CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Version Number	**Date**	**Description and reason of revision**
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

>>
Ojos de Agua Hydroelectric Project, Version 7, 6th of November, 2006

A.2. Description of the small-scale project activity:

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The Ojos de Agua Hydroelectric Project is a run-of-river hydroelectric project located in the seventh region of Chile being developed by Endesa Eco[1]. The project will have an installed capacity of 9MW and will depend on the flow of water from the Cipreses River to generate electricity for the Central Interconnected Electricity System (SIC). The Cipreses River basin receives approximately 1.4 km^2, 1444mm of annual rainfall. The purpose of the Ojos de Agua Hydroelectric project is to generate electricity from renewable hydrological resources.

Development of the Ojos de Agua Hydroelectric Project will directly reduce greenhouse gas emissions produced by thermal electric plants using fossil fuels that are currently in operation in Chile. With an average annual generation of approximately 60 GWh, the Project will reduce emissions by 26,418 tons of CO_2e per year.

The project has several key objectives motivating its development. First, the project aims to generate electricity using the renewable hydrological resources available in the region to meet Chile’s growing energy demand. Second, the project has the objective of conserving the Cipreses River basin and therefore employs a run-of-the-river plant in order to minimize the project’s impact on the environment to the greatest extent possible. Third, the project strives to foster sustainable development in the surrounding region. Fourth, the project demonstrates the feasibility of meeting Chile’s energy demand through increasing the percentage of installed capacity and annual generation represented by renewable energy in Chile’s interconnected grid. In the long-run, the aim of the project is to reduce developers’ perception of the risk associated with non-conventional, renewable energy projects like small hydro, wind, solar, biomass, and geothermal.

The project activity will contribute to the sustainable development of Chile in several ways:

- Optimizes the use of natural resources through clean technology that avoids emissions of harmful gases or effluents.
- Employs run-of-the-river technology thus has minimal impacts on the surrounding environment compared those associated with thermoelectric plants or hydrological projects with large dams and reservoirs.
- Provides direct and indirect jobs for regional laborers for approximately two years during the project’s construction.
- Creates a protected area near the project site. The protected area will be chosen from the numerous parcels that Endesa Chile owns in the area for high biological diversity and abundance of flora and fauna. The objective of creating a protected area is to preserve the surrounding environment and to make the area accessible to students and scientists interested in studying the regional flora and fauna.

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[1] EndesaEco is a subsidiary of Endesa Chile.

The area directly surrounding the project site is sparsely populated. There is only one small community in proximity to the project site, Los Álamos, which is located 5 km from the Ojos de Agua. However, the construction phase of the project development will result in approximately 136 jobs for the residents within the region of Talca, which is located further from the project site. Construction related jobs will be offered for a period of 23 months, the estimated time for the project to complete construction. Accident insurance and health care for workers are a prerequisite for contractors who will manage the project construction and will therefore be provided to all laborers working on the project's construction. Before Endesa Chile awards a contractor a contract, they must provide proof of their insurance and health care policy. A copy of these requisites will be provided to the DOE during validation.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) I. Project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Chile (host)	Endesa Eco Santiago, Chile	No
España	Endesa Generación, S.A. Sevilla, Spain	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

A.4. Technical description of the small-scale project activity:

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The small-scale run-of-the-river project activity will employ a fuse type diversion dam with a lateral concrete funnel and regulating gate with the main water intake along the Cipreses River. The Diversion dam consists of a 2-meter high, 5 m wide and 30-meter long concrete structure that will divert water from the Cipreses River through a lateral funnel and into a collector channel 350 m long on the river's west bank. Two other intakes will be constructed in the Ojos de Agua Creek and the Green Lagoon, connected to the collector channel on the west bank of the Cipreses River. The three intakes combined will conduct 13.3 m^3/s of water into the second collector channel 650 m in length. The second channel will end in a headrace chamber, which regulates the intake level to eliminate excess air from the water before it enters the siphon. The 2.5 diameter, 200 m long siphon will connect to the 1800 m long intake tunnel. The 13.3 m^3/s of water with a gross head of 72 m and a net head of 67.8 m will be conducted through the intake tunnel into the powerhouse. Upon exiting the powerhouse, the water will return to the Cipreses River through a tailrace channel.

