CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

>> Chilean Programme of Activities for integrated Non Conventional Renewable Energies
Version 1.2
Date: 27/12/2012

A.2. Description of the programme of activities:

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This CDM Programme of Activities (CDM-PoA) seeks to encourage the wide scale adoption of grid-connected renewable energy projects. The CDM-PoA is limited to the technologies/measures that are eligible under the methodology ACM0002 (Version 12.3.0).

The higher-level and long-term additional purpose of this PoA is to strengthen Chile's renewable energy promotion policies by providing a platform that facilitates the transition to a low-carbon economy through generation of additional financial support for renewable energy via international carbon markets.

In order to comply with the stated objectives this CDM-PoA will include renewable energy projects (CPAs) which uses natural resources (i.e. the kinetic energy from wind and waves/tides, heat from the earth or solar radiation) in order to convert it into electricity generation. Therefore, the electricity generated will be based on a clean renewable energy source with no greenhouse gases emissions generated from the CPAs included in the PoA. This clean electricity will be supplied to the following non connected Chilean grids: Interconnected Central System (SIC) or Grand North Interconnected System (SING) of Chile, as defined in Section A.4.1.2. below.

If the CDM-PoA is not implemented, the electricity delivered to the grids, by the CPAs included in this CDM-PoA, will be supplied by the existing power plants connected to the systems and future additions, which emit greenhouse gases. Thus, the renewable energy projects promoted by this PoA will contribute with the reduction of greenhouse gas emissions by displacing CO_2 emissions attributable to the generation of electricity that would have otherwise been generated by the operation of fossil fuel fired grid-connected power plants connected either to the SIC or SING grids, which is considered the main source of greenhouse gases. Those grids are dominated by non renewable sources (see table 1 below).

Therefore, the production of electricity will be made with environmentally friendly technology, contributing to local and national sustainable development.

The Designated National Authority of Chile has confirmed that it has not defined specific criteria for sustainability in order to approve CDM projects or PoAs carried out under the Clean Development Mechanism of the Kyoto Protocol[1]. Renewable energy projects in Chile are subject to a legal framework and system for approval for environmental impacts[2; 3]. These national laws and regulations, together with supporting documentation, form the basis for approval of CDM projects or PoAs.

[1] Supporting evidence "SD97 Email Chilean DNA 30.11.2011.pdf" email communication with officials of the Chilean DNA is provided to the DOE

[2] Supporting evidence "SD86 Law 19.300.pdf" "Ley de Bases Generales del Medio Ambiente" (Environmental General Basis Law) is provided to the DOE. The current version of law 19.300, which includes the modifications introduced by Law Nº 20,417, is publicly available at:

The implementation of this CDM-PoA will contribute to the sustainable development in Chile. even if these sustainability specific criteria are nor defined in Chile as follows:

Environmental benefits

The use of renewable energy resources for the production of non-conventional renewable energy is essential for the reduction of carbon intensive fossil fuels resulting in emissions of greenhouse gases (GHG) in Chile, and for the diversification and sustainability of the energy sector. Renewable natural resources will be used as an energy source by CPAs included in this PoA; therefore this PoA will contribute to the reduction of fossil fuel based electricity generation and associated pollution by generating electricity with technologies that does not produce greenhouse gas emissions (GHG).

Social benefits

CPAs under this PoA will generate additional direct employment and income generation opportunities, for various groups in Chile during the construction, operation, maintenance and closing stages of the project activities implementation. At the same time, this PoA and included CPAs will contribute to the awareness and knowledge of renewable energy sources and technologies in Chile

Economic benefits

The CPAs under this PoA will help to increase the economic activity at the local level by creating demand for resources or services at different levels. It will also create fiscal effects such as taxes for works permits and payment of concessions/easements for the use of the land. At a national level this PoA will help to reduce fossil fuel imports dependency (improving Chile's trade balance) that will enable Chile's transformation to a low carbon economy, contributing to the Chile's emission reduction targets and by assigning value to unused Chile's natural resources. Because replacement parts are needed on a timely basis to ensure the smooth operation of the power plants, the CPA encourages local production of spare parts in the region.

Technological benefits

The technology to be installed by CPAs under this PoA is typically not a Chilean technology; however most of the technologies to be used by the CPAs are well established in projects worldwide. The technology providers will contribute then, before and during the project implementation and during O&M services with an environmentally safe and sound technology and know-how, thus transferring technology to the Host Party and to the CPA implementer. Even though this technology is not typically manufactured in Chile, it will not fall under any type of Technology Transfer from an Annex I party to Chile or to the CPA implementer. Thus, the PoA will lead to technology transfer from abroad to Chile and within Chile from urban centres to rural areas. It will strengthen the development of the renewable energy industry across Chile.

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http://www.leychile.cl/Consulta/Exportar?radioExportar=Normas&exportar_formato=pdf&nombrearchivo=LEY-19300_09-MAR-1994&exportar_con_notas_bcn=True&exportar_con_notas_originales=True&exportar_con_notas_al_pie=True&hddResultadoExportar=30667.2010-11-13.0.0%23

[3] Supporting evidence "SD87 Supreme decree 95.pdf" "Reglamento del Sistema de Evaluación de Impacto Ambiental (SEIA)" (Environmental Impact Assessment System Regulation) is provided to the DOE. Available at: http://www.leychile.cl/Navegar?idNorma=205385&idVersion=2008-11-29

In summary, it can be affirmed that the PoA will contribute to the increase of the installed capacity of non conventional renewable energy in Chile, thereby contributing to the mitigation of climate change.

1. General Operating and Implementing Framework of PoA

The Chilean Programme of Activities for integrated Non Conventional Renewable Energies will support, facilitate and encourage the development of grid-connected, renewable energy projects in Chile. The PoA is a voluntary action and the Coordinating/Managing Entity (CME) is Carbon Capital Inc. & Cia. Ltda.. Carbon Capital Inc. & Cia. Ltda will develop and promote the PoA in Chile and will cooperate with project developers to include their projects within the PoA thereby helping them to overcome local barriers to development and financing as well as encouraging the uptake of renewable energy generation in Chile.

In addition to preparing the CDM-PoA-DD, Carbon Capital Inc. & Cia. Ltda as the CME, will support renewable energy project developers by carrying out the following operating and implementing activities[4]:

- Providing information to project developers about CDM carbon markets and opportunities.
- Provide standardised and streamlined access to CDM services such as:
  - Documentation of the CDM-CPA-DD
  - Coordinating the inclusion of the CPAs in the PoA
  - Funding the transaction costs for the carbon cycle (to be evaluated on a project-by-project basis)
  - Reducing the costs of the carbon cycle through economies of scale
  - Supporting and administering the validation, monitoring, verification and issuance processes
  - Providing data gathering, security and storage services to each CPA implementer
  - Documenting the purchase of the CER's
  - Allocation and distribution of benefits from carbon sales among CPA implementers
  - Purchasing the CERs thereby introducing carbon finance to the projects which may help project developers to get access to equity, debt or project finance by signing CER sale agreements and using them as collateral

This CDM-PoA is focused on four technologies: solar power (both photovoltaic or PV and concentrated solar power (CSP)), wind farms (both on-shore and off-shore), wave/tidal and geothermal power plants to be located within the coverage of the 2 main electricity networks, SING or SIC. The technologies to be covered by this CDM-PoA by electricity network are:

SING: Solar (PV, CSP), wind farms, wave/tidal and geothermal power plants.
SIC: Solar (PV, CSP), wind farms, wave/tidal and geothermal power plants.

Each CPA can apply to one or more than one power plant without a minimum installed capacity which are grid-connected projects within each relevant grid boundary.

This CDM-PoA will be applicable to the following project activities described in ACM0002 (Version 12.3.0)[5]:

[4] Supporting evidence "SD115 Carbon Capital Statement Responsibilities.pdf" is provided to the DOE

(a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (green-field plant)
(b) Involve a capacity addition.

Other applicability conditions may apply depending on the project type and technology based on the methodology above. Please refer to Section A.4.2.1 and A.4.2.2 for details on applicable technology Types and CPA eligibility criteria.

The geographical boundary of this PoA is Chile. As described above each CPA will be either restricted to the SING or the SIC electric systems (see Figures 1&2 in section A.4.1.2. below).

2. Policy/Measure or Stated Goal of the PoA

This CDM-PoA is intended to achieve greenhouse gases emission reductions. The CME and this CDM-PoA will then incentivize the development of renewable energy projects by helping to overcome local infrastructural and institutional barriers, reducing CDM transaction costs, introducing carbon finance to renewable energy projects and increasing the internal rate of return (IRR) of renewable energy projects thereby making them viable and more attractive to financiers. At the same time, this CDM-PoA will support the Government of Chile's national energy and climate objectives by reducing the emissions intensity of the Chilean energy grid.

The following information helps to understand the current situation of the Chilean electricity market, in view of support the Policy /Measure or Stated Goal stated above for this proposed CDM-PoA.

The Chilean electricity market consists of 4 main unconnected electricity networks. From North to South, the networks are as follows: Grand North Interconnected System (SING), Central Interconnected System (SIC), Electric System of Aysen (SEA) and Electric System Magallanes (SEM). Each network has particular characteristics in relation to size, energy supply / demand, matrix composition and energy sources (see Table 1). As a result, each system has its own emissions factor.

Table 1: Electricity Generation by Electricity System in Chile (GWh and %)

Electricity System	Electricity generation by source (GWh - %)					Installed Capacity (MW - %)				
	Thermal fossil fuel	Thermal biomass	Hydro	Wind	Total	Thermal fossil fuel	Thermal biomass	Hydro	Wind	Total
SING	15,043.1 99.62%		56.9 0.38%	-	15,100.0 100%	3,560.0 99,6%		14.9 0.4%	-	3,574.9 100%
SIC	20,792.2 48.18%	841.4 1.95%	21,198.8 49.12%	325.2 0.75%	43,156.7 100%	6,125.8 51.72%	217 1.83%	5,341.8 45.10%	160.5 1.36%	11,845.1 100%
SEA	10.4 7.8%		117.4 87.1%	6.9 5.1%	134.7 100%	28.0 57.2%		19.0 38.8%	2.0 4.0%	49.0 100.0%
SEM	268.9 100%		-	-	268.9 100%	89.1 100%		-	-	89.1 100%
TOTAL (Chile)	36,114.6 61.05%	841.4 1.95%	21,373.1 36.4%	332.1 0.6%	58,660.3 100%	9,802.9 62.57%	217 1.83%	5,375.7 34.55%	162.5 1.04%	15,558.1 100%

Source: Own elaboration based on data from the National Energy Commission (CNE)[6; 7; 8; 9] (December, 2010) (values are rounded)

[5] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L
[6] Supporting evidence "SD04 generation_sic_sing.xls" is provided to the DOE. Information publicly available at: http://www.cne.cl/images/stories/estadisticas/energia/Electricidad/generacion_bruta_sic_sing.xls

As illustrated in the table above, thermal fossil fuel energy generation forms the principal part of the Chilean energy market. In relation to renewable energy in the SIC system, hydro generation has a strong component with most of this generation coming from large hydro power plants (as shown in table 1 and stated in CDM-SSC WG 32 Annex 7 para. 14 and Annex 2). Generation from large hydro power plants (>20MW) is not considered as non conventional energy source[10] under Chilean law. In relation to the SING, most of the energy is produced by thermal power plants with renewable energy sources forming a negligible part. Therefore, from the official data, it can be observed that there is little or no experience in renewable energy generation in Chile e.g. wind, solar, small hydro, tidal/wave and geothermal.

In general terms, the main problems associated with the lack of development of renewable technologies in Chile are high investment costs, leading to low financial returns against investment benchmarks when compared to conventional energy sources (typically thermal or large hydro with dams). Because of this, financial institutions are reluctant to provide financing for renewable energy projects which accordingly also experience difficulties in securing power purchase agreements. Other barriers include lack of local capacity, lack of locally available technology or equipment, the costs and timelines for regulatory approvals and frequently long distances to the nearest grid connection. In some cases, there are also issues with the capacity of the grid to accept increased or intermittent energy supply.

Chile has substantial potential for the development of renewable energy including unused capacity for hydroelectric energy, high levels of solar radiation for solar energy, favorable geological conditions for geothermal energy, unutilized wind power in the Andes mountains (among other prospective areas) and unutilized tidal power from the country's extensive coastline. The government of Chile has declared, even though is not legally binding, that intends that by 2020, Chile's growth rate of greenhouse gas emissions will be reduced by 20% using 2007 as the base year[11]. In this way, local policy makers intend to address global warming by reducing CO2 emissions from the Chilean energy matrix.

There are some policy instruments in Chile with legal force to promote renewable energy sources[12] of which the most significant are:

- Law N° 19.940[13] (13.03.2004) known as the "Short Law I" which exempts the payment of transmission tolls to projects up to 9MW and reduces the toll from projects between 9MW and 20MW. At the same time, the law grants access to the transmission line to all generation companies irrespective of size

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[7] Supporting evidence "SD05 generation_Magallanes.xls" is provided to the DOE. Information publicly available at: http://www.cne.cl/images/stories/estadisticas/energia/Electricidad/generacion_bruta_Magallanes.xls

[8] Supporting evidence "SD06 generation_Aysxn.xls" is provided to the DOE. Information publicly available at: http://www.cne.cl/images/stories/estadisticas/energia/Electricidad/generacion_bruta_Aysxn.xls

[9] Supporting evidence "SD07 generation installed capacity.xls" is provided to the DOE. Information publicly available at: http://www.cne.cl/images/stories/estadisticas/energia/Electricidad/capacidad_instalada_de_generacion.xls

[10] Supporting evidence "SD02 Law 20257 01042008.pdf" is provided to the DOE. The law is publicly available at: http://www.leychile.cl/Navegar?idNorma=270212&buscar=energia+renovable#renovable0

[11] http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/chile_approach_progress_in_chile.pdf

[12] Supporting evidence "SD98 Congress Library Renewable energy collection.pdf" is provided to the DOE. The collection is publicly available at: http://www.bcn.cl/leyes_temas/leyes_por_tema.2007-03-20.7683847886

[13] Supporting evidence "SD99 Law 19.940.pdf" is provided to the DOE. The law is publicly available at: http://www.leychile.cl/Navegar?idNorma=222380

- Law N° 20.018[14] (19.05.2005) known as the "Short Law II" which makes it compulsory for transmission companies to issue a tender to acquire electricity through a competitive system securing long term prices (contracts up to 15 years)
- Law N° 20.257[15] (01.04.2008) known as "Non Conventional Energy Sources (ERNC)" which establishes that:
  - Non-conventional energy sources are geothermal, wind farms, solar, biomass, wave/tidal and small hydro electricity generating technologies up to 20 MW.
  - 10% of the energy produced by large generation companies (>200MW) must be sourced from non-conventional renewable energy (ERNC) projects, to be purchased in the market or generated in-house.
  - The regulation above is applicable in phases starting with an ERNC commitment of 5% for the period 2010 – 2014 and increasing by 0.5% afterwards up to the year 2024.
  - Any excess generation using ERNC can be transferred between companies.
  - Non compliance with the regulation involves a fine of 0.4UTM[16]/MWh (about 31.1$US/MWh[17]) which increases up to 0.6UTM/MWh (about 46.6$US/MWh) after the 3rd year of non-compliance.
  - The law will be in force for a 25 years period starting 1st January, 2010.

