM project activity (that is, in the case of doubt, values that generate a lower baseline projection shall be used).

Annex 3.2 Operational Guidelines for Baseline Studies for grid-connected electricity projects.

Annex 4

NEW MONITORING METHODOLOGY

Proposed new monitoring methodology

CERUPT monitoring methodology for grid-connected electricity proje cts

1. Brief description of new methodology

The CERUPT monitoring methodology for grid-connected electricity projects is designed primarily to be used in relation with the different CERUPT baseline methodologies.
When using the CERUPT baseline methodologies, the resulting baseline carbon emission factor will be conservative. For this reason the baseline carbon emission factor will be fixated per year and data leading hereto will not be monitored. In general, a precise monitoring of data leading to a baseline carbon emission factor is never possible, as the baseline is a hypothetical situation.

Monitoring of project performance is crucial to ensure that emission reduction units claimed from a CDM project are justified. The monitoring activities should ensure that indicators that show the GHG emission level from the project are recorded in a way that enables comparison with the baseline emission scenario. Subsequently the difference in the real and the baseline emissions can be claimed as emission reductions. Monitoring and recording of indicators will also provide a foundation for presenting CERs for verification by a designated operating entity, and ultimately end up in reporting of verified emission reductions to the parties involved in the project and towards the UNFCCC.

Project performance to be monitored to calculate the emission reduction in ton CO_2e/yr are all data relevant to determine the annual average project carbon emissions factor (ton CO_2/GWh)and the activity level (project output in GWh/yr).

The annual emission reductions (ER) will then be calculated as follows:
ER = activity level (GWh/yr)*(baseline carbon emission factor – project cef)

2. Data to be collected or used in order to monitor emissions from the project activity and how this data will be archived

(Please add rows to the table below, as needed)

ID number *(Please use numbers to*	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be	How will the data be archived?	For how long is archived data kept?	Comment

ease cross-referencing to table 5)				estimated (e)		be monitored	archived? (electronic/ paper)	kept?	
1	*Activity level*		*GWh*	*m*	*At least monthly*	*100%*	*Paper or electronic*	*Two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later)*	*See par. 4*
2	*Fuel input*		*ton*	*m*	*Real time*	*100%*	*Paper of electronic*	*Two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later)*	*See par. 4*
3	*Fuel carbon emission factor*		*Ton CO_2/ MJ*	*C or m*	*If m, at least monthly*	*100%*	*Paper or electronic*	*Two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later)*	*See par. 4*
4	*Project cef*		*Ton CO_2/ GWh*	*c*					*See par. 4*

In the monitoring plan it should be clearly identified the frequency of, responsibility and authority for registration, monitoring and measurement activities. In the monitoring plan the project organisation should describe the methods it will employ for data registration, monitoring, measurement and calibration.

Wherever possible internationally recognised methods for monitoring, measurement and calibration should be applied. When other methods are used, the project organisation shall clearly establish conformity or correlation between the methods used and internationally recognised methods.

Records proving method validity and accuracy shall be kept and be available on request.

3. Potential sources of emissions which are significant and reasonably attributable to the project activity, but which are not included in the project boundary, and identification if and how data will be collected and archived on these emission sources
(Please add rows to the table below, as needed.)

ID number *(Please use numbers to ease cross-referencing to table 5)*	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 kept?	Comment

Monitoring of indicators must ensure that the indicators are reliable. Reliability means that the indicators give consistent and accurate values/readings when they are measured by the determined method.

For project leakage indicators, business-linked indicators are not likely to be available for all purposes. Projects generally will be less in control of the measurement and/or monitoring of leakage effects than of variables with direct impact on project operations. The nature of the project will determine the need and possibility to estimate project leakage. Data from suppliers/utilities may be of help to monitor and report leakage effects, as well as available public statistics. Specific surveys with the aim to monitor and estimate project leakage, *e.g.* in energy efficiency projects, may also be required.

4. Assumptions used in elaborating the new methodology:
(Please list information used in the calculation of emissions which is not measured or calculated, e.g. use of any default emission factors)

The annual emission reductions (ER) will be calculated as follows:
ER = activity level (GWh/yr)*(baseline carbon emission factor – project cef)

The <u>activity level</u> (A) is equal to the electricity produced. Electricity produced will be measured with a meter for real –time measurement. A back-up device will be installed. Commercial available meter will be used, provided that these are:

- certified electronic meters of precision class 0.2%, placed at the SP's substation at the delivery point (downstream from any own consumption);
- able to integrate the instantaneous sum of the power of the whole plant;
- able to record electricity supplied to the grid (in GWh) on a daily or at least monthly basis.

(These kinds of meters are usually needed for billing purposes as well).

Both meters will need to be calibrated every month.

The activity level (A) will be reported at least on a monthly basis. The yearly activity level will be calculated by summing the monthly output over the year:

$$A = \sum_{n=1}^{12} A_n$$

The annual average project carbon emission factor will be determined by monitoring the following data:
F = Fuel input (ton fuel)

Meters will be installed for the continuously measurement of fuel input. Calibration will take place monthly. Alternatively, purchasing records for the fuels purchased may be used. This way, changes in efficiency (or internal leakage) are taken into account as well.

C = CO_2 emission factor (ton CO_2/MJ)
IPCC default values can be used (see also Annex 3.2, annex B). However, it is up to the project developer to use project-specific values. In the latter case, it is to be described how the carbon content will be monitored.

E = energy content (MJ/ton fuel)
If specific analysis of the energy content of the fuel is sustained by statistics that give a confidence level at 95%of the value, tis value can be considered as a default value. In all other cases, the energy content will be monitored t least on a monthly level.

$$project\,cef = \frac{F \cdot E \cdot C}{A}$$

If, in the baseline study, it is shown that the project emissions will be zero, the project carbon emission factor will not be determined. This is eg the case for most renewable energy projects.

5. Please indicate whether quality control (QC) and quality assurance (QA) procedures are being undertaken for the items monitored. *(see tables in sections 2 and 3 above)*

Data *(Indicate table and ID number e.g. 3.-1; 3.-2.)*	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.

Where applicable the methods used for quality assurance of monitoring and measurement activities should be described. Where deemed necessary accredited laboratories or inspection bodies should be used for monitoring and/or measurement.

Where statistical techniques are used for recording, monitoring and measurement these shall be documented and used in a conservative manner.

6. What are the potential strengths and weaknesses of this methodology? *(please outline how the accuracy and completeness of the new methodology compares to that of approved methodologies).*

The strength of this methodology is that the monitoring and verification activities are relatively low. This results in relatively low costs for monitoring and validation.

The baseline carbon emission factor is fixated in this methodology. As the calculated baseline carbon emission factor will be conservative if one of the CERUPT methodologies has been used, this could lead to an underestimation of the actual emission reductions.

7. Has the methodology been applied successfully elsewhere and, if so, in which circumstances?
After completing above, please continue filling sub-sections D.2. and following.

Up until the moment this methodology has been submitted to the EB, it has not been used before.

Annex 5

The Peñas Blancas baseline study gives more details on the applied methodology and the resulting estimated emission reductions.