Inside the powerhouse, the water will spin a 9 MW Francis turbine and generate electricity through the synchronic generator. The electricity generated by the project activity will be transmitted through a step up transformer to the 154 KV transmission line connecting to the Cipreses substation, which will dispatch the electricity to the Central Interconnected Electric System (SIC).

Nominal Data:

Installed Capacity	9 MW
Average annual generation:	60 GWh
Design head:	71.5 m
Number of units:	1 Francis Turbine
Powerline:	154 kV

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

>>
Chile

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

>>
Talca, Region VII

A.4.1.3. City/Town/Community etc:

>>
San Clemente

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

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The Ojos de Agua Hydroelectric Project is located 100 km from the city of Talca in the Municipality of San Clemente, Province of Talca in the VII Region. The project site is accessible from route 115-Ch that runs in the direction of Paso Pehuenche. The project site is located 1km from route 115-Ch.

The Cipreses river basin is located in the eastern part of the Region VII of Chile, close to Chile's frontier with Argentina. The Ojos de Agua hydroelectric plant is located between the following UTM coordinates: 6038600 N, 376835 E. Geographically, the Cipreses River basin is situated in the Andes Mountains and is comprised of the Cipreses River, Verde Lake, Maule Lake and Invernada Lake, whose river outlet continues down the valley to the Ojos de Agua project site.

A.4.2. Type and category(ies) and technology of the small-scale project activity:

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The category for the project activity according to the UNFCCC's published simplified procedures for small-scale activities is Type 1D – Renewable Electricity Generation for a Grid. The project conforms to the project category since the nominal installed capacity of the Ojos de Agua project is below the 15 MW threshold and the plant will sell its generated electricity to the SIC.

One horizontal Francis turbine with 9,000 kW of nominal power will be used.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

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The inclusion of the Ojos de Agua Hydroelectric Project with its 9 MW of installed capacity and an average 60 GWh annual generation will directly reduce the greenhouse gases emissions produced by thermal energy plants using fossil fuel that are currently in operation in Chile. Under the business as usual scenario there would be continuing growth in the fossil fuel based electricity generation capacity and large scale hydroelectric projects.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emissions reductions shall be indicated using the following tabular format.type (iii) small-scale projects the estimation of project emissions is also required.

Years	**Annual estimation of emission reductions in tons of CO_2e**
2008 (April-December)	17,612
2009	26,418
2010	26,418
2011	26,418
2012	26,418
2013	26,418
2014	26,418
2015 (January-April)	6,604
Total estimated reductions (tons of CO_2e)	182,724.5
Total number of crediting years	7 (renewable up to 21 years)
I. ANNUAL AVERAGE OVER THE CREDITING PERIOD OF ESTIMATED REDUCTIONS **(TONS OF CO_2E)**	26,418

A.4.4. Public funding of the small-scale project activity:

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This project has not received and is not seeking any public funding.

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

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Based on the information provided in Appendix C of the simplified modalities, this Project is not a debundled component of a larger project activity since the project participants have not registered or operated another project in the region surrounding the project boundary.

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:

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Methodology AMS-I.D. "Renewable electricity generation for a grid" Version 9, 28 July 2006, will be applied, as outlined in paragraph 7 of Annex B of the simplified modalities and procedures for small-scale CDM project activities.

B.2 Project category applicable to the small-scale project activity:

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According to Annex A of the Kyoto Protocol, the project fits into sectoral scope 1: Energy industries (renewable - / non-renewable sources).

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities, evidence as to why the proposed project is additional can be produced by conducting an analysis of the following: (a) investment barriers, (b) technological barriers, and (c) prevailing practice. The result is a matrix that summarizes the analysis, providing an indication of the barriers faced by each scenario. The most plausible scenario will be the one with the fewest barriers.

The first step in the process is to list the likely future scenarios. Two scenarios were considered:

- Scenario 1 - The continuation of current activities – This scenario represents the continuation of current practices, which is the continuation of electricity supply by the existing mix of (more carbon intensive) power plants connected to the grid.
- Scenario 2 - The construction of the hydroelectric power plant (i.e. the project activity) without CDM financing.

The barriers are as follows:

- Financial/economic – This barrier evaluates the viability, attractiveness and financial and economic risks associated with each scenario, considering the overall economics of the project and/or economic conditions in the country.

• Technical/technological – This barrier evaluates whether the technology is currently available, if there are indigenous skills to operate it, if the application of the technology is a regional, national or global standard, and generally if there are technological risks associated with the particular project outcome being evaluated.