This law is only applicable to energy contracts signed on or after April 2008. As most large contracts were signed before that date, the law does not have a material effect on renewable energy development and it is not difficult for generation companies to comply with its targets. In addition, there are no feed-in tariffs for renewable energy generation in Chile as is common in other countries in Latin America and throughout the world.

3. Confirmation that the Proposed PoA is a Voluntary Action by the Coordinating/Managing Entity

Prior to the submission of the request for registration to the Executive Board, the project participant of this PoA has obtained the Letter of Approval from the Chilean Designated National Authority (DNA) which confirms its voluntary participation and the confirmation that the project activity assists in achieving sustainable development (3/CMP.1, Annex, paragraph 40(a)) and therefore, in compliance with the required procedure[18].

This voluntary action is coordinated and managed by Carbon Capital Inc. & Cia. Ltda. the coordinating/managing entity (CME). This voluntary coordinated action is carried out in order to promote and/or facilitate the development of small scale renewable energy projects in Chile and their inclusion in the SSC-PoA.

[14] Supporting evidence "SD100 Law 20.018.pdf" is provided to the DOE. The law is publicly available at: http://www.leychile.cl/Navegar?idNorma=238139

[15] Supporting evidence "SD02 Law 20257 01042008.pdf" is provided to the DOE. The law is publicly available at: http://www.leychile.cl/Navegar?idNorma=270212&idParte=&idVersion=2008-04-01

[16] Considering the November 2011 value, http://www.sii.cl/pagina/valores/utm/utm2011.htm

[17] Considering an exchange rate of 499.47 CLP/$US (08.11.2011) (click on the year and search the relevant data) source Chilean Central Bank publicly available at: http://si3.bcentral.cl/Siete/secure/cuadros/arboles.aspx

[18] Supporting evidence "SD 101 DNA conditions for LoA.pdf" is provided to the DOE. Information is publicly available at: http://www.mma.gob.cl/1304/w3-article-44986.html The Letter of Approval is provided to the DOE.

Carbon Capital Inc. & Cia. Ltda. as CME of this PoA declares and confirms[19] that:

- The proposed programme of activities is a voluntary action coordinated and managed by the coordinating/managing entity.
- There are no mandatory laws or regulations that compel the CME or any other entity to carry out a PoA for Renewable Energy Generation in Chile
- Renewable energy projects are also voluntary and are not a result of any law, decree or by-law.

A.3. Coordinating/managing entity and participants of POA:

>>
The Coordinating or managing entity of the PoA which communicates with the Board will be Carbon Capital Inc. & Cia. Ltda.

Project participants being registered in relation to the proposed PoA are.

Name of the Party Involved (*) ((host) indicates a host party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Chile (host)	Private entity Carbon Capital Inc. & Cia. Ltda.	No

Project participant of the CDM-PoA above may or may not be involved in the CPAs related to this PoA.

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

>> Chile.

A.4.1.1. Host Party(ies):

>> The host party is Chile.

[19] Supporting evidence "SD115 Carbon Capital Statement Responsibilities.pdf" is provided to the DOE.

A.4.1.2. Physical/ Geographical boundary:

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The boundary of the PoA, in terms of a geographical area within which all CDM programme activities (CDM-CPAs) included in the PoA will be implemented, covers the geographical boundary of Chile, specifically those CDM projects connected either to the Interconnected Central System (SIC) or the Grand North Interconnected System (SING). Chile is located between 17° 30' 00" and 56° 30' 00" south latitude, and its central meridian is 70° 30' 00" west longitude[20]. If allowed by the UNFCCC regulations, in the future the CME would like to extend the boundary of the CDM-PoA to the Latin America Region. The first CPA will be in Chile.

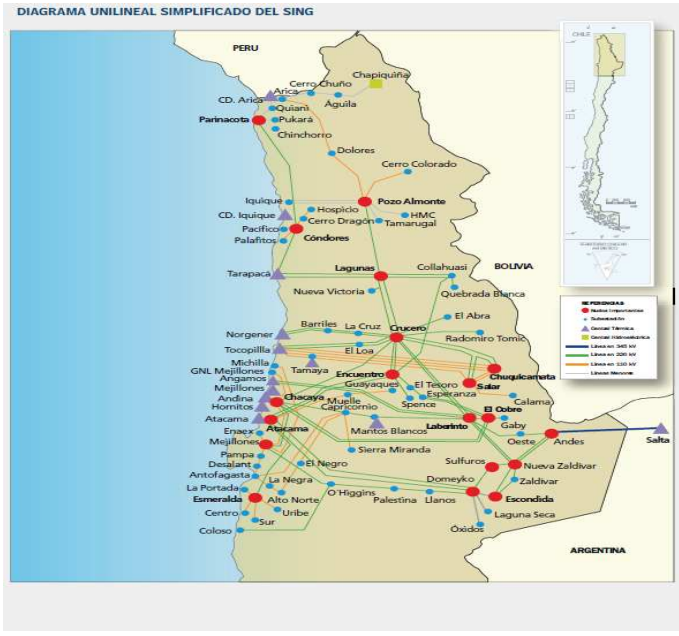

Figure 1: Grand North Interconnected System (SING)
Source: CDEC-SING[21]

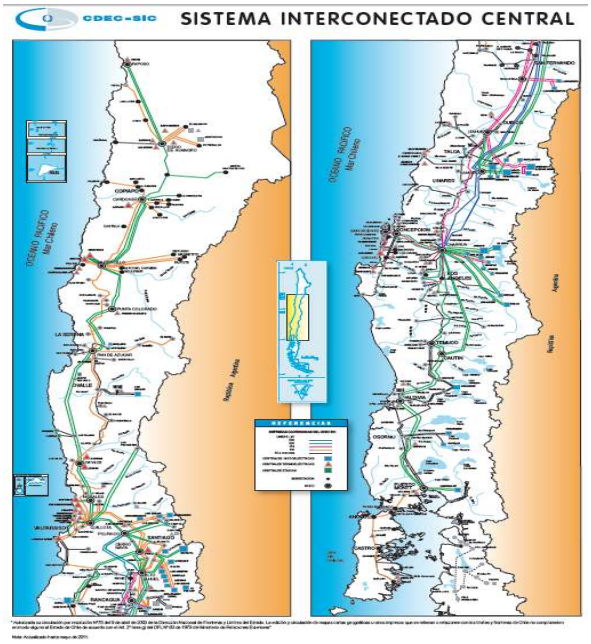

Figure 2: Central Interconnected System (SIC)
Source: CDEC-SIC[22]

The physical boundary of each CDM-CPA is restricted to the physical boundary and geographical area of each renewable energy project covered in the CDM-CPA to be defined in the CDM-CPA-DD and connected to the relevant grid network. All applicable national and/or sectoral policies and regulations of Chile within that chosen boundary will be taken into consideration and correspondingly referenced at CPA level.

[20] http://www.uchile.cl/portal/presentacion/la-u-y-chile/acerca-de-chile/8035/presentacion-territorial

[21] Supporting evidence "SD103 map sing.pdf" is provided to the DOE. The information is publicly available at: http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_pag_web_pub.get_file?p_file=Unilineal.pdf&p_tipo=A

[22] Supporting evidence "SD102 map sic.pdf" is provided to the DOE. The information is publicly available at: https://www.cdec-sic.cl/contenido_es.php?categoria_id=4&contenido_id=000028

A.4.2. Description of a typical CDM programme activity (CPA):

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A typical CPA under this PoA will correspond to one or more green-field renewable energy power plants, or a capacity addition to an existing renewable energy project regardless of its installed capacity.

The renewable power plants will generate electricity from geothermal, wind, solar (PV, SCP) or wave/tidal power plants.

A.4.2.1. Technology or measures to be employed by the CPA:

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Category:

A CPA under this PoA corresponds to Type I Scope I: Energy industries (renewable - / non-renewable sources).

Technology:

All the CPAs under this PoA will be renewable energy technology projects, which use the kinetic energy from wind and waves/tides, heat from the earth or solar radiation to produce electricity. This clean electricity will be supplied to the following non connected Chilean grids: Interconnected Central System (SIC) or Grand North Interconnected System (SING) of Chile, as defined in Section A.4.1.2. above. The facilities (CPA) will be physically connected to the relevant electricity system. The renewable energy projects (CPAs) promoted by this PoA will contribute with the reduction of greenhouse gas emissions by displacing CO_2 emissions attributable to the generation of electricity that would have otherwise been generated by the operation of fossil fuel fired power plants connected to the SIC or SING grids, which is considered the main source of greenhouse gases.

The CPAs included under this CDM-PoA will use environmentally sound technologies in compliance with national environmental regulations. As shown in table 1 of section A.2. above in the Chilean energy matrix, the share of the technologies promoted by the proposed CDM-PoA, is negligible or inexistent; therefore, the technologies promoted by this CDM-PoA will result in a significantly better performance than any commonly used technology in Chile.

Typically, the technology to be installed by CPAs under this CDM-PoA will not be a Chilean technology as these technologies are not manufactured in the country and, therefore, are not locally available. Usually, the technology provider before and during the CPA implementation and during O&M will use its know-how, transferring technology to the Host Country (Chile) and to the CPA. Even though the technologies will be mainly imported to Chile, it will not fall under any type of Technology Transfer from an Annex I party to Chile or to the CPA Implementer.

A typical CPA under this CDM-PoA will consist of renewable energy projects of any size (i.e. installed capacity) delivering electricity to the Interconnected Central System (SIC) or the Grand North Interconnected System (SING), as follows:

- *Geothermal power plant*: The power plant will consist of 1 or more steam turbines that will convert heat from the deep underground of the earth into electricity generation. Typically, a geothermal facility (usually named geothermal power station) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) injection well; b) production well; c) wellhead; d) separator or heat exchanger

(optional); e) turbine; f) generator; g) condenser; h) power transformer; i) control room and measurement equipment; j) substation and k) transmission line.

- *Wind power plant*: The power plant will consist of 1 or more wind turbines (either on-shore and/or offshore) that will convert the kinetic energy of the wind into electricity generation. Typically, a wind facility (usually named wind farm) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) wind turbines (which consist of foundation, tower, nacelle, rotor hub and blades); b) power transformer; c) control room and measurement equipment; d) substation and e) transmission line.
- *Wave/Tidal power plant*: The power plant will consist of 1 or more underwater tidal turbines or wave generation devices that will convert the kinetic energy of the moving water (ocean waves/tides) into electricity generation. Typically, a tidal facility (usually named tidal power plant) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) turbine (e.g. axial turbines, cross flow turbines); b) tidal lagoons/storage ponds (optional); c) generator; f) power transformer; d) control room and measurement equipment; e) substation and f) transmission line. Typically, a wave facility (usually named wave farm) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) oscillatory device (e.g. power buoy, wave energy converter, etc); b) power take-off device (e.g. hydroelectric turbine, hydraulic ram, etc); c) generator; f) power transformer; d) control room and measurement equipment; e) substation and f) transmission line.
- *Solar power plant*: The CPAs will consist of solar photovoltaic power projects (PV) or concentrated solar power projects (CSP) that will convert solar radiation into electricity generation. Typically, a solar PV facility (usually named solar PV power plant) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) solar modules; b) inverters; c) mounting structures; d) sun trackers (optional); b) power transformer; c) control room and measurement equipment; d) substation and e) transmission line. A typical solar CSP facility (usually named solar CSP plant) will include the following equipments and systems which will allow the electricity generation and delivery of the electricity to the grid: a) lenses or mirrors; b) sun trackers; c) solar power tower; d) heath engine (steam turbine); e) generator; f) power transformer; g) control room and measurement equipment; h) substation and i) transmission line.

Individual CPA-DDs will contain detailed information about the technology to be implemented on a project-by-project basis. At the beginning of the project implementation extensive initial training will be provided to the staff, either by technology provider or technical experts, especially in the matters referred in section E.7.2. Similarly, new staff will also receive extensive initial training. The staff involved in CDM tasks will also receive training application of the monitoring plan including data management, data analysis, reporting the monitored data, data collection, internal audit, maintenance and operation of the measuring and monitoring equipment, calibration, sales receipts, day-to-day operation and maintenance of the facility, operational reports, and recording.

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

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The eligibility criteria for inclusion of a CPA under this CDM-PoA are defined in the table 2 below (as per EB 65 Annex 3 para. 14)

Table 2: Eligibility criteria for inclusion of a CPA in the PoA

N°	Eligibility Criteria for inclusion of a CDM-CPA in the PoA	Condition to be met	Likely Evidence / Supporting Document
1	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA;	Confirmation that the Project Activity's boundary is within the geographical territory of Chile based on UTM and/or geographic coordinates (latitude and longitude) of the project location. The CPA Implementer is an entity incorporated within the CDM-PoA boundary.	The CPA Implementer must provide at least one of following documentation as evidence: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or Company incorporation document(s); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
2	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	Confirmation that the CPA is not already included in another PoA or developed as a stand-alone CDM registered project. Detailed procedure to avoid doubt counting is formulated in A.4.1. of the PoA-DD	The CPA Implementer must provide the following documentation: Inclusion Agreement executed (or other contract of similar characteristics) between the CPA Implementer and the CME; and/or Declaration letter from CME, confirming that the proposed CPA is not included in another PoA or developed as a stand-alone CDM registered project and/or

			The CME, before a new CPA is to be included in the PoA, an exhaustive check will be made against the database and the list of projects and their status (i.e. validation requesting registration and registered) on the UNFCCC website demonstrating compliance with section A.4.4.1. d) and e) of the CDM-PoA-DD
3	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/ certifications;	Confirmation that: The technology to be installed is for a renewable energy generation project such as solar (PV or CSP), geothermal, tidal/wave or wind, which delivers electricity to a grid, as described in section A.4.2.1. and A.4.1.2. of the CDM-PoA-DD and will meet the host country or international standard/ requirements in terms of testing /certification	The CPA Implementer must provide the following documentation: Supporting documents like proposals, requests for quote, quotations, tender documents, project design diagram, FSR, engineering feasibility study or equivalent documents and/or Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
4	Conditions to check the start date of the CPA through documentary evidence;	Confirmation that: To the effect that the start date of the CPA is not before 25/04/2012, i.e., the date on which the PoA-DD was webhosted for Global Stakeholder's Comments.	The CPA Implementer must provide the following documentation: a statement from the CPA Implementer indicating an

		The starting date of the Project Activity (CPA) is not before the date of commencement of validation of the PoA, whereas "starting date" of the Project Activity (CPA) means the earliest date at which either the equipment purchase order, financial closure, implementation or construction or real action of a Project Activity (CPA) begins.	expected project start date; and/or Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or Legally binding contract between the Project Entity and a third party with a commitment by the Project Entity to expenditures related to the implementation or construction of the Project Activity; and/or Purchase order(s) of the Project Activity's equipment /technology; and/or Any other significant purchase order, contract or payment documentary evidence related to the construction of the Project Activity; and/or. other documents e.g. engineering studies, pre/feasibility studies, etc.
5	Conditions that ensure compliance with applica-bility and other requirements of single or multiple methodologies applied by CPAs; The applicability criteria of the methodology	Confirmation the CPA meets the applicability criteria and conditions, as per methodology ACM0002, version 12.3.0.(as listed in section E.2 of the PoA DD) Confirmation that:	.The CPA Implementer must provide the following documentation: An statement from the CPA Implementer indicating that the power plant will be either to (a) install a new power plant at a site where no renewable power plant was operated prior