• Prevailing business practice – This barrier evaluates whether the project activity represents prevailing business practice in the industry. In other words, this barrier assesses whether in the absence of regulations it is a standard practice in the industry, if there is experience to apply the technology and if there tends to be high-level management priority for such activities.

BACKGROUND AND MARKET SITUATION:

Chile's privatized electricity sector is divided into four subsystems: the SING (Great Northern Interconnected System), the SIC (Central Interconnected System), and two local systems in the southern regions of Aysen and Magallanes. The SIC is the largest of the four, covering the most populated regions of Chile and providing electricity to roughly 90% of Chilean consumers. Historically a large percentage of the SIC has been comprised of hydroelectric generation; however severe droughts have periodically impacted electricity supply and prompted developers to invest in conventional thermal plants to ensure greater energy security. Consequently, and facilitated by the availability of Argentine natural gas imports, the percentage of installed hydroelectric capacity within the SIC dropped from 77.8% in 1995 to 59.7% in 2004.[2] Between 2003 and 2004 alone, energy supply from thermoelectric origin grew from 35.1% to 42.5%.[3]

The Argentine energy crisis of 2004 resulted in the restriction of natural gas imports to Chile by 50%, forcing the Chilean electricity sector to react immediately, and in many cases switch fuels from natural gas to coal and diesel. While the constraint on natural gas in Chile may favour hydropower in the short-term, it is unlikely to reverse the trend towards fossil fuel generation in the long-run for two critical reasons. First, Chile's historical experience with periodic droughts as well as their recent experience in 1998, has instilled a lack in confidence in hydro power other than large-scale, dam controlled plants with large water storage capacity, better able to cope with severe fluctuations in rainfall. For example, in 1998 the Cipreses River watershed only received 400 mm of water compared to its 1444 mm/year average.[4] Second, the electricity sector continues to focus on securing a reliable source of fossil fuel for both existing thermal generation plants and those expected to come online in the near future. For example, Colbun recently finished constructing the 250MW Candelaria combined-cycle, gas-fired turbine (CCGT) and Endesa Chile plans to complete a 370MW CCGT at its existing San Isidro plant.[5] Furthermore, the energy sector has several plans to augment Chile's capacity for importing fossil fuels. Suez Energy is currently studying the feasibility of constructing a natural gas pipeline from Peru's Camisea natural gas

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[2] Central Interconnected System – Load Economic Dispatch Center (CDEC-SIC). "Operation Statistic 1995-2004." Santiago, Chile: CEDEC-SIC, 2004.

[3] Central Interconnected System – Load Economic Dispatch Center (CDEC-SIC). "Operation Statistic 1995-2004." Santiago, Chile: CEDEC-SIC, 2004.

[4] Record of Annual Precipitation in Cipreses River Basin 1958-2000, *Endesa Chile*, 2000 (available in electronic and hard copy for validation).

[5] Energy Information Administration. "Country Analysis Briefs; Chile." Department of Energy Website. 15 November 2005. <http://www.eia.doe.gov/emeu/cabs/Chile/Full.html>

project and ENAP (National Petroleum Company) is planning the construction of a Liquefied Natural Gas (LNG) receiving terminal.[6]

Significant barriers exist to the development of small-hydro and run-of-river power plants, in spite of Chile's privatized electricity sector that legally enables small-scale electricity plants to connect to the grid. The large capital costs associated with construction, as well as the extensive studies required by law make it difficult for small developers to afford and for large developers to undertake for small scale renewable energy plants.

a) Investment Barrier:

In general, access to credit and investments in Chile are geared towards large-scale electric projects with attractive IRR's, or relatively short pay-off periods. Furthermore, Endesa Chile has a long history of investment in large-scale electric plants. Endesa Chile's Board of Directors is in charge of reviewing and approving proposed electric plants and therefore focused on the construction and operation of large-scale plants. Illustrating this are the last six plants constructed by Endesa Chile, which represent a cumulative installed capacity of 1,897MW and an average of 316 MW per plant, with the smallest having an installed capacity of 45MW.