	ACM0002(Version 12.3.0) are the following: 1. *This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s.)*	A CPA under this PoA will be renewable energy generation units, grid connected (either to the SING or to the SIC system) complying with either requirement (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); or (b) involve a capacity addition; This criteria is applicable to current and future CPAs to be included under this CDM-PoA (c) and (d) are not applicable under this CDM-PoA	to the implementation of the project activity (greenfield plant); or (b) involve a capacity addition; and/or Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or Documents of the electricity delivery of the power plant; and/or Certificate of commercial operation of the existing facility; and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
	2. The methodology is applicable under the following conditions: *The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;*	Confirmation that a CPA under this PoA will comprise of greenfield renewable energy power plants or capacity additions to existing power plants/units only of the following types (as described in Section A.4.2.1. of the CDM-PoA-DD): o a geothermal power plant o a wind farm power plant, on-shore and/or off-shore o a wave/tidal power plant o a solar farm power plant (solar photovoltaic (PV) or concentrated solar power (CSP)) In which a greenfield renewable energy power plants is, as per methodology ACM0002 (Version	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

		12.3.0)"*a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (greenfield plant)"*; And a capacity addition corresponds to "*an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units continue to operate after the implementation of the project activity.*" This criteria is applicable to current and future CPAs to be included under this CDM-PoA Hydro power plants are not eligible to be part of this CDM-PoA. Retrofit or replacement of a power plant/unit are not eligible under this CDM-PoA	
	3. In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline	Confirmation that: A CPAs under this PoA will comprise of greenfield renewable energy power plants (as described in Section A.4.2.1. of the CDM-PoA-DD) or capacity additions to existing power plants/units only. In case of capacity addition the existing plant should have start commercial operations prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition of the plant	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or Documents of the electricity delivery of the power plant; and/or

	emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	has been undertaken between the start of this minimum historical reference period and the implementation of the project activity (except for capacity addition CPAs for which the electricity generation of the existing power plant(s) or unit(s) is not affected). This criteria is applicable to current and future CPAs to be included under this CDM-PoA • Retrofits and replacements are not eligible to be part of this CDM-PoA.	Certificate of commercial operation of the existing facility; and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
	4. In case of hydro power plants: • *At least one of the following conditions must apply:* o *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or* o *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or* *The project activity results in new single or multiple*	Not applicable as hydro power plants are not eligible to be part of this CDM-PoA.	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

	reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity.		
	5. In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 after the implementation of the project activity all of the following conditions must apply: • *The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2;* • *All reservoirs and hydro power plants are located at the same river and where designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant;* • *The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;* • *The total installed capacity of the power units, which are driven*	Not applicable as hydro power plants are not eligible to be part of this CDM-PoA.	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

	using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15MW; *Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.*		
	6. The methodology is not applicable to the following: • *Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;* • *Biomass fired power plants;* *A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4 W/m^2.*	• Not applicable. Switching from fossil fuels to renewable energy sources, biomass fired power plants or hydro power plants are not eligible to be part of this CDM-PoA.	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
	7. *In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the*	Confirmation that: A CPA under this PoA may include the addition of renewable energy generation units at an existing renewable power generation plant. CPA involving capacity additions will be eligible under this PoA only if the most	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or

	continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	plausible baseline scenario is the continuation of current situation i.e "*to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance*". This criteria is applicable to current and future CPAs to be included under this CDM-PoA Retrofits and replacements are not eligible to be part of this CDM-PoA	Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or CPA Implementer statement; and/or other documents e.g. engineering studies, pre/feasibility studies, etc. The baseline scenario (continuation of the current situation) for capacity addition to an existing grid connected renewable power plant/unit is already defined by ACM0002 (Version 12.3.0)
6	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality as specified in Section A above; Under this PoA, additionality is demonstrated and assessed at CPA level. In order to assess the additionality for a CDM-CPA under this PoA EB 65 Annex 21 methodological tool "Tool for the demonstration and assessment of additionality" (Version 06.0.0) will be considered	Confirmation that the CPA is in compliance with the additionality assessment as per the steps described under Section E.5.1. of this CDM-PoA The CPA has to demonstrate additionality by conducting an investment analysis at CPA level in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) in which, as a result, it will be determined whether the proposed project activity is not financially/economically attractive without the revenue from the sale of certified emission reductions (CERs), thereby demonstrating that in the absence of CDM, the CPA would not be implemented. The financial indicator for this analysis will be the (Internal Rate of Return) IRR. This analysis will compare the IRR with a suitable benchmark, whereas the IRR of the CPA has to be lower than the suitable benchmark.	The CPA Implementer must provide the following documentation: Demonstration of additionality and compliance with the additionality assessment by conducting the IRR calculation for the CPA and benchmark assessment (as per the relevant/selected approach), in which as a result, the CPA IRR is lower than the benchmark IRR, therefore, is demonstrated that in the absence of CDM, CPA would not occur; and Supporting evidence for each of the input parameters used in the IRR calculation (e.g. technology provider quotations, energy price, etc) and benchmark selection (e.g. government benchmark, UNFCC benchmark, etc) must be provided; and relevant referenced calculation

			spreadsheets.
7	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stake-holder consultations and environmental impact analysis;	Confirmation that: • The CPA Implementer has conducted a local stakeholder consultation as per the requirements of the CDM. • The proposed CPA is in compliance with all relevant host country laws and regulations available at the time of the CPA inclusion into the PoA, especially in relation to environmental impact analysis. • The proposed CPA does not cause trans-boundary impacts [23] • Confirmation that Environ-mental Approval (RCA) has been obtained by the proposed CPA or that the "Relevance Letter" has been issued by the CPA Implementer to the relevant national/local authority as applicable	The CPA implementer must provide the following documentation regarding stakeholder consultation : i) Invitation letters and/or newspaper advertisement and/or public notice for the invitation of local stakeholders; and ii) Stakeholder meeting presentation; and iii) Stakeholder meeting report; and iv) Attendance list of attended stakeholders; and v) Summary of the answers provided to the relevant attendees; and vi) Evidence that the answers have been provided to the relevant stakeholders; and/or vii) other documents as appropriate e.g. pictures, videos, etc The CPA implementer must provide the following documentation regarding environmental impact analysis: i) Environmental Approval (Resolución de

[23] Trans-boundary impacts are defined under the Convention on Environmental Impact in a Trans-boundary Context (see http://www.unece.org/fileadmin/DAM/env/eia/documents/legaltexts/conventiontextenglish.pdf).

			Calificación Ambiental "RCA") or "Relevance Letter" as applicable; and/or - other documents e.g. engineering studies, pre/feasibility studies, etc.
8	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance;	Confirmation in writing by the CPA Implementer that no public funding declared as Official Development Assistance (ODA) from Annex I parties will be used in CPA development	The CPA implementer must provide the following document regarding the non ODA diversion: . Inclusion Agreement executed (or other contract of similar characteristics) between the CPA Implementer and the CME; and/or A statement from the CPA Implementer indicating that no public funding from Annex I parties will be used in CPA development.
9	Where applicable, target group (e.g. domestic/ commercial/industrial, rural /urban, grid connected/off-grid) and distribution mechanisms (e.g. direct installation);	Confirmation that: The CPA supplies (or will supply) electricity to the national grid (SING or SIC) complying with either requirement (a) or (b) as per applicability conditions of ACM0002 (Version 12.3.0) (see eligibility criteria 5 point 1. of the CDM-PoA-DD)	Relevant document is to prove that the proposed project will supply electricity to the grid e.g. Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
10	Where applicable, the conditions related to	Not applicable	Not applicable

	sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys;	The CME has decided not to use statistically sound sampling methods/procedures for monitoring. All the CPAs included in the PoA will be monitored individually. As defined in section E.7.1. and E.7.2., the CPA Implementer will monitor all relevant parameters (as per project type) according to the established procedures.	
11	Where applicable, the conditions that ensure that every CPA in aggregate meets the small-scale or microscale threshold criteria and remains within those thresholds throughout the crediting period of the CPA;	Not applicable A large scale methodology i.e. ACM0002 (Version 12.3.0) is applied to this CDM-PoA.	Not applicable
12	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories	Not applicable A large scale methodology i.e. ACM0002 (Version 12.3.0) is applied to this CDM-PoA.	Not applicable
13	The CPA is a voluntary initiative and is not implemented due to mandatory policies or regulations.	Confirmation that: The CPA is a voluntary initiative, not mandated by policies or regulations of the host party.	The CPA Implementer must provide the following documentation: Inclusion Agreement executed (or other contract of similar characteristics) between the CPA Implementer and the CME; and/or A statement of the CPA Implementer indicating that the CPA is a voluntary initiative, not mandated by policies or regulations of the host party
14	Signature of a contract of	he CPA Implementer shall sign a	TheCPA Implementer must

	services between the CPA Implementer and the CME	contract of services (e.g. Inclusion Agreement or other contract with similar characteristics) with the CME and comply with its requirements.	provide the following documentation: Inclusion Agreement executed (or other contract of similar characteristics) between the CPA Implementer and the CME
15	Project size	The CPAs under this PoA will be considered eligible regardless of its installed capacity	The CPA Implementer must provide the following documentation: Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

As a part of the additionality assessment (see eligibility criteria 6 above) all CPAs to be included under this CDM-PoA will comply with all additionality-related guidelines, tools or any requirement (as applicable) described in ACM0002 (Version 12.3.0). The eligibility criteria may be updated according to the procedures described in EB 65 Annex 3 para. 21 to para. 25.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

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As explained in Section A.2, the PoA will facilitate access to carbon finance for renewable energy developers which will encourage and support renewable energy generation in Chile. The reasons the PoA can be considered a voluntary coordinated action are:

- In Chile, private electricity generators are free to choose the technology to be deployed in their projects as long as all necessary environmental, construction and operational permits are in place[24; 25]

[24] The supporting evidence "SD104 chile energy policy review 2009.pdf" report is provided to the DOE. Also see IEA Chile Energy Sector Report publicly available at: http://www.iea.org/publications/freepublications/publication/chile2009.pdf

- The proposed PoA is a voluntary action coordinated and managed by Carbon Capital Inc. & Cia. Ltda. (the CME)
- This voluntary coordinated action will not be implemented in the absence of the proposed PoA.
- There are no mandatory laws or regulations that compel the CME or any other entity to carry out a PoA for Renewable Energy Generation in Chile
- Renewable energy project development or the use of renewable resources is also voluntary and is not a result of any law, decree or by-law
- Chilean law does not oblige a CME to develop a PoA
- Chilean law does not oblige the developers to develop a CPA, or to include a CPA under this PoA
- As per paragraph 73 EB47, "*The Board*" noted "*that in the context of programmes of activities that additionality is to be demonstrated either at the PoA level or at CPA level*"[26]. Under this PoA, project participants choose to demonstrate additionality at the CPA level
- This approach is appropriate since the various prohibitive barriers to different renewable energy plants in Chile may apply differently as described in E.5. The project proponent will apply an investment analysis to demonstrate the additionality, according to the methodological tool "Tool for the demonstration and assessment of Additionality" (Version 06.0.0) and the procedures and tools described in Section E.5.
- In the absence of CDM, none of the implemented CPAs would occur (EB65 Annex 3 para. 7)
- Without the implementation of the proposed PoA, it is expected that no material or incremental changes would take place in relation to renewable energy projects and the use of renewable energy sources in Chile[27]. The current status and market share of renewables can be observed in Table 1 of Section A.2. Because of the existing barriers, other stakeholders are also seeking to implement renewable PoAs in Chile[28], which supports the idea that PoAs are necessary to develop renewable energy projects in Chile
- The above is supported by the National Energy Commission (CNE) report which forecasts an increase in the share of fossil fuels in the composition of the Chilean energy matrix. At the same time, CO2 emissions in the energy sector are forecast to double by 2025 (see footnote 32). As a result, fossil fuel generation is and will be the most likely scenario in Chile.
- The Chilean Small Scale Renewable Energy Programme of Activities will support, facilitate and encourage the development of small and medium sized grid-connected, renewable energy projects in the Chile. The PoA is a voluntary action and the Coordinating/Managing Entity (CME) is Carbon Capital Inc. & Cia. Ltda. . Carbon Capital Inc. & Cia. Ltda. will develop and promote the PoA in Chile and cooperate with project developers to include their projects within the PoA thereby helping them to overcome local barriers to development and financing as well as encouraging the uptake of renewable energy generation in Chile.

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[25] The supporting evidence "105 environmental permits and authorizations scheme.pdf" is provided to the DOE. The description is publicly available at: http://www.sea.gob.cl/contenido/sistema-de-informacion-sobre-permisos-y-autorizaciones-de-contenido-ambiental

[26] http://cdm.unfccc.int/EB/047/eb47rep.pdf

[27] Supporting evidence "SD106 Executive Summary Chile GHG.pdf" is provided to the DOE. The report is publicly available at:
http://antiguo.cne.cl/cnewww/export/sites/default/05_Public_Estudios/emisiones_de_gases_2000_2025/Resumen_Ejecutivo_GEIS.pdf

[28] http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/Y3G1KXGDHHKJUOF8PYGCH3LIJXMMBX/view.html

- Prior to the submission of the request for registration to the Executive Board, the project participant of this PoA has obtained the Letter of Approval from the Chilean Designated National Authority (DNA) which confirms its voluntary participation and the confirmation that the project activity assists it in achieving sustainable development (3/CMP.1, Annex, paragraph 40(a)) therefore, in compliance with the required procedure[29].
- This voluntary action is coordinated and managed by Carbon Capital Inc. & Cia. Ltda. the coordinating/managing entity (CME). This voluntary coordinated action is carried out in order to promote and/or facilitate the development of small scale renewable energy projects in Chile and their inclusion in the SSC-PoA

- Based on the information above, it can be concluded that:
  - In the absence of CDM, none of the implemented CPAs would occur and, as a result, this CDM-PoA proposed by the CME would not be implemented in the absence of CDM.
  - Without the services provided by the proposed PoA, financial incentives will remain at insufficient levels to undertake any of the CPAs promoted by the current PoA
  - Therefore, without the proposed PoA the business-as-usual (BAU) generation scenario (consisting principally of fossil fuel thermal generation) will remain.

A.4.4. Operational, management and monitoring plan for the programme of activities:

A.4.4.1. Operational and management plan:

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The CME (Carbon Capital Inc. & Cia. Ltda.) will develop and implement a management system that includes the following (as per EB 65 Annex 3 para. 17):

(a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;

A definition of roles and responsibilities is defined in the document "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*"[30]. The CME will review the competencies of the personnel to be involved in CPA inclusions prior to the employment/assignment of new staff and will ensure that the staff is properly trained in regard to specific CPA inclusion requirements. Current staff has experience in CDM and at least 1 staff member has been formally trained in PoA[31].