The average costs per kilowatt hour of the majority of Endesa Chile's power plants are less than the average cost of Ojos de Agua. The Average cost per kilowatt hour is calculated by summing all costs associated with building and operating a power plant: the investment costs (construction), the fixed costs and the maintenance costs. The sum of these costs is then annualized and divided by the expected annual GWh that the plant will generate. The average of the cost per kWh of the last six plants constructed by Endesa Chile, for example, is US$48.45. In comparison, the cost per kWh for Ojos de Agua is US$57.7, which is significantly higher.

In addition to Ojos de Agua's higher average cost per kilowatt hour, the costs associated with carrying out the feasibility studies, environmental impact assessments, obtaining all the necessary permits, and ultimately receiving approval from the Chilean government for construction, are equal to those associated with large-scale projects. In comparison, the costs of studying and gaining approval for Ojos de Agua are multiples greater per installed MW than large-scale electric plants.

Analyzing other power plants owned and operated by Endesa Chile as well as comparing their lower average costs to those of Ojos de Agua, it becomes evident that the inclusion of carbon credits acted as a significant driver in Endesa Chile's decision to develop a small-scale 9MW run-of-the-river hydroelectric power plant. The inclusion of CERs was critical in the Board of Directors' approval of Ojos de Agua. Even though the addition of the CER revenue does not make Ojos de Agua's average costs equal to the "business-as-usual,", large-scale power plants, it transformed Ojos de Agua from a project that would was not viable for Endesa Chile into a project that earned the Board of Directors' approval. Endesa Chile specifically included the development of this project as a CDM activity and the inclusion of CERs in the project portfolio as means to acquire approval from the Board of Directors for the construction of a small-scale hydroelectric project with minimal environmental impacts. The development of the project as a CDM activity increased the project's financial attractiveness by promising a hard currency revenue stream that is critical to any project's development.

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[6] Energy Information Administration. "Country Analysis Briefs; Chile." Department of Energy Website. 15 November 2005. <http://www.eia.doe.gov/emeu/cabs/Chile/Full.html>

b) Technological Barrier:

Run-of-river hydroelectric technology poses a greater hydrological risk to the project owner than its large-scale dam associated counterpart. By employing run-of-river hydroelectric technology, the project owner relinquishes the ability to control the amount of electricity that the plant will generate. Without a dam, which offers a mechanism to strategically control the flow of water, a run-of-river hydroelectric plant is vulnerable to low rainfall during drought years. Similarly, run-of-river technology generates financial risk because less than anticipated rainfall reduces the annual electricity generation dispatched to the grid, substantially impacting the IRR.

c) Prevailing Practice:

To examine the prevailing practice related to small-scale hydroelectric plants, it is important to review their history in Chile. The financing, construction and operation of small hydroelectric plants is not common practice in Chile. The financial sector resources are targeted for thermal electric plants and large scale hydro. In addition, electricity sector expertise and structure is also almost disproportionately focused on large scale hydro. Within the "short electricity law" recently established by the Chilean government, achieving 5% of the electricity mix is set out as goal for small hydro. However, despite the Chilean government's initiatives to promote small hydro as means of meeting the growing energy demand, in the absence of subsidies hydroelectric plants below 15MW represent only 1% of the electricity mix.

Like the Chilean energy sector as a whole, Endesa Chile's traditional practice is oriented towards thermoelectric plants and large scale hydro. Endesa's core business in Chile is the construction and operation of large-scale power plants that provide electricity to the grid. Since 1944, when Endesa began operating in Chile, it has only built two plants that are not large-scale, Los Molles and Sauzalito. These plants were constructed in 1952 and 1959 respectively.

With the exception of Los Molles and Sauzalito, hydroelectric plants built and owned by Endesa Chile are attached to reservoirs controlling the flow of water in order to generate a high load factor. The installation of a dam based large-scale hydroelectric plant offers a high level of energy security that reflects Endesa's core business. On the contrary, run-of-the-river hydroelectric plants are subject to substantial hydraulic risk in the face of drought years as well as between seasons. These barriers apply not only to Endesa Chile, but also to other companies in the sector, who have to compete with Endesa for electricity production, and who will also favorably pursue least cost, large-scale power projects.

The issue of hydraulic risk becomes even more pertinent in the context of the need to construct power plants quickly in order to generate rapid returns on investment. The time frame for completing the necessary studies, obtaining permits and constructing a large-scale thermoelectric plant is equivalent to the time frame required for small-scale run-of-the-river hydroelectric plants, meaning the time investment is relatively much more burdensome for such small projects.