(b) Records of arrangements for training and capacity development for personnel;

The CME will request training and personnel capacity development information to the CPA Project Manager of each CPA included under this CDM-PoA at least once a year. The CME will keep a record of these arrangements which will be stored (electronically and paper) at the CME main office and will be available to the DOE at any time. The CPA Project Manager will be responsible for ensuring that all the personnel participating in the CDM tasks, as described in sections A.4.4.2 and E.7.2, are properly trained as per the CDM-PoA monitoring requirements. The CME if necessary will train CPA designated

[29] http://www.mma.gob.cl/1304/w3-article-44986.html

[30] The procedures manual has been provided to the DOE

[31] Documentary evidence of the training (i.e. SD09; SD10; SD11 and SD12) is provided to the DOE

monitoring staff on how to implement the monitoring plan presented in the CPA-DD, in accordance with "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*"[32]. The CME will also keep all the training and capacity development records of the CME staff.

(c) Procedures for technical review of inclusion of CPAs;

CME has the main responsibility for technical review of inclusion of CPAs. All necessary documents to demonstrate compliance with the eligibility criteria of the PoA are collected and verified by CME prior to signature of the contract (Inclusion Agreement) between the Project Developer and CME. The CME will collect also all information and supporting evidences required to draft the CPA-DD and assess its additionality. The CPA-DD and all supporting documents are then quality checked and review by CDM experts from Carbon Capital Inc. & Cia. Ltda., prior to its submission to the DOE. The entire technical review process is described in detail in the document "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*"[33].

(d) Records and documentation control process for each CPA under the PoA;

The CME will maintain an electronic and hard copy record system consisting of the data below for each CPA included in the PoA. This will allow the CME to unambiguously identify each renewable energy CPA participating in the PoA. All the data will be physically and electronically stored and kept for at least 2 years after the end of the last crediting period, or the last verification date, whatever occurs later by both the developer of the CPA and the CME. The system will contain the following information:

(a) Serial Number ID (e.g. CPA Serial Number 001). This number will be used to record baseline and monitoring data.
(b) Name of the CPA
(c) Name of the developer
(d) Type of technology
(e) Installed capacity
(f) Location (including GPS geo coordinates (UTM WGS 84 and geographic coordinates). For geothermal, wind farms, wave/tidal and solar projects a reference waypoint will suffice.
(g) CERs per year
(h) CERs per crediting period
(i) Commissioning date
(j) National status (CDM, local DNA informed/not informed)
(k) Contact name
(l) Phone number
(m) Email
(n) Address
(o) Website
(p) International status (CDM)
(q) Validation status
(r) Verified Emission reductions
(s) Baseline emissions (Grid emission factor (SIC, SING))

[32] Supporting evidence "SD13 C.h_. PoA procedures Monitoring v.1.pdf" is provided to the DOE

[33] Supporting evidence "SD116 B.b_.b. PoA procedures Inclusion of a CPA in the PoA clean.pdf" is provided to the DOE

(t) Monitoring data (according to section E.7.1)
(u) Verification status (verification number and monitoring period)
(v) Issuance data

The record keeping system will be based on electronic excel spreadsheets[34] with a backup system. Data will be updated manually based on the information provided by each CPA implementer. This database will be the basis for verification of CPAs and will be available for inspection by the Designated Operational Entity (DOE) at any time. In this way the CME will have an updated account of the emissions reductions produced by each CPA during its crediting period.

(e) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA);

In order to avoid double counting the following measures will be implemented by the CME:

- The database mentioned in (d) above will be used to check double counting.
- Before a new CPA is to be included in the PoA, an exhaustive check will be made against the database and the list of projects and their status (i.e. validation[35; 36], requesting registration[37; 38] and registered[39; 40]) on the UNFCCC website.
- The developer will sign a contract[41] (or other confirmation in writing as described in section A.4.2.2) containing an exclusivity clause with the CME which states that:
  - Grid connected electricity generation with a different technology has not been considered as an alternative to the project
  - The CPA has not been and will not be registered as a single CDM project activity or as a CPA under another PoA.
  - The CPA Implementer is aware and has agreed that the CPA will be part of the present PoA.
  - The CPA Implementer cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC, or any voluntary scheme, to the CME of the PoA.
  - The CPA Implementer knows and understands the definition of double counting
  - The CPA Implementer must confirm in writing that 100% of the CPA will be monitored (in accordance with the procedures described in A.4.4.2.).
- If any of the conditions above are not met, the CPA will not be included in the PoA.

The above in accordance with the "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*", Procedure for Double counting avoidance check at CPA level[42]

[34] Supporting evidence spreadsheet "SD24 CME CDM-CPA-DD record system v.1.1 (EN).xls" is provided to the DOE
[35] http://cdm.unfccc.int/Projects/Validation/index.html
[36] http://cdm.unfccc.int/ProgrammeOfActivities/Validation/index.html
[37] http://cdm.unfccc.int/Projects/Projects/request_reg.html
[38] http://cdm.unfccc.int/ProgrammeOfActivities/request_reg.html
[39] http://cdm.unfccc.int/Projects/registered.html
[40] http://cdm.unfccc.int/ProgrammeOfActivities/registered.html
[41] Supporting evidence for inclusion of CPA1 "SD112 Inclusion Agreement Sol del Loa.pdf" containing the relevant statements is provided to the DOE
[42] Supporting evidence "SD14 B.b_.a.iv. PoA procedures Double counting avoidance clean.pdf" is provided to the DOE

(f) Measures for continuous improvements of the PoA management system;

The CME has developed a procedures manual. This management system is subject to a continuous review of its effectiveness. One of the aims of the management system (procedures manual) is to seek continuous improvement of the PoA's performance in all aspects. All those involved in the management of the PoA will be encouraged to raise any issues that they feel need to be corrected and suggest any means of improvement. Updating procedures are also described in the document "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*"[43].

In order to ensure that the CPA Implementer is aware of, and has agreed that, its activity is being included in the PoA, a contract must be in place with the CME making this legally binding. This will include the provisions set out in A.4.4.1. above.

A.4.4.2. Monitoring plan:

>>

The CME has decided not to use statistically sound sampling methods/procedures for monitoring. All the CPAs included in the PoA will be monitored individually.

As defined in section E.7.1. and E.7.2., the CPA Implementer will monitor all relevant parameters (as per project type) according to the established procedures. For all project type CPAs the net electricity delivered to the relevant grid (in MWh) will be monitored (i.e. $EG_{facility,\ y}$; for capacity additions the parameter is called $EG_{PJ\ Add,y}$). In addition, for Geothermal project type CPAs the following parameters will be monitored:

a) Average mass fraction of carbon dioxide in the produced steam in year *y* ($W_{steam,CO2,y}$ (tCO_2/t steam));
b) Average mass fraction of methane in the produced steam in year *y* ($W_{steam,CH4,y}$ (tCH_4/t steam)); and
c) Quantity of steam produced in year *y* ($M_{steam,\ y}$ (t steam)).

For CPAs involving fossil fuel combustion the following parameters will be monitored:

d) Quantity of fuel type *i* combusted in process *j* during the year *y* ($FC_{i,j,y}$ (Mass or volume unit per year));
e) Weighted average mass fraction of carbon in fuel type *i* in year *y* ($W_{C,i,y}$ (tC/mass unit of the fuel));
f) Weighted average density of fuel type *i* in year *y* ($\rho_{i,y}$ (Mass unit/volume unit));
g) Weighted average net calorific value of fuel type *i* in year *y* ($NCV_{i,y}$ (GJ per mass or volume unit));
h) Weighted average CO_2 emission factor of fuel type *i* in year *y* ($EF_{CO2,i,y}$ (tCO_2/GJ))

The CPA staff involved in CDM tasks will receive training on the application of the monitoring plan including data management, data analysis, reporting the monitored data, data collection, internal audit, maintenance and operation of the measuring and monitoring equipment, calibration, sales receipts, day-to-day operation and maintenance of the facility, operational reports, and recording.

One verification is expected per year for the PoA under normal circumstances. Each CPA Implementer will send the monitoring data to the CME on a monthly basis and an annual summary in a standardised form in order to comply with the verification procedure. The CME will control, organize and prepare the

[43] Supporting evidence "SD117 C.g_. PoA procedures Update Procedures Manual v.1.pdf" is provided to the DOE

necessary documentation for verification by the DOE. All the data will be physically and electronically stored and kept for at least 2 years after the end of the last crediting period, or the last verification date, whatever occurs later by both the developer of the CPA and the CME.

Verifications will be administered and managed by the CME. Verification will be conducted for each CPA independently or grouped. The verification status of each CPA must be registered by the CME in its electronic database.

The CME will update monthly the database described in A.4.4.1 and, in order to avoid double counting, record and keep the verification status available anytime for each CPA. The following is the procedure which will be followed to ensure that no CPAs are double counted:

- Monitoring of electricity will be conducted by the CPA as per section E.7.1. and section E.7.2. below.
- The storage system will include
  - Electronic files.
  - An automatic measurement system e.g. SCADA.
  - Cross-check of information against the information available from the relevant CDEC system (SING or SIC).
- CPAs shall store all the monitoring data (e.g. net electricity generation delivered to the relevant grid by the CPA) which will be provided to the CME monthly
- A data storage system will be managed by the CME which will contain the relevant data for each CPA including the data from the relevant grid i.e. SIC or SING.
- The database information described above will be updated periodically for each CPA.
- CME will prepare a monitoring report by relevant grid, including all the relevant CPAs under the PoA.
- The DOE will be contracted by the CME to carry out verification.
  - Desk review will be performed by the DOE for every CPA according to the CDM validation and verification manual.
- The CME monitoring report must be consistent with the CPA monitoring reports and monitoring plan, this in accordance with the "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*", Procedure for Monitoring the PoA[44].
- The emissions reductions shall be correctly calculated and must be consistent with the CDM-PoA-DD and CDM-CPA-DDs.

A.4.5. Public funding of the programme of activities:

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This Programme of Activities (CDM-PoA) or any CPAs included or to be included under this CDM-PoA does not receive and there are no plans to receive/use funds declared as Official Development Assistance (ODA) from Annex I parties for its implementation[45].

[44] Supporting evidence "SD13 C.h_. PoA procedures Monitoring v.1.pdf" is provided to the DOE.
[45] Supporting evidence "SD93 CME Statement non ODA large scale.pdf" is provided to the DOE

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

>>
01/03/2013

Or the registration date of the PoA, whichever is later.

B.2. Length of the programme of activities:

>>
28 years, 0 months

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

>>

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level ☑

Environmental analysis will be undertaken at a CPA level according to the relevant national legislation in force at the time of its inclusion. The reasons for this decision are:

a) CPAs included under this PoA may comprise several technologies, locations, ownership, start dates and different sizes.
b) Environmental impacts from renewable energy projects are usually carried out locally and are specific to the project
c) Because of the wide range of projects, local environmental assessments and legislation may differ between the CPAs to be included under this PoA.
d) Chilean environmental regulations require environmental impact assessments on a project basis through a public process as set out in the Chilean Environmental Assessment Service (SEA)[46], as shown in section C.3. below.

Therefore, the CME decision to conduct the environmental analysis at CPA level is justified based on the criteria established by the environmental national regulation Law 19.300 “Bases Generales del Medio Ambiente” as described in section C.3. below.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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The documentation required will be the nationally defined environmental impact assessment (DIA, EIA or Relevance Letter) as applicable (see section C.3. below) approved by the Chilean environmental authority (Environment Ministry) which will be conducted at CPA level. Projects with trans-boundary impacts will not be eligible under this proposed PoA. As this PoA is to be developed in the Republic of

[46] http://www.sea.gob.cl/

Chile, by the time being, trans-boundary impacts are not expected to occur. No trans-boundary impacts are expected within each relevant country in the case that the CDM-PoA is extended to the Latin America Region.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

>>

Environmental impact assessments will be carried out at CPA level according to the applicable laws and regulations of the host country (Chile) before the inclusion of the CDM-CPA in the CDM-PoA. The law applicable to a typical CPA under this PoA is as follows:

- Law 19.300[47] "Ley Sobre Bases Generales del Medio Ambiente" Article 10, clauses (a), (b) and (c) as follows:

Projects or activities likely to cause environmental impact, at any of their phases, which should be subject to the System of Environmental Impact Assessment, are:

a) Aqueducts, reservoirs or dams and siphons to be submitted to the authorization established in article 294 of the "Water Code", dams, drainage, dredging, defense or alteration, significant, of water bodies or natural water courses.
b) High voltage Electric Transmissions Lines and substations
c) Power plants greater than 3MW

According to Law 19.300 "Bases Generales del Medio Ambiente" Article 11, all those projects that generate the following effects must submit an Environmental Impact Study:

a) Risk to the health of the population due to the quantity and quality of effluents, emissions or waste
b) Significant adverse effects on the quantity and quality of renewable natural resources, including land, water and air.
c) Resettlement of human communities, or significant alteration of the systems of life and habitats of human groups;
d) Location close to a population, resources and protected areas susceptible to be affected, as well as the environmental value of the land in which the project will be located
e) Significant changes in terms of the magnitude or duration of the scenic or tourist value of an area, and
f) Alteration of monuments, sites with an anthropological, archaeological and historical value, in general, the cultural heritage.

Therefore, all facilities or power plants, irrespective of the type of technology involved, if greater than 3 MW of installed capacity, are subject to the Environmental Assessment Service. The owner of the CPA must submit either an Environmental Impact Declaration or Environmental Impact Study as appropriate. An Environmental Impact Declaration (DIA) for a project is shorter than an Environmental Impact Study (EIA) as it is expected that the environmental impact is lower.

[47] Supporting evidence "SD86 Law 19.300.pdf" is provided to the DOE. Also publicly available at: http://www.leychile.cl/Navegar?idNorma=30667

CPAs below 3MW of installed capacity will require a "Relevance Letter" (Carta de Pertinencia) to be submitted to the national environment authority and sectoral approvals (mainly construction permits).

SECTION D. Stakeholders' comments

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D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at CPA level ✔ ☐

Invitation for consultation/comments from local stakeholders will be conducted at CPA level. The stakeholders will be invited to provide their comments which will be received, compiled and due accounted.

The CME decision to conduct the consultation at a CPA level is justified because CPAs will be typically located in different locations within Chile and as a result, the individual circumstances of each CPA may affect different communities in the implementation area of each CPA.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

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Not applicable. Local stakeholders' consultation will be conducted at CPA level.

D.3. Summary of the comments received:

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Not applicable. Local stakeholders consultation will be conducted at CPA level.

D.4. Report on how due account was taken of any comments received:

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Not applicable. Local stakeholders consultation will be conducted at CPA level.

SECTION E. Application of a baseline and monitoring methodology

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

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Title of the approved baseline and monitoring methodology:

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0) [48]

Reference:

Type I. Renewable Energy Projects. Sectoral Scope: 01, EB 61.

[48] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

ACM0002 is an approved baseline and monitoring methodology.

If the approved methodology is put on hold or withdrawn, for any reason other than for the purpose of inclusion in a consolidated methodology the procedure described in EB55, Annex 38, para. 18 to 21 will apply. Therefore, no new CPAs will be included in the PoA, until a new version of the PoA is validated by a DOE and approved by the CDM Executive Board. Revisions will not be necessary where a methodology is simply revised without initially having been placed on hold or withdrawn.

CPAs that were included in the PoA before the methodology was put on hold or withdrawn will apply the latest version of the PoA-generic CPA-DD at the time of renewing the crediting period.