The primary barriers within Chile to small-scale hydro development are the unclear processes, risks to energy security (like hydraulic risk), and the difficulty of developing small projects. Returning to the most recently constructed six power plants, Endesa Chile's track record demonstrates their interest in building large-scale power plants with high IRRs and significant installed capacity. Given the financial, technical and strategic advantages to constructing and operating large-scale plants, coupled with the barriers to small-scale hydro development in Chile, it is clear that constructing and operating small-scale run-of-the-river hydroelectric plants represents a scenario that is not business-as-usual.

Summary:

The current and expected practice of predominantly relying on thermal sources and large hydro in expanding the generation capacity, as well as the combination of investment, prevailing practice and strategic barriers, clearly demonstrate that the Ojos de Agua project is additional and therefore not the baseline scenario. The CDM has allowed Ojos de Agua to overcome these barriers and receive approval from Endesa's "Board of Directors" for the project's development. The prohibitive barriers to the development of similar projects in Chile are confirmed by the observed trend in historical and recent capacity additions.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

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As referred to in Appendix B for small-scale project activities, the project boundary for a small scale hydropower project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source. For the Ojos de Agua project this includes emissions from activities that occur at the project location.

The system boundary for the proposed project is defined as the SIC (Central Interconnected Electric System) in Chile. The project boundary for the baseline will include all the direct emissions, being the emissions related to the electricity produced by the facilities and power plants to be replaced by the Ojos de Agua project. This involves emissions from displaced fossil fuel use at power plants.

Conforming to the guidance and rules for small scale project activities, the emissions related to production, transport and distribution of the fuel used for the power plants in the baseline are not included in the project boundary as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport are also excluded from the project boundary.

B.5. Details of the baseline and its development:

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Appendix B of the simplified modalities and procedures for CDM small-scale project activities offers the following two choices for preparing the baseline calculation for this type of project activity:

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

OR

(b) The weighted average emissions (in kg CO_2*/kWh) of the current generation mix.*

Option A is selected for this project because the project will displace mostly fossil-fuel generating sources since they are at the margin of the electricity generation system.

Date of completing the final draft of this baseline section: 3/11/2006

Name of person/entity determining the baseline:

Julie McLaughlin, EcoSecurities Ltd (Tel: +56 2 207 5000, julie@ecosecurities.com).

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

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The construction of Ojos de Agua Hydroelectric project is planned to start in May 2006 and will be in operation by April 2008.

C.1.1. Starting date of the small-scale project activity:

>>
Starting date: 01/05/2006

C.1.2. Expected operational lifetime of the small-scale project activity:

>>
50y-0m

C.2. Choice of crediting period and related information:

C.2.1. Renewable crediting period:

>>
The project activity will use a renewable crediting period of 7 years.

C.2.1.1. Starting date of the first crediting period:

>>
Starting date*:* 01/04/2008

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

>>
Not Applicable

C.2.2.1. Starting date:

>>
Not Applicable, see C.2.1.1

C.2.2.2. Length:

>>
Not Applicable, see C2.1.2

SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

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Methodology AMS-I.D. "Renewable electricity generation for a grid" Version 9, 28 July 2006, will be applied, as outlined in paragraph 7 of Annex B of the simplified modalities and procedures for small-scale CDM project activities.

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

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The project meets all the applicability conditions of the methodology since it is a small scale hydroelectric plant supplying to the electricity grid, with an installed capacity less than 15MW.

D.3 Data to be monitored:

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

ID n°	Data type	Data variable	Data unit	calculated (c) Measured (m), 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
D.3.1	Electricity	Electricity Generation of the Project delivered to the Grid	MWh	m	Continuous	100%	Electronic and paper	During the whole crediting period + 2 years	Data can be cross checked with sales receipts from the grid

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

The electricity generated by the Project will be supplied to the Chilean SIC. The metering system will comply with technical specifications for commercial metering. The metering requirements are defined by the Chilean electricity law and are regulated by the SIC. These data will be directly used for calculation of emission reductions. Sales records to the grid and other records are used to ensure consistency.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

The Project Developer will have a designated engineer on site that will be responsible for monitoring emissions reductions of the project activity. No leakage is expected.

- The proven and qualified monitoring equipment (electricity meter) will allow automated and continuous recording and reporting of data. These readings will be checked for any anomalies before being filed for future reference.

- The data will be monitored and recorded by qualified technicians according to the monitoring plan. Electricity records will be double checked with the Chilean electricity system.

- The data will be electronically archived. Receipts of electricity sales will be obtained.

Proper management process and routine procedures are in place to ensure the quality of reports required by verification audits. The plant operator will monitor the electricity generation for Ojos de Agua hydroelectric plant by reading the meter at the Endesa Chile's Pehuenche substation. These readings will be recorded daily and reported to Endesa Chile's central office. Furthermore, the maintenance team will periodically calibrate and maintain the electricity meter in accordance with the high standards of the company and Chilean authorities.

D.6. Name of person/entity determining the monitoring methodology:

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The monitoring methodology was prepared by:

Julie McLaughlin, EcoSecurities Ltd (Tel:+56 2 207 5000, julie@ecosecurities.com).

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

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E.1.1 Selected formulae as provided in appendix B:

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The Ojos de Agua project is based on electricity generation for a grid by a small hydraulic turbine. Appendix B does not currently provide a formula for calculating the baseline for a Type I.D. project. It gives the developer two GHG estimation options to choose in order to determine the total emissions avoided by the project; the emission calculation would be determined by the project developer.

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

>>
Formula are described below in section E.1.2.4

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>
No formula is used. Emissions by sources are zero since hydroelectric power is a CO_2-neutral energy source.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>
This is not applicable as the renewable energy technology used is not equipment transferred from another activity. Therefore, as per the Simplified Procedures for small scale CDM project activities, no leakage calculation is required.

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

>>
Zero Emissions

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>>
The methodology used for the calculation of baseline emissions from the use of grid electricity follows option (a) of the approved baseline methodology AMS-I.D Version 09, 28 July 2006, which uses a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures described in ACM0002. The large scale methodology will be applied using Option (b) of the Consolidated Methodology for Grid Connected Projects (Simple Adjusted Operating Margin). Low-cost must run resources constitute more than 50% of total grid generation and detailed data to apply option (c) is not available.

The baseline is the energy produced by the small hydro power station (in kWh) multiplied by an emission factor (in kg CO_2equ/kWh). According to AMS-1.D, this is calculated according to the procedures described in the approved methodology ACM0002.

ACM0002 will be applied using Option (b) of the Methodology (Simple Adjusted Operating Margin). This is because low-cost must run resources constitute more than 50% of total grid generation and detailed data to apply option (c) is not available. In addition, Option (c) (Dispatch Data Analysis) will not be used because even if data was available, the costs of processing the data would be beyond the amount considered to be affordable by the project developer.

The baseline emissions factor (EF_y) is the weighted average of the Operating Margin emission factor (EF_OM_y) and the Build Margin emission factor (EF_BM_y):

$$EF_y = [\omega_{OM} \cdot EF\_OM_y] + [\omega_{BM} \cdot EF\_BM_y] (1)$$

where:

EF_OM_y is the operating margin carbon emissions factor, expressed in tCO_2/MWh
EF_BM_y is the build margin carbon emissions factor, expressed in tCO_2/MWh
and the weights ω_{OM} and ω_{BM} are by default 0.5.

Since the Project is using ex ante emission reductions calculation, a 3-year data vintage is used based on the most recent statistics available at the time of PDD submission. The source of the data is the CDEC-SIC and the National Energy Council, CNE.

The simple-adjusted Operating Margin (OM) emission factor (EFOM,simple_adjusted,y) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh), where the power sources are separated in low-operating cost and must-run power plants (*k*) and other power sources (*j*). A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used.

$$EF\_OM_y (tCO_2 / MWh) = (1-\lambda_y) \cdot \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j.y}]} + (\lambda_y) \cdot \frac{\sum_{i,j} F_{i,k,y} * COEF_{i,k}}{\sum_k GEN_{k.y}]} (2)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in TJ) consumed by power source *j* in year *y*;
j is the set of plants delivering electricity to the grid, not including low-cost or must-run plants and carbon financed plants;
$COEF_{i,j,y}$ is the carbon coefficient of fuel *i* (tCO_2/TJ);
$GEN_{j.y}$ is the electricity (MWh) delivered to the grid by source *j*.