The last approved versions of methodological tools applied along with ACM0002 (Version 12.3.0) are:

- "Tool to calculate the emission factor for an electricity system" (Version 02.1)[49] (EB63 Annex19).
- "Tool for the demonstration and assessment of additionality" (Version 06.0.0)[50] (EB65 Annex21).
- "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0)[51] (EB66 Annex48) (not applicable)
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)[52] (EB 41 Annex11).

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

>>

This methodology is applicable to the CPAs to be included under this PoA because of the following reasons:

Table 3: Fulfillment of the applicability conditions of ACM0002 (Version 12.3.0)

N°	The applicability criteria of ACM0002 (Version 12.3.0) are the following:	Methodology ACM0002 (Version 12.3.0) is applicable to an CDM-CPA under the proposed CDM-PoA because:	Likely Evidence/Supporting Document

[49] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
[50] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf
[51] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v4.0.0.pdf
[52] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

1	*This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).*	CPAs under this PoA will be renewable energy generation units, grid connected (either to the SING or to the SIC) installing (a) a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); or (b) involve a capacity addition; This criteria is applicable to current and future CPAs to be included under this CDM-PoA (c) and (d) are not applicable under this CDM-PoA	A statement from the CPA Implementer indicating that the power plant will be installation of (a) a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); or (b) involve a capacity addition; and/or Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
2	*The methodology is applicable under the following conditions:* *The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;*	CPAs under this PoA will comprise green-field renewable energy power plants or capacity additions to existing power plants/units only of the following types (as described in Section A.4.2.1. of the CDM-PoA-DD): o a geothermal power plant o a wind farm power plant, on-shore and/or off-shore o a wave/tidal power plant o a solar farm power plant (solar photovoltaic (PV) or concentrated solar power (CSP)) In which a green-field renewable energy power plants is, as per methodology ACM0002 (Version 12.3.0)*"a new power plant at a site where there was no renewable energy*	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

		power plant operating prior to the implementation of the project activity (greenfield plant)"; And a capacity addition corresponds to "*an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units continue to operate after the implementation of the project activity.*" This criteria is applicable to current and future CPAs to be included under this CDM-PoA Hydro power plants are not eligible to be part of this CDM-PoA. Retrofit or replacement of a power plant/unit are not eligible under this CDM-PoA	
3	*In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;*	CPAs under this PoA will comprise green-field renewable energy power plants (as described in Section A.4.2.1.) or capacity additions to existing power plants/units only. In case of capacity additions the existing plant should have started commercial operations prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition of the plant has been undertaken between the start of this minimum historical reference period and the implementation	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or Documents of the electricity delivery of the power plant; and/or Certificate of commercial operation of the existing facility; and/or other documents e.g. engineering studies,

		of the project activity (except for capacity addition CPAs for which the electricity generation of the existing power plant(s) or unit(s) is not affected). This criteria is applicable to current and future CPAs to be included under this CDM-PoA Retrofits and replacements are not eligible to be part of this CDM-PoA.	pre/feasibility studies, etc.
4	*In case of hydro power plants:* • *At least one of the following conditions must apply:* o *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or* o *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or* o *The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity.*	Not applicable as hydro power plants are not eligible to be part of this CDM-PoA.	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.

5	*In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply:* • *The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2;* • *All reservoirs and hydro power plants are located at the same river and where designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant;* • *The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;* • *The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15MW;* • *Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.*	Not applicable as hydro power plants are not eligible to be part of this CDM-PoA.	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, pre/feasibility studies, etc.
6	*The methodology is not applicable to the following:*	Not applicable. Switching from fossil fuels to renewable energy sources, biomass fired power	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or

	• *Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;* • *Biomass fired power plants;* • *A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4 W/m^2.*	plants or hydro power plants are not eligible to be part of this CDM-PoA.	"Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or other documents e.g. engineering studies, FSR, etc.
7	*In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".*	CPAs under this PoA may include the addition of renewable energy generation units at an existing renewable power generation plant. CPA involving capacity additions will be eligible under this PoA only if the most plausible baseline scenario is the continuation of current situation. i.e "*to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance*". This criteria is applicable to current and future CPAs to be included under this CDM-PoA Retrofits and replacements are not eligible to be part of this CDM-PoA	Environmental Impact Study (EIA); Environmental Impact Declaration (DIA) or "Relevance Letter" as applicable; and/or Environmental Approval (Resolución de Calificación Ambiental "RCA"); and/or CPA Implementer statement; and/or other documents e.g. engineering studies, FSR, etc. The baseline scenario (continuation of the current situation) for capacity addition to an existing grid connected renewable power plant/unit is already defined by ACM0002 (Version 12.3.0)

Applicability conditions included in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1); methodological tool "Tool for the demonstration and assessment of additionality"

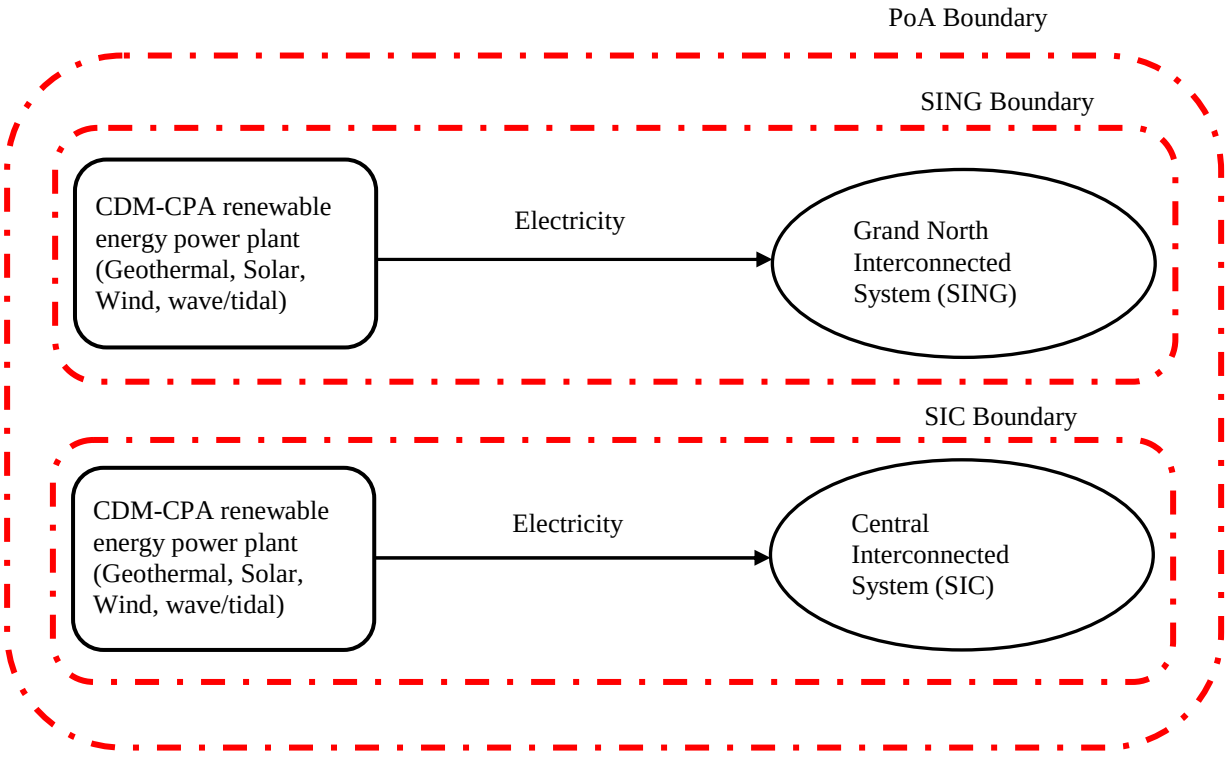
(Version 06.0.0) and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02) may apply.

E.3. Description of the sources and gases included in the CPA boundary

>>

As established in ACM0002 (Version 12.3.0), for each individual CDM-CPA "*The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*". Note that this PoA considers the 2 main electricity grids of Chile to which the CDM-CPA will deliver electricity (see Figure 3. below).

Figure 3: Project boundary of the CDM-PoA.



As it can be seen in the figure above, the grids are unconnected; therefore the CDM-CPA will be connected and delivered electricity either to the SING or to the SIC.

If allowed by the UNFCCC regulations, in the future the CME would like to extend the boundary of the PoA to the Latin America Region. The first CPA will be in Chile.

The greenhouse gases emission sources included in, or excluded from the project boundary are shown in the table 4 below and are identical for each one of the grids described above:

Table 4: Emissions sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Base Line	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	Yes	Main emission source.
		CH_4	Yes	Main emission source.
		N_2O	No	Minor emission source.
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
	The wind farm power plant.	CO_2	No	No emissions are expected from the project activity
		CH_4	No	No emissions are expected from the project activity
		N_2O	No	No emissions are expected from the project activity
	The solar photovoltaic power plant.	CO_2	No	No emissions are expected from the project activity
		CH_4	No	No emissions are expected from the project activity
		N_2O	No	No emissions are expected from the project activity
	The wave/tidal photovoltaic power plant.	CO_2	No	No emissions are expected from the project activity
		CH_4	No	No emissions are expected from the project activity
		N_2O	No	No emissions are expected from the project activity

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

>>

The baseline scenario for all the CPAs to be included under this PoA is the electricity generated in each relevant grid by the existing power plants.

According to the methodology ACM0002 (Version 12.3.0) the following baseline scenario will apply to new grid-connected renewable power plants for each relevant grid:

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"."

Similarly, the following baseline scenario will apply to capacity addition to an existing grid-connected renewable power plants for each relevant grid: "*In the absence of the CDM project activity, the existing facility would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselkineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and no emission reductions are assumed to occur."*

"*Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants".*

For greenfield and capacity addition renewable energy projects, methodology ACM0002 (Version 12.3.0) prescribes the baseline scenario as mentioned above and therefore no further analysis is required.

The baseline emissions will be calculated for each relevant grid as per equation 6 of ACM0003 (Version 12.3.0) as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (6)$$

Where:

BE_y = Baseline emissions in year *y* (tCO2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Under this PoA the CDM-CPAs will be located at 2 different grids. Each of these has its own grid emissions factor. The relevant grid emission factor will be applied on an individual CPA basis according to the location of each CPA. As CPAs under this PoA may include greenfield and capacity addition power plants, the calculation of $EG_{PJ,y}$ will be different for each situation. The calculations will be carried out and will be applicable as per procedures presented in ACM0002 (Version 12.3.0).

For more details about methodological assumptions and baseline emission calculations, please refer to Section E.6.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA): >>

>>

E.5.1. Assessment and demonstration of additionality for a typical CPA:

>>

Each CPA wishing to be part of this CDM-PoA must comply with the eligibility requirements and its additionality must be demonstrated at CPA level in order to be included under this CDM-PoA. A CPA must be in compliance with the additionality assessment by following the required steps described below.

The CPA has to demonstrate additionality by conducting an investment analysis at CPA level in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) in which, as a result, it will be determined whether the proposed project activity is unlikely to be financially/economically attractive without the revenue from the sale of certified emission reductions (CERs). Therefore, demonstrating that in the absence of CDM, the CPAs would not occur.

Under this PoA, additionality is demonstrated at CPA level. In order to assess and demonstrate the additionality for a CDM-CPA under this PoA the EB 65 Annex 21 methodological tool "Tool for the demonstration and assessment of additionality" (Version 06.0.0) will be considered

Conditions:

The CPA under this PoA will generate electricity from different renewable energy technologies, project sizes and grid connections to which the electricity will be delivered.

In order for a CPA to be part of this proposed PoA, the eligibility criteria described in A.4.2.2. must be meet. In order to be considered additional, a CPA has to demonstrate that it meets the requirements established in "Tool for the demonstration and assessment of additionality" (Version 06.0.0) as set out below at the time of its inclusion as a CPA.

A CPA Implementer will apply a renewable crediting period only.

CPA Implementers will demonstrate additionality by conducting an investment analysis at CPA level in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) as follows:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

CPAs will define realistic and credible alternatives to the CPA which provides comparable power output with the proposed CPA.

Sub-step 1a: Define alternatives to the project activity:

According to EB 55 Annex 1 CDM Validation and Verification Manual v 1.2 para. 105, "*The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required.*[53]".

The eligibility criteria of this CDM-PoA states that greenfield renewable energy projects and capacity addition projects will be included in this PoA. For greenfield renewable energy projects, methodology ACM0002 (Version 12.3.0) describes the baseline scenario as follows *"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"*

If the project activity is a capacity addition to existing grid-connected renewable power plant/unit, the baseline scenario is the following: *"In the absence of the CDM project activity, the existing facility would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and no emission reductions are assumed to occur."*

Sub-step 1b: Consistency with mandatory laws and regulations:

The identified baseline scenario is in compliance with all mandatory laws and regulations taking into account the legal framework in Chile and EB decisions. As per the eligibility conditions (Section A.4.2.2.), all CPAs under this PoA must comply with the local laws and regulations.

After the assessment of Step I the CPA shall "*Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both Steps 2 and 3.)*". As barrier analysis is not applicable under this CDM-PoA, CPAs under this CDM-PoA will proceed with Step 2 (Investment Analysis).

Step 2: Investment analysis

If investment analysis is to be performed in order to demonstrate additionality, it is necessary to determine that the proposed CPA is either: "*not the most economically or financially attractive, or not economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)"*.

The "Guidelines on the assessment of investment analysis" (Version 05)[54] shall be taken into account when applying this step.

Sub-step 2a: Determine the appropriate analysis method

Because renewable energy projects will receive other benefits than CDM related incomes (electricity sales), the CME has chosen to use Option III: Benchmark analysis as an alternative to be used to assess and demonstrate additionality for the CPAs.

[53] http://cdm.unfccc.int/Reference/Standards/accr_man01.pdf
[54] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

A commonly used financial indicator in the electricity sector is the internal rate of return (IRR). The IRR will help to demonstrate the existence of an investment barrier when compared against a, benchmark rate e.g. local sectoral (to be determined at CPA level).

Sub-step 2b: Option III. Apply benchmark analysis

The financial/economic analysis will be based on standard market parameters i.e. Project IRR or Equity IRR most suitable for the project type at the time of the CPA investment decision.

Renewable energy projects under the scope of this PoA commonly require high investment expenditure during the construction phase but have relatively low operational and maintenance costs. Their investment horizons are usually 20 years or more. Renewable energy projects are equity investments with a large cash outflow at the beginning and relatively stable cash inflows during their lifetime.

When analysing a renewable energy project, depending on the project context and the information available, CPA investors may conduct either an Equity IRR or a Project IRR as a comparison basis for benchmark analysis.

When a Project IRR is used, local lending rates or the weighted average costs of capital (WACC) will be, for instance, an appropriate benchmark. Similarly, when the Equity IRR is used, the expected return on equity e.g. Capital Asset Pricing Model (CAPM) will be, for instance, an appropriate benchmark. Other benchmarks (e.g. government/official benchmarks, default values UNFCCC benchmarks) may apply as per provisions in the "Guidelines on the assessment of investment analysis" (Version 05) (EB62 Annex5). Discount rates and benchmarks will be derived as per EB65 Annex21 para. 30.

For a typical CPA, valid approaches to determine the benchmark against which the IRR (equity or project) shall be evaluated are presented below:

Approach 1: Financial indicator: Capital Asset Pricing Model (CAPM):

In financial analytics the most widely used approach to determine the required return on equity of an investment is the Capital Asset Pricing Model (CAPM)[55]. The CAPM provides a formalized approach for the requirements of option (a) (EB65 Annex21 para. 30) through:

$$Expected\ Return = Riskfree\ Rate + Beta_{Asset} \times (Equity\ Risk\ Premium)$$

Where:

Expected return (ER)	=	Is the return that an investor expects on its investment as the sum of the risk free rate and a risk premium to compensate for the risk
Riskfree Rate (RFR)	=	Is the expected return of a risk free investment with an investment horizon comparable to the analyzed investment

[55] Supporting evidence "SD107 ERP 2011 Damoradan.pdf" is provided to the DOE. A.Damodaran, 2010. Equity Risk Premiums (ERP): Determinants, Estimations and Implications – The 2011 Edition. Stern School of Business. Is publicly available at: http://people.stern.nyu.edu/adamodar/pdfiles/papers/ERP2011.pdf ; Accessed 29.11.2011.

e.g. long-term default-free (government) bond rate or treasury bonds.

$Beta_{Asset}$ = Is the exposure of an investment to a market risk, beta captures the differences in risk across sectors/companies. i.e. higher betas for riskier investments and vice-versa.

Equity Risk Premium (ERP) = Additional return of asset investment over a riskless investment, e.g. as the geometric average premium for stock over historical data in the US, Germany, France and UK.

In the same document, Damodaran states that the CAPM model understates the expected returns of stocks for small market capitalisation companies and companies with low price-to-book ratios, which may be the case for many renewable energy projects in Chile. ERNC projects in Chile are usually developed by a special purpose company (SPC) which does not own any other assets other than those of the project. For these companies higher equity risk premiums will be obtained when investing in riskier emerging markets (such as Chile) as its risk is not diversified.

As such, equity risk premiums for investments in emerging markets can be calculated as follows:

Equity Risk Premium = Base Premium for Mature Equity Market + Country Risk Premium

Where:

Base Premium for Mature Equity Market = Additional return of asset investment over a riskless investment in a mature market, e.g. as the geometric average premium for stock over historical data in the US, Germany, France and UK.

Country Risk Premium = Premium that reflect the extra risk in a specific market (when compared to a mature market) e.g. sovereign ratings attached to a country by rating agencies.

In general, emerging markets and immature economies may have a reduced availability of reliable and historical data, especially for renewable energy investments which are innovative within the country.

In addition a size premium has to be considered in order to compensate for the additional risk that investors have when investing in smaller companies as well as for the higher returns expected by investors. Empirical evidence suggests that investments in smaller capitalised companies have earned greater historical rates of return than investments in larger capitalised companies over the long-term. The size premium is estimated based on the information contained in the Grabowski, 2011[56], Duff & Phelps Risk Premium Report.

Therefore, the Expected Return CAPM estimate adjusted by a size-premium is as follows:

[56] Supporting evidence "SD108 Grabowski 2011.pdf" is provided to the DOE. The document is publicly available at: http://www.bvresources.com/pdfs/TC030311/BVR-DPRPR11.pdf

Expected Return = Riskfree Rate + $Beta_{Asset}$ x (Base Premium for Mature Equity Market + Country Risk Premium) + Size Premium

Where:

Parameter	Explanation	Source
Expected Return	The expected return is the internal discount rate that an investor uses to evaluate the IRR of a project	Calculated
Riskfree Rate	Is the expected return of a risk free investment with an investment horizon comparable to the analyzed investment	Sovereign country debt long-term: default-free (government) bond rate or treasury bonds
$Beta_{Asset}$	It reflects the exposure of an investment to a market risk, beta captures the differences in risk across sectors/companies. Unlevered betas, and if possible corrected for cash, shall be used as might provide better estimates of costs of equity for undiversified owners	Rating; independent financial expert assessment, official publicly available data If no sufficient and reliable data are available a conservative approach is to set *Beta* = 1
Base Premium for Mature Equity Market	Additional return of asset investment over a riskless investment in a mature market	Rating; independent financial expert assessment, official publicly available data
Country Risk Premium	Premium that reflect the extra risk in a specific market (when compared to a mature market)	Rating; independent financial expert assessment, official publicly available data
Size Premium	Is the risk of investing in a small company	Rating; independent financial expert assessment, official publicly available data

Approach 2: Financial Indicator Weighted Average Cost of Capital WACC

When project IRR is calculated, as per EB 62 Annex 5 para. 12, the WACC is one of the appropriate benchmark rates of return.

The WACC is defined as the average return expected across the different types of capital that finance a given project. Under this PoA WACC may be determined at CPA level. The WACC (after tax) will be calculated as described by Velez-Pareja and Tham, 2009[57]:

$$WACC\ (after\ tax) = K_d \times (1\text{-}T) \times D\% + K_e \times E\%$$

Where:

[57] Supporting evidence "SD109 papers.ssrn.com abstract velez.pdf" is provided to the DOE. The abstract is publicly available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=254587

K_d = Cost of debt before taxes

T = Tax rate

$D\%$ = Percentage of debt on total value (market values)

K_e = Cost of equity

$E\%$ = Percentage of equity on total value (market values)

The cost of equity may be determined as the CAPM as calculated in Approach 1. In all cases, EB 62 Annex 5 will be considered.

The WACC (after tax) will be calculated as follows:

WACC (before tax) = WACC (after tax) / (1-T)

Approach 3: Financial Indicator: Other alternative or modified approaches.

Other reliable sources and approaches may be considered. Alternative approaches shall be comprehensively explained and documented at a CPA level, which can be conducted by independent consultants hired to assess the benchmark or developed by the CME.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

As Option III (benchmark analysis is used), the CDM-CPA-DD shall demonstrate that the CPA has a less favourable indicator (e.g. lower IRR) than the benchmark and therefore the CPA cannot be considered as financially/economically attractive without revenue from the sale of certified emission reductions (CERs).

For the calculation of the relevant IRR an excel spreadsheet will be prepared for each CPA. This will be submitted along with the CDM-CPA-DD to the DOE. All assumptions of critical parameters have to be substantiated with reliable sources or evidence where available. The following table presents key parameters and alternatives for appropriate sources:

Table 5: Key parameters applied in the calculation of the CPA Equity IRR

Parameter	Unit	Source
Total investment	Thousands of United States Dollars	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; quotations for major equipment; purchase orders; other reliable documentation
Equity	Thousands of United States Dollars	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; other reliable documentation
Installed capacity	MW	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; quotations for electro-mechanical or other generating equipment; other

		reliable documentation
Yearly electricity generation	kWh/year	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; other reliable documentation
Plant load factor	%	As per EB 48 Annex 11 (Version 01) para. 3, or (Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; other reliable documentation
Yearly O&M costs	Thousands of United States Dollars / year	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; other reliable documentation
VAT (including fiscal incentives)	%	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; national legislation
Loan payback rates	Thousands of United States Dollars / year	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; bank financing agreement; quotation of loan terms from banks; other reliable documentation
Loan interest rate	%	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; bank financing agreement; quotation of loan terms from banks; other reliable documentation
Electricity feed in tariff (including subsidies and inflation rate adjustments)	Thousands of United States Dollars / kWh	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; electricity sector legislation or official feed-in tariff analysis; Project PPA; feed-in tariff studies by sectoral experts; other reliable documentation
Project lifetime (investment term)	years	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; information provided by technology manufacturer; other reliable documentation

Table 6: Key parameters applied in the calculation of the CPA Project IRR

	Unit	Comment
Technical lifetime	Year	Based on information provided by technology manufacturer, expert opinion or the default values as per EB 50 Annex 15 (Version 01).
Investment decision date	DD/MM/YY	Board minutes and/or financial closure and/or equipment order and/or EPC contract and/or statement provided by the CPA Implementer showing the investment decision date

		(expected); other reliable documentation
Construction start date	Year	EPC contract and/or statement provided by the CPA Implementer showing the construction project start date (expected); other reliable documentation
Date project starts operating	Year	Operation certificate and/or statement provided by the CPA Implementer showing the project operation start date (expected); other reliable documentation
Annual electricity generation	MWh/year	As per calculations using a plant load factor based on EB 48 Annex 11 (Version 01). Value is given according to Sections E.6 and E.7.; engineering studies; other reliable documentation
FINANCIAL PARAMETERS		
	Unit	**Comment**
Electricity tariff	Relevant currency/kWh	Independent studies and/or as per legislation at date of investment or as per PPA (or equivalent document) if signed at the date of investment. The tariff will be indexed to inflation only if specified in the PPA (or equivalent document) or relevant policy; and/or other reliable documentation
Increase in electricity tariff	% per year	
Inflation	% per year	If not otherwise specified, as per inflation rate during the last 5-10 years average from the date when investment decision was made.
Exchange Rate	Relevant currency/(Euros or $US)	If some costs/revenues are provided in foreign currency the exchange rate as per date of investment decision shall be used to convert them into Euros or $US.
COSTS AND EQUIPMENT		
	Unit	**Comment**
Total investments	Relevant currency[58]	If the investment is expected to take place over several years, a yearly breakdown of the investment can be provided. The total investment might include cost components such as (but not limited to): land costs, project development costs (e.g. consultancy fees, license fees, engineering costs), equipment costs, construction costs, etc.
(Other revenues)	Relevant currency/relevant unit	Only if applicable
Operation & Maintenance cost	Relevant currency/year	The O&M costs might include cost components such as (but not limited to)

[58] e.g. $US; EURO; CLP

		management and administrative expenses, labour costs, consumables, equipment maintenance costs (including regular as well major maintenance costs that occur on a less-frequent but periodic basis). These can be sourced from the feasibility study or information provided by technology provider or internally estimated based on third party evidence.
(Other operating expenditure)	Relevant currency/year	Only if applicable
Insurance	% of Capex p.a.	Only if applicable

Generally values that were known at the moment of the investment decision should be used. In most cases this might imply that the feasibility study has to be used. In this regard when the investment analysis is used, all relevant rules contained in EB62 Annex 5 will be considered.

Nevertheless, if more recent and reliable data is available from quotations, purchase orders, financing agreements or PPAs, this data may be used as well.

In order to conduct the financial analysis in one common currency and avoid currency bias, all items denominated in foreign currencies will be converted to $US or EUROS (to be chosen at CPA level) using the average exchange rate during the twelve months preceding the date of the investment decision.

For a specific CPA, the list of parameters used to determine the Equity IRR may be different between CPAs, according to the particular circumstances of the project. In cases where approach 2 or 3, e.g. Project IRR, is followed for the benchmark analysis, the parameter list may be altered (e.g. loan finance is not considered for calculating a Project IRR).

The parameters listed in Table 6 shall be obtained from documents the CPA Implementer provides to financiers or government agencies or third party studies or technology providers or quotations or reliable information for project development purposes. If there is a substantial gap (>1 year) between the date of the investment decision and the date at which the corresponding document was compiled, the respective item will adjusted for the Chilean inflation index (IPC)[59].

The results of the relevant IRR (equity or project) compared to the relevant benchmark will be presented as:

IRR (equity or project) of CPA	
Benchmark	

As a result of the benchmark analysis, it will be clearly demonstrated that the proposed CPA (project) is unlikely to be financially/economically attractive. Therefore, the CER revenues will help the CPA to reach an improved return.

[59] http://encina.ine.cl/calculadoraipc/

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III):

When assessing the sensitivity analysis, EB62 Annex 5 para. 20 and/or 21 as applicable will be considered i.e. variables that constitute more than 20% of either total project costs or total project revenues. For example essential parameters for the profitability of a renewable energy project are the total investment and the electricity price. Other parameters such as O&M costs have only minor impact, as their contribution to the overall costs is small. The assessed variation is +/- 10%.

Table 7: Sensitivity of total investment and electricity price[60].

IRR (equity or project)			
Variable	+10%	0%	-10%
Fixed investment			
O&M Costs			
Energy price			

For a typical CPA, even the most favourable variations, e.g. +10% electricity price and -10% investment will not help the project to reach the required benchmark. Therefore, it can be demonstrated that the CPA is not financially attractive without access to CER revenues.

Step 3: Barrier analysis

Not applicable under this CDM-PoA.*Step 4: Common practice analysis*

Common practice analysis will be carried out according to the methodological tool "Tool for the demonstration and assessment of additionality" (Version 06.0.0).

"Unless the proposed project type has demonstrated to be first-of-its kind (according to Sub-step 3a), and for measures different from those listed in paragraph 6 the above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. This test is a ***credibility check*** *to complement the investment analysis (Step 2) or barrier analysis (Step 3)*

Identify and discuss the existing common practice through the following Sub-steps:

Sub-step 4a:

Analyze other activities similar to the proposed project activity:

Sub-step 4b:

Discuss any similar Options that are occurring:

[60] Variables in this table are not exhaustive and may change in a Project by Project basis.

If Sub-steps 4a and 4b are satisfied, i.e.(i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional).

If Sub-steps 4a and 4b are not satisfied, i.e. similar activities can be observed and essential distinctions between the project activity and similar activities cannot reasonably be explained, the proposed CDM project activity is not additional.

For measures that are listed in paragraph 6 of the Tool:

"Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step;

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled: the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3."

E.5.2. Key criteria and data for assessing additionality of a CPA:

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As described in section E.5.1, all CPAs under this PoA may follow the methodological tool "Tool for the demonstration and assessment of additionality" (Version 6.0.0) in order to assess additionality.

Due to the range of project technologies and grids into which the projects will deliver electricity, key criteria may vary for each CPA. Overall, the key additionality criteria as stated in E.5.1 is Investment Analysis

Investment Analysis

According to section E.5.1 *Step 2: Investment Analysis*, to prove that a CPA is not financially attractive without additional revenues from the sales of certified emission reductions (CERs), the following information and criteria has to be provided and assessed:

1. The applicable benchmark (expected return on equity or project) is calculated and presented in section E.5.1, sub-step 2b. Applied financial indicators must be included with sources.

2. The relevant IRR (equity or project) of the CPA is calculated and presented in section E.5.1, sub-step 2c. The key parameters for the calculation have to be included with sources.
3. A sensitivity analysis on electricity price and total investment as presented in section E.5.1, sub-step 2d has to be presented.
4. The CPA fulfils the additionality criterion, and therefore it is included in the PoA if its IRR (including all realistic scenarios of the sensitivity analysis) is below the benchmark without considering CDM incomes.

Common Practice

According to section E.5.1 *Step 4: Common Practice*, to prove that a CPA is not common practice and that institutional barriers are present, the methodological tool "Tool for the demonstration and assessment of additionality" .(Version 06.0.0) and EB 69 Annex 8 "Guidelines on common practice" (Version 02.0) stepwise approach will be used.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

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The total volume of GHG emissions reductions to be achieved by this proposed PoA is unknown at the time of its registration. The emissions reductions are calculated and monitored for each CPA under this PoA based on the baseline and monitoring methodology ACM0002 (Version 12.3.0) as follows.