$F_{i,k,y}$, $COEF_{i,k,y}$, and $GEN_{k.y}$ are analogous to the variables described above for plants *k*.
λ_y is the calculated number of hours for which low cost/must run sources are on the margin divided by 8760

$$\lambda_y = \frac{number\_of\_hours\_per\_year\_low\cos t / must - run\_sources\_are\_on\_m\arg in}{8760 hours\_per\_year} (3)$$

The simple-adjusted OM emissions factor of the grid is then calculated as 0.6228 tCO_2e /MWh

The Build Margin emission factor (EF_BM_y)
To calculate the Build Margin (BM), the formulae should be the following according to the ACM0002:

$$EF\_BM_y (tCO_2 / MWh) = \frac{[\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}]}{[\sum_m GEN_{m.y}]} (4)$$

where $F_{i.m,y}$, $COEF_{i,m}$ *and* $GEN_{m,y}$ are analogous to the variables described for the *OM* calculation above for plants *m*, where sample group *m* is defined according to the ACM0002. Sample group *m* is the 20% of the total system generation that have been built most recently and comprises the larger annual generation.

The BM average emissions factor of the grid is therefore calculated as 0.2577 tCO2e /MWh.

Data and assumptions are from the following sources:

Baseline Emission Factor of the SIC grid (tCO2/MWh)

No.	Elements	Value	Data Source
A	Operating Margin Emission Factor	0.6228	Own production
B	Build Margin Emission Factor	0.2577	Own production
C	Combined Emission Factor (C=0.5·A+0.5·B)	0.4403	Own production

Source: Own production

Finally, baseline emissions, BE_y, are given by:

$$BE_y(tCO_2)_y = EF_y(tCO_2 / MWh) \cdot EG_y(MWh)_y \quad (5)$$

*Where EG_y stands for Ojos de Agua's electricity generation for year y.

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

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Emission reductions of the project activity are:

Ojos de Agua:

0.4403 t CO_2/MWh · 59,918 MWh/year = 26,381.89 t CO_2/year

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

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Baseline	EF_{OM} [tCO2/MWh]	Load [MWh]	LCMR [MWh]
2003	0.5891	33,629,685	22,704,874
2004	0.6088	36,278,297	22,015,006
2005	0.6674	37,915,064	14,516,195
	Total (2003-2005) =	**107,823,046**	**59,236,075**
	$EF_{OM,\ simple\text{-}adjusted}$ [tCO2/MWh]	**$EF_{BM,2005}$**	**Lambda**
	0.6228	0.2577	λ_{2003}
	Alternative weights	**Default weights**	0.0023
	$w_{OM} =$ 0.75	$w_{OM} =$ 0.5	λ_{2004}
	$w_{BM} =$ 0.25	$w_{BM} =$ 0.5	0.0000
	***Alternative** EF_{CM}* **[tCO2/MWh]**	**Default EF_{CM} [tCO2/MWh]**	λ_{2005}
	0.5316	**0.4403**	0.0000

Source: Own production

Based on Endesa Chile's assumptions and findings in the Feasibility Study, the annual generation will be 59,918MWh per year.

Based on the above formulas and collected data the baseline is determined as follows:

<u>Approximate Operating Margin:</u>

$<E>_{\text{operating margin}} = 0.6228\ \text{t}\ CO_2\ \text{e/MWh)}$

<u>Build Margin:</u>

$<E>_{\text{build margin}} = 0.2577\ \text{t}CO_2\text{e/MWh}$

<u>Baseline Emissions:</u>

$$<E>_{\text{baseline}} = (<E>_{\text{operating margin}} + <E>_{\text{build margin}}) / 2$$
$$= (0.6228 + 0.2577) / 2 = 0.4403$$

Therefore, the baseline emissions are:

0.4403 tons CO_2/MWh * 60 MWh/year = 26,418 t CO_2e/year

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

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An Environmental Impact Declaration (DIA) was completed by Ingendesa in accordance with Chilean law for the project and is available in both electronic and hard copy in Spanish. A copy of the DIA will be provided to the Operational Entity validating the project. The DIA was approved by the appropriate Chilean authorities as the project was found not to have significant environmental impacts. In turn, the environmental impacts of the project identified in the DIA were followed and defined mitigation measures will be undertaken by Endesa Eco.