Baseline emissions:

The baseline emissions for **greenfield generation** units CPAs, as described in ACM0002 (Version 12.3.0), are the product of the electrical energy baseline expressed in MWh of electricity produced by the relevant renewable generation unit CPA multiplied by the grid emission factor. The calculation procedure is shown in E.6.2.

For CPAs under this PoA involving **capacity addition**, the baseline emissions, as described in ACM0002 (Version 12.3.0), are determined based on the current electricity generation and the historical electricity generation (adjusted by its standard deviation) of the existing renewable power plant/unit. The calculation procedure is shown in E.6.2.

No other capacity addition CPAs other than those described in ACM0002 (Version 12.3.0), are considered under this PoA.

Grid emissions factor:

The grid emission factor calculations are carried out in a transparent and conservative manner, separately, for both the SING and SIC electricity systems.

The grid emission factor is calculated ex-ante at PoA level. Operating Margin (OM), Build Margin (BM), and Combined Margin (CM) are calculated according to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)[61], which defines that "*Project participants shall apply the following six steps:*

STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3. Select a method to determine the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emission factor."

Step 1: Identify the relevant electricity systems

The relevant electric systems included under this PoA to which the CPAs will be connected to are:

1) Central Interconnected System (SIC: Sistema interconectado Central); or
2) Grand North Interconnected System (SING: Sistema Interconectado del Norte Grande)

Please note that these systems are not connected to each other. A detailed description is presented in Section A.4.1.2.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The CME will include grid-connected renewable power plant/units only for the calculation of the operating margin and build margin emission factor. Off-grid power plant/units are not considered.

Option I: Only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The CME use ***ex ante*** values for the estimations of the OM, provided that the calculations is made at PoA level. The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods which are described under Step 4:

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

Under the current Chilean electricity market scenario, the methods that are used to calculate the operating margin by relevant grid under this PoA are:

[61] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

Central Interconnected System (SIC): Simple Adjusted OM (Option B) is currently applicable because low-cost/must-run resources[62] constitute more than 50% of total SIC grid generation according to table 8 as the average of the five most recent years. It is expected that due to the effect of the proposed PoA the share of low-cost/must run generation may increase.

Table 8: Total grid electricity generation in the SIC by Low cost/must run units and others during 2006, 2007, 2008, 2009 and 2010

Total Grid Generation (MWh)	2006	2007	2008	2009	2010	
Low-cost/must run SIC (MWh)	28,567,684	22,905,845	24,416,545	25,531,825	22,364,505	
Other	11,697,837	19,068,814	17,387,782	16,206,186	20,792,219	
Total	**40,265,521**	**41,974,659**	**41,804,327**	**41,738,010**	**43,156,724**	
Total Grid Generation (%)	**2006**	**2007**	**2008**	**2009**	**2010**	**Average %**
Low-cost/must run SIC (%)	70.9	54.6	58.4	61.2	51.8	59.4
Other (%)	29.1	45.4	41.6	38.8	48.2	40.6
Total (%)	100	100	100	100	100	100

Source: Own elaboration based on data from the National Energy Commission (CNE).[63]

Grand North Interconnected System (SING): Simple OM (Option A), is currently applicable because low-cost/must-run resources constitute less than 50% of total grid generation according to table 9 based on the as the average of the five most recent years.

Table 9: Total grid electricity generation in the SING by Low cost/must run units and others during 2007, 2008, 2009, 2010 and 2011

Total Grid Generation (MWh)	2007	2008	2009	2010	2011	
Low-cost/must run SING (MWh)	68,167	67,836	61,863	56,868	44,603	
Other (MWh)	13,877,.613	14,434,509	14,844,587	15,043,147	11,635,739	
Total	**13,945,780**	**14,502,345**	**14,.906,.450**	**15,100,015**	11,680,342	
Total Grid Generation (%)	**2007**	**2008**	**2009**	**2010**	**2011**	**Average (%)**
Low-cost/must run SING (%)	0.5	0.5	0.4	0.4	0.4	0.4
Other (%)	99.5	99.5	99.6	99.6	99.6	99.6
Total (%)	100	100	100	100	100	100

Source: Own elaboration based on data from the National Energy Commission (CNE)

[62] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants

[63] Supporting evidence "SD04 generation_sic_sing.xls" is provided to the DOE. The information is publicly available at: http://www.cne.cl/images/stories/estadisticas/energia/Electricidad/generacion_bruta_sic_sing.xls

The emission factor is calculated using the data vintage ***ex ante***, based on the average of the three year generation weighted average considering the most recent available data at the time of the validation of this PoA. The emission factor is calculated once at the validation stage and then no monitoring or recalculation of the emissions factor will be conducted during the first crediting period.

Step 4: Calculate the operating margin emission factor according to the selected method

The operating margin emission factor is calculated at PoA level according to the relevant grid as follows:

(a) Simple OM ***ex ante*** for Grand North Interconnected System

The simple OM for the SING is calculated by using Option A:

Option A: *Based on the net electricity generation and a CO2 emission factor of each power unit;*

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

However, Option B may be used solely in the case that Option A cannot be applied. At the same time the conditions established by the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) must be fulfilled.

The emission factor for this PoA is determined by choosing Option A1, A2 or A3, in that specific order of preference and data availability.

(b) Simple Adjusted OM ***ex ante*** for Central Interconnected System

The simple OM for the SIC is calculated according to the procedure established in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

Step 5: Calculate the build margin (BM) emission factor

The build margin emission factor is calculated at PoA level according to its relevant Grid and based on the data available at the time of the validation of this proposed PoA.

The build margin is calculated according to vintage data **Option 1** of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) for both the SIC and SING grids. As the PoA will last for 28 years, and every CPA under this PoA may reach a total 21 years crediting period (2 renewals), Option 1 provides different approaches for the BM calculation for each crediting period as follows:

1st crediting period: the BM is calculated ***ex ante***, based on the most recent information available on units already built for sample group *m* at the time of the CDM-CPA submission to the DOE for validation.
2nd crediting period: the BM will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE.
3rd crediting period: the BM emission factor calculated for the 2nd crediting period will be used. The monitoring of the emission factor during the crediting period is not required.

The sample group of the power units *m* used to calculate the BM is determined as per the procedure established in "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). The capacity additions from retrofits will not be included in the calculation of the BM emission factor.

Step 6: Calculate the combined margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on option (a), the weighted average CM for both SING and SIC systems*:*

(a) Weighted average CM

Option (b) Simplified CM is not applicable as Chile is not a LDC, Chile has more than 10 registered CDM projects and the data requirements for step 5 can be met.

Under this PoA, the CPA can be located in and deliver its electricity to one of the following Chilean grids: Interconnected Central System (SIC) or Grand North Interconnected System (SING) and, as a result, the procedures and explanations above will be applicable to each grid separately.

Project emissions

Most of the CPAs to be included under this PoA, irrespective of the grid to which the generated electricity will be delivered, will have zero project emissions (PE_y=0). This will be applicable to solar, wind and wave/tidal renewable energy projects.

However geothermal power plants, may have project emissions different to zero. According to ACM0002 (Version 12.3.0), some project activities may involve project emissions that can be significant (PE_y tCO_2/yr) and then shall be accounted for as project emissions (e.g. combustion in process *j*, when a diesel generator is used as a back-up). These will be assessed according to the procedures described in ACM0002 (Version 12.3.0) baseline and monitoring methodology and as per the procedures described in EB 41 Annex 11 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02).

Based on the data available, Option A or Option B of EB41 Annex 11 can be selected. However, Option A will be the preferred approach. Relevant data and parameters will be monitored accordingly as described in section E.7.

Leakage emissions

According to ACM0002 (Version 12.3.0), "*no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected"*.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a CPA:

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All the calculations in this section are based in the explanation of methodological choices described in Section E.6.1 of this CDM-PoA-DD.

I. Emission Reductions (ER_y) calculation:

Based on the methodology ACM0002 (Version 12.3.0) equation 11, emission reductions are calculated on a CPA-by-CPA basis as follows:

Note: Emissions reductions equation will be applicable to both the SING and SIC grids/systems.

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

ER_y = Emission reductions in year y (t CO_{2e})

BE_y = Baseline Emissions in year y (t CO_2)

PE_y = Project emissions in year y (t CO_{2e})

II. Baseline Emissions (BE_y) calculation

Independent of the grid to which the projects will be connected, greenfield and capacity addition CPAs may apply two methods under this proposed PoA for calculating the baseline emissions based on the methodology ACM0002 (Version 12.3.0) equation 6 as follows:

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (6)$$

BE_y = Baseline emissions in year y (tCO2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the .Tool to calculate the emission factor for an electricity system. (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, and (c) capacity additions. These cases are described next:

(a) Greenfield renewable energy power plants

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then (as per equation 7 of ACM0002 (Version 12.3.0):

$$EG_{PJ,y} = EG_{facility,y} \quad (7)$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh)

(c) Capacity addition to an existing renewable energy power plant

The addition of a new power plant or unit may in some cases affect the electricity generated by the existing plant(s) or unit(s). This applies for example, in the following situation:

- A new geothermal power unit installed next to an existing geothermal energy based power plant may affect the power generation by the existing plant

In other situations, the power plant of the existing plant(s) or unit(s) may not be affected. This applies, for example, in the following situation:

- A new solar power plant installed next to an existing solar power plant may not affect the radiation received by the existing power plant and would therefore not affect the power generation of the existing solar power plant;

The project participants shall use the approach applied to retrofits and replacements above set out in section b. $EG_{facility,y}$ corresponds to the total electricity generation of the existing plant(s) or unit(s) and the added plant(s) or unit(s). A separate metering of electricity fed into the grid by the added plant(s) or unit (s) is not necessary under this option:

$EG_{PJ,y}$ is calculated as per equation 8 and 9 of ACM0002 (Version 12.3.0) as follows:

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical}) \text{; until DATE}_{\text{Baseline Capacity addition}} \quad (8)$$

And

$EG_{PJ,y} = 0$; on/after $DATE_{\text{Baseline Capacity addition}}$ (9)

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh)

$EG_{historical}$ = Annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)

$\sigma_{historical}$ = Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)

$DATE_{\textbf{Baseline}\ \text{Capacity addition}}$ = Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

$EG_{historical}$ is the annual average of historical net electricity generation, delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity. To determine $EG_{historical}$, project participants may choose between two historical periods. This allows some flexibility: the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the most recent years.

Project participants may choose among the following two time spans of historical data to determine $EG_{historical}$:

(a) The five last calendar years prior to the implementation of the project activity; or

(b) The time period from the calendar year following $DATE_{hist}$, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least five calendar years, where $DATE_{hist}$ is latest point in time between:

  (i) The commercial commissioning of the plant/unit;

  (ii) If applicable: the last capacity addition to the plant/unit; or

  (iii) If applicable: the last retrofit of the plant/unit.

In the case where the addition of new capacity does not affect the electricity generated by existing plant(s) or unit(s), the following approach can be used provided that the electricity fed into the grid by the added power plant(s) or unit(s) addition is separately metered:

$$EG_{PJ,y} = EG_{PJ\_Add,y}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG_{PJ\_Add,y}$ = Quantity of net electricity generation supplied to the grid in year *y* by the project plant/unit that has been added under the project activity (MWh)

Project participants should document in the CDM-PDD which approach is applied.

Calculation of DATE ***Baseline*** *Capacity addition*

In order to estimate the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity (*DATE* **Baseline** Capacity addition), project participants may take the following approaches into account:

(a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.;

(b) The common practices of the responsible company regarding replacement/retrofitting schedules may be evaluated and documented, e.g. based on historical replacement/retrofitting records for similar equipment.

The point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

III. Grid emission factor calculation ($EF_{CO2,grid,y}$)

According to section E.6.1, the grid emissions factor is calculated based on the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) at PoA level. The same 6 steps in the calculation procedure (Option (a) ex ante) will be applicable to both relevant grids as follows:

Step 1: Identify the relevant electricity systems

1. Grand North Interconnected System (SING)
2. Central Interconnected System (SIC)

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Not applicable. All CPAs under this PoA will be grid connected renewable power plants.

Step 3: Select a method to determine the operating margin (OM)

1. Simple OM ***ex ante*** for Grand North Interconnected System (SING)
2. Simple Adjusted OM ***ex ante*** for Central Interconnected System (SIC)

Step 4: Calculate the operating margin emission factor according to the selected method

1. Simple OM ***ex ante*** for Grand North Interconnected System (SING)

The Simple Operating Margin (OM) is calculated ***ex ante*** using the equations (1) to (6) (when applicable) of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) as follows:

The Simple OM is calculated using Option A as follows:

Option A - Calculation based on average efficiency and electricity generation of each plant

$$EF_{OMsimple,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (1)$$

Where:

$EF_{OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

As described in E.6.1 the emission factor of each power unit *m* should be determined in the order of preference A1, A2, A3 as follows:

Option A1. If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} * NCV_{i,y} * EF_{CO2,i,y}}{EG_{m,y}} \quad (2)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$, = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power units
i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3

Option A2. If for a power unit *m*, only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3,6}{\eta_{m,y}} \quad (3)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ)
$\eta_{m,y}$ = Average net energy conversion efficiency of power unit *m* in year *y* (ratio)
m = All power units serving the grid in year *y* except low-cost/must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Where several fuel types are used in the power unit, use the fuel type with the lowest CO_2 emission factor for $EF_{CO2,m,i,y}$.

Option A3. If for a power unit *m*, only data on electricity generation is available, an emission factor of *0* tCO_2/MWh can be assumed as a simple and conservative approach.

As described in Annex 3, the following are the results for the parameters used for calculating the operating margin for Grand North Interconnected System (SING):

Table 10: Parameters for Emissions Factor OM 2009, 2010, 2011

Parameter	2009	2010	2011
$\sum_m EG_{m,y} \times EF_{EL,m,y}$ (tCO_2)	11,056,869	11,127,907	12,497,649
$\sum_m EG_{m,y}$ (MWh)	14,844,903	15,043,328	15,817,902
% (2009-2011)	32.5%	32.9%	34.6%

According to these values:

OM_{2009} = (11,056,869tCO_2 / 14,844,903MWh)
OM_{2009} = 0.7448 tCO_2/MWh

OM_{2010} = (11,127,907 tCO_2 / 15,043,328 MWh)
OM_{2010} = 0.7397 tCO_2/MWh

OM_{2011} = (12,497,649 tCO_2 / 15,817,902 MWh)
OM_{20011} = 0.7901 tCO_2/MWh

$OM_{2009\text{-}2011}$ = 0.7448 tCO_2/MWh * 0.325 + 0.7397 tCO_2/MWh * 0.329 + 0.7901 tCO_2/MWh * 0.346
$OM_{2009\text{-}2011}$ = 0.7588 tCO_2/MWh

2. Simple Adjusted OM ***ex ante*** for Central Interconnected System (SIC)

The Simple Adjusted Operating Margin (OM) is calculated *ex ante* using the equation (7) of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) as follows:

$$EF_{grid,OM-adj,y} = (1-\lambda_y) * \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y * \frac{\sum_k EG_{k,y} * EF_{EL,k,y}}{\sum_k EG_{k,y}} \quad (7)$$

Where:

$EF_{grid,OM-adj,y}$	= Simple adjusted operating margin CO_2 emission factor in year y (tCO_2/MWh)
λ_y	= Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EG_{k,y}$	= Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$EF_{EL,k,y}$	= CO_2 emission factor of power unit k in year y (tCO_2/MWh)
m	= All grid power units serving the grid in year y except low-cost/must-run power units
k	= All low-cost/must run grid power units serving the grid in year y
y	= The relevant year as per the data vintage chosen in Step 3

$EF_{EL,m,y}$, $EF_{EL,k,y}$, $EG_{m,y}$ and $EG_{k,y}$ are determined using the same procedures as those for the parameters $EF_{EL,m,y}$ and $EG_{m,y}$ in Option A of the simple OM method above, which were used for the SING system. Off-grid power plant/units are outside the scope of this PoA.

As stated in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) net electricity imports must be considered low-cost/must-run units *k*.

The parameter λ_y is defined as follows:

$$\lambda_y\,(\%) = \frac{Number\ of\ hours\ low-cost/must-run\ sources\ are\ on\ the\ margin\ in\ year\ y}{8760\ hours\ per\ year} \quad (8)$$

Lambda (λy) is calculated according to the following steps:

Step (i) Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the year *y*, and sort the load data from the highest to the lowest MW level. Plot MW against 8760 hours in the year, in descending order.

Step (ii) Collect electricity generation data from each power plant/unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants/units (i.e. $\Sigma_k EG_{k,y}$).

Step (iii) Fill the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low cost/must-run power plants/units (i.e. $\Sigma_k EG_{k,y}$).

Step (iv) Determine the "Number of hours for which low-cost/must-run sources are on the margin in year *y*". First, locate the intersection of the horizontal line plotted in Step (iii) and the load duration curve plotted in Step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, then one may conclude that low-cost/must-run sources do not appear on the margin and λ_y is equal to zero.

In determining λ_y only grid power units (and no off-grid power plants) should be considered

As described in Annex 3, the following are the results for the parameters used for calculating the operating margin for the Central Interconnected System (SIC):

Table 11: Parameters for Emissions Factor OM 2008 2009 2010

Parameter	2008	2009	2010
λ	0.0000	0.0001	0.0065
1 - λ	1.0000	0.9999	0.9935
$\sum_m EG_{m,y} \times EF_{EL,m,y}$ **(** tCO2)	13,506,896	12,976,266	12,401,363
$\sum_m EG_{m,y}$ **(**MWh)	17,400,648	16,206,724	20,797,007
$\sum_k EG_{k,y} \times EF_{EL,k,y}$ (tCO2)	**0**	**0**	**0**

$\sum_k EG_{k,y}$ (MWh)	24,473,304	25,582,990	22,435,769
Annual generation	41,873,952	41,789,714	43,232,776
%(2008-2010)	33.00%	32.93%	34.07%

According with these values:

OM_{2008} = (1.0000 * (13,506,896 tCO_2) / 17,400,648 MWh) + (0.0000 * (0 tCO_2) / 24,473,304 MWh)

OM_{2008} = 0.7762 tCO_2/MWh

OM_{2009} = (0.9999 * (12,976,266 tCO_2) / 16,206,724 MWh) + (0.0001 * (0 tCO_2) / 25,582,990 MWh) =

OM_{2009} =0.8006 tCO_2/MWh

OM_{2010} = (0.9935 * (12,401,363 tCO_2) / 20,797,007 MWh) + (0.0065 * (0 tCO_2) / 22,435,769 MWh) =

OM_{2010} = 0.5924 tCO_2/MWh

$OM_{2008\text{-}2010}$ = 0.7762 tCO_2/MWh * 0.3300 + 0.8006 tCO_2/MWh * 0.3293 + 0.5924 tCO_2/MWh * 0.3407

$OM_{2008\text{-}2010}$ = 0.7216 tCO_2/MWh

Step 5: Calculate the build margin (BM) emission factor

1. Build margin (BM) emission factor for the Grand North Interconnected System (SING)

The build margin emission factor is calculated ex ante using Option 1. This option does not require monitoring the emission factor during the crediting period. Capacity additions from retrofits of power plants are not included in the calculation of the build margin emission factor.

In defining the group of power units *m* that comprises the larger annual generation, the results (for 2011) are:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh):

$SET_{5\text{-}units}$

Table 12: Set of five power units (SING)

Power plant Name	Plant Name	$EG_{m,y}$ (MWh)
Termoeléctrica Hornitos	CTH	668,995

Termoeléctrica Andina	CTA	755,526.8
Termoeléctrica Angamos	ANG1-2	1,988,025.7
Minihidro Alto Hospicio	MHAH	8,272.1
Minihidro el Toro No2	MHT2	8,291.9

$AEG_{SET\ 5\text{-}units}$: 3,429,072 MWh

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh).

Total SING generation = 15,889,183 MWh
CDM projects generation = 0 MWh

(Source: as described in section E.6.3 for *EGm,y* and *EGk,y*)

Then:

AEG_{total} = 15,889,183 MWh

Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh).

The list of power plants and their generation is presented in Annex 3.

$AEG_{SET-\geq 20\%}$ = 3,412,508 MWh

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}). As shown in steps (a) and (b) the larger annual electricity generation. $SET_{5\text{-}units}$, is larger than $SET_{\geq 20\%}$ then:

$SET_{sample} = SET_{5\text{-}units}$

As none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago the sample group of power units m corresponds to SET_{sample} (see Annex 3). The following are the results obtained for the build margin a per equation 12 of "Tool to calculate the emission factor for an electricity system" (Version 02.2.1.) For further details see Annex 3.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (12)$$

$\sum_m EG_{m,y} \times EF_{EL,m,y}$ = 2,981,108 t CO_2

$\Sigma_m EG_{m,y}$ = 3,429,072 MWh

then:

$EF_{grid,BM}$ = 2,981,108 t CO_2 / 3,429,072 MWh.

$EF_{grid,BM}$ = **0.8694** t CO_2/MWh.

2. Build margin (BM) emission factor for the Central Interconnected System (SIC)

The build margin emission factor is calculated ex ante using Option 1. This option does not require monitoring the emission factor during the crediting period. Capacity additions from retrofits of power plants are not included in the calculation of the build margin emission factor.

In defining the group of power units *m* that comprises the larger annual generation, the results (for 2010) are:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh):

$SET_{5\text{-}units}$

Table 13: Set of five power units (SIC)

Power plant Name	$EG_{m,y}$ (MWh)
CBB-Centro	4,190.3
Punta Colorada	7,882.5
San Clemente	7,349.1
Juncalito	1,263.3
El Salvador	297.0

$AEG_{SET\ 5\text{-}units}$: 20,982 MWh

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh).

Total SIC generation = 43,232,776 MWh

CDM projects generation = 1,820,098.8 MWh

(Source: as described in section E.6.3 for *EGm,y* and *EGk,y*)

Then:

AEG_{total} = 43,232,776 MWh - 1,820,098.8 MWh

AEG_{total} = 41,412,677 MWh

Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} and determine their annual electricity generation ($AEG_{SET-\geq 20\%,}$ in MWh).

The list of power plants and their generation is presented in Annex 3.

$AEG_{SET-\geq 20\%,}$ = 8,436,565 **MWh**

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}). As shown in steps (a) and (b) the larger annual electricity generation. $SET_{\geq 20\%}$ is larger than $SET_{5\text{-}units}$, then:

$SET_{sample} = SET_{\geq 20\%}$

As none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago the sample group of power units m corresponds to SET_{sample} (see Annex 3). The following are the results obtained for the build margin per equation 12 of "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). For further details see Annex 3.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (12)$$

$\sum_m EG_{m,y} \times EF_{EL,m,y}$ = 4,791,481 t CO_2

$\sum_m EG_{m,y}$ = 8,436,565 MWh

Then:

$EF_{grid,BM,y}$ = 4,791,481 tCO_2 / 8,436,565MWh

$EF_{grid,BM,y}$ = 0.5687 tCO_2/MWh

Step 6: Calculate the combined margin (CM) emission factor

1. Combined margin (CM) emission factor for the Grand North Interconnected System (SING)

The calculation of the Combined Margin (CM) emission factor ($EF_{grid,CM,y}$) for the Grand North Interconnected System (SING) is conducted at PoA level based on equation 13 of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) as follows:

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{om} + EF_{grid,BM,y} * W_{BM} \quad (13)$$

Where:

$EF_{grid,BM,Y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

  Considering the results presented above:

  $EF_{grid,CM}$, = 0.7588 t CO_2/MWh*0.75+ 0.8694 t CO_2/MWh*0.25

  $EF_{grid,CM}$, = 0.7865t CO_2/MWh

- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

  Considering the results presented above:

  $EF_{grid,CM}$, = 0.7588 t CO_2/MWh *0.5 + 0.8694 t CO_2/MWh*0.5

  $EF_{grid,CM}$, = 0.8141 t CO_2/MWh

2. Combined margin (CM) emission factor for the Central Interconnected System (SIC)

The calculation of the Combined Margin (CM) emission factor ($EF_{grid,CM,y}$) for the Central Interconnected System (SIC) is conducted at PoA level based on equation 13 of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) as follows:

(b) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{om} + EF_{grid,BM,y} * W_{BM} \quad (13)$$

Where:

$EF_{grid,BM,Y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

  Considering the results presented above:

  $EF_{grid,CM,y}$ = 0.7216 t CO_2/MWh*0.75 + 0.5687 tCO_2/MWh *0.25

  $EF_{grid,CM,y}$ = **0.6834** t CO_2/MWh

- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

  Considering the results presented above:

  $EF_{grid,CM,}$ = 0.7216 t CO_2/MWh*0.5 + 0.5687 t CO_2/MWh*0.5

  $EF_{grid,CM,}$ = **0.6451** t CO_2/MWh

IV. Project emissions calculations *(PE_y)*

Most renewable power generation CPAs will have zero project emissions, PE_y = 0. However, some project activities may involve project emissions that can be significant. As defined in the methodology, project emissions are calculated according to equation 1 of the methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0)[64]. These emissions shall be accounted for by using the following equation:

[64] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$ (1)

Where:

PE_y = Project emissions in year *y* (tCO_2e)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO_2)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e).

$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year *y* (tCO_2e)

For CPAs under this PoA, the source of emissions to be considered are those related to geothermal power plants and fossil fuel consumption. The parameter $PE_{HP,y}$ has not been included as hydro power plants are not eligible under this CDM-PoA. The following equation will then be used to determine project emissions:

$PE_y = PE_{FF,y} + PE_{GP,y}$ (1)

Where:

PE_y = Project emissions in year *y* (tCO_2e)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO_2)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e).

The procedure to calculate the project emissions from the sources presented below, as required by ACM0002 (Version 12.3.0), for geothermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$), which is based on the EB 41 Annex 11, where the parameter is called ($PE_{FC,j,y}$).

Emissions from fossil fuel consumption ($PE_{FC,j,y}$)

CO_2 emissions from fossil fuel combustion in process *j* is calculated based on the equation 1 of EB 41 Annex 11, as the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} * COEF_{i,y} \quad (1)$$

Where:

$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year *y* (tCO_2/yr);
$FC_{i,j,y}$ = Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr);
$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i = Are the fuel types combusted in process *j* during the year *y*

In order to calculate the CO2 emission coefficient $COEF_{i,y}$ the CPA implementer can choose one of the following two Options (Option A should be preferred), depending on the availability of data on the fossil fuel type *i*, as follows:

Option A: The CO2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type *i*, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit: $COEF_{i,y} = w_{C,i,y} \times 44/12$ (2)

If $FC_{i,j,y}$ is measured in a volume unit: $COEF_{i,y} = w_{C,i,y} \times \rho_{i,y} \times 44/12$ (3)

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient fuel type i (tCO_2/mass or volume unit);
$w_{C,i,y}$ = Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel);
$\rho_{i,y}$ = Is the weighted average density of fuel type i in year y (mass unit/volume unit of the fuel)
i = Are the fuel types combusted in process j during the year y

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$COEF_{i,y} = NVC_{i,y} \times EF_{CO2,i,y}$ (4)

Where

$COEF_{i,y}$ = Is the CO_2 emission coefficient fuel type i in n year *y* (tCO_2/mass or volume unit);
$NVC_{i,y}$ = Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i = Are the fuel types combusted in process *j* during the year *y*

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

For geothermal project activities, project participants shall account fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam. Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4. In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/bicarbonate

in the cooling water circuit. In addition, parts of the non-condensable gases are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all non-condensable gases entering the power plant are discharged to atmosphere via the cooling tower. Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.

$PE_{GP,y}$ is calculated as follows (equation 2 of ACM0002 (Version 12.3.0):

$$PE_{GP,y} = \left(w_{steam,CO2,y} + w_{steam,CH4,y} \cdot GWP_{CH4}\right) \cdot M_{steam,y} \quad (2)$$

Where:

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e)

$w_{steam,CO2,y}$ = Average mass fraction of carbon dioxide in the produced steam in year *y* (tCO_2/t steam)

$w_{steam,CH4,y}$ = Average mass fraction of methane in the produced steam in year *y* (tCH_4/t steam)

GWP_{CH4} = Global warming potential of methane valid for the relevant commitment period (tCO_2e/tCH_4)

$M_{steam,y}$ = Quantity of steam produced in year *y* (t steam)

V. Leakage calculations *(LE_y)*

According to methodology ACM0002 (Version 12.3.0), no leakage emissions are considered.

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

Based on ACM0002 (Version 12.3.0), the following data and parameters will be reported during the CPA crediting period. Because different technologies are applicable under this PoA, not all the parameters will be reported for each CPA.

Data / Parameters applicable to the SIC

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for grid connected power generation in year *y* for the SIC
Source of data used:	Official records CDEC-SIC webpage operational statistics and yearbooks.
Value applied:	0.6834 for wind and solar power generation project activities 0.6451 for all other projects different to wind and solar power generation project activities.

Justification of the choice of data or description of measurement methods and procedures actually applied :	As per procedures of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)
Any comment:	Fixed value during the 1st crediting period (ex-ante)

Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y*
Source of data used:	Files "Operacion Real Anual" (Real Annual Operation) for 2010, 2009 and 2008[65], available at CDEC-SIC website: https://www.cdec-sic.cl/est_opera_privada.php
Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Is official data provided by the dispatch center from all plants connected to the SIC grid
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	**$EG_{k,y}$**
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y*
Source of data used:	Files "Operacion Real Anual" (Real Annual Operation) for 2010, 2009 and 2008[66], available at CDEC-SIC website: https://www.cdec-sic.cl/est_opera_privada.php
Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Is official data provided by the dispatch center from all plants connected to the SIC grid
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

[65] Supporting evidence "SD81 Op real year 2008.xls"; "SD82 Op real year 2009.xls"; "SD83 Op real year 2010.xls" is provided to the DOE

[66] Supporting evidence "SD81 Op real year 2008.xls"; "SD82 Op real year 2009.xls"; "SD83 Op real year 2010.xls" is provided to the DOE

Data / Parameter:	$FC_{i,m,y}$
Data unit:	T
Description:	Amount of fossil fuel type *i* consumed by power unit *m* in year *y*.
Source of data used:	CDEC-SIC's yearbook: "Estadísticas de Operación 2001-2010"[67], page 68-71, available at https://www.cdec-sic.cl/datos/anuario2011.pdf
Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	"Estadísticas de Operación 2001-2010" is the most recent version available (at the time of submission of