Construction Phase:

The majority of environmental impacts identified in the DIA are associated with the project's construction phase. The main environmental impacts that the construction phase is likely to include are the liberation of sediments and particulate matter, the generation of liquid and solid wastes, and the intervention of machines in terrestrial and aquatic ecosystems. Nevertheless, the project's impacts are not considered significant because of the 3,000 hectares surrounding the project activity; construction will take place on only two hectares. The impacts of the project activity on the regional populations of aquatic and terrestrial species as a whole will be limited. Furthermore, as a component of the DIA, a survey of the regional flora and fauna was carried out and no threatened or endangered species populations were found in the area. In addition to the hydroelectric plant's construction, the construction of one road 1,500 m in length is necessary in order to access the project site from existing roads.

During construction, Endesa Eco will undertake several mitigation measures in order to minimize the environmental impact of the project. First, Endesa Eco will enforce strict conduct laws that prohibit all employees and contract workers from hunting, harassing or collecting wildlife in the region. Second, both industrial and domestic wastes will be handled according to applicable health and environmental regulations and disposed of in retention or septic tanks respectively. Third, all machinery fluid changes, mechanical repairs and maintenance will be conducted in a designated area specifically designed to prohibit the contaminants from entering the surrounding environment. Likewise, the wastes generated by such processes will be disposed of in appropriate containers as instructed by regulation. Finally, during the construction phase, Endesa Eco will continuously monitor water quality downstream from their operations and take measures to mitigate any changes in water quality as necessary.

Operation Phase:

The environmental impacts that the project is expected to have during operations are related to the alteration of hydraulic conditions in the segment of the river where the project will operate. The project activity is also likely to generate small amounts of liquid and solid wastes during operation. The maintenance of the powerhouse will periodically require the use of oils and lubricants which will be safely stored and removed from the project site in accordance with Chilean law and company procedures. Similarly, the generation of domestic and industrial solid wastes will also be disposed of in a safe and appropriate manner.

Even though the environmental impacts of the project activity during operation are expected to be negligible, Endesa Eco will continue to monitor water quality as well as the surrounding region for environmental health.

SECTION G. Stakeholders' comments:

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

The stakeholder consultation took place on 4th of October 2006 and was attended by a total of 24 people. The event allowed stakeholders to understand the basic concepts related to climate change, its consequences and the aims of the Kyoto Protocol, as well as the most important features of the Ojos de Agua Hydroelectric Project undertaken by the Project Developer.

The event was announced via an open invitation which was posted at the Municipality of San Clemente, and community members were invited individually by letter, because the small size of San Clemente Municipality limited potential channels of communication.

Specifically, people from local authorities, local gendarmerie, and members of the community participated in the event which lasted approximately 3 hours. Most of the participants were members of the local communities of Los Alamos and La Mina within the Municipality of San Clemente. All participants were registered with appropriate formats kept in the Project Proponent's files.

The stakeholder consultation included a brief description of the project and its benefits by the Project Proponent as well as presentations by the Project Developer including; the technical details of the project, presentation of the DIA (the Environmental Impact Declaration) and the environmental aspects; climate change, the project's contribution to greenhouse gas mitigation; and a question and answer session.

G.2. Summary of the comments received:

To date no formal comments have been received from stakeholders. However, during the public consultation stakeholders raised various questions regarding the project activity and its potential benefits for the communities of Los Alamos and La Mina. Stakeholders were mostly concerned about employment opportunities and the environmental impacts related to the project.

One individual was very concerned about the number of trees that would be felled during construction. To this concern, the project developer responded that as mandated by the DIA, EndesaEco planned the project's construction to incur the least environmental impact possible, which included minimizing the number of trees that would be felled. Furthermore, EndesaEco explained that the project included an extensive reforestation plan and the creation of a nature reserve bordering the hydroelectric plant.

Stakeholders also expressed their interest in obtaining employment during the construction phase. To this request, EndesaEco confirmed that local community members would be given priority for whichever jobs they were best qualified to do. In addition, EndesaEco agreed to collaborate with the San Clemente Mayor's office in order to create a database of community members and their vocations to achieve this end. After answering all questions and comments posed by the audience, EndesaEco also made themselves available for future questions and concerns that may arise.

All comments, questions and responses during the stakeholders' consultation were recorded and will be made available to the DOE on request.

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

As indicated in Section G.2 above, there have been no formal comments submitted by any of the stakeholders regarding this project. Many of them had questions about the benefits of the project for the local community, and those were addressed at the meeting. Overall, the stakeholder consultation was a positive event with stakeholders being informed about the project activities.

Annex 1: Contact details

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding used in this project.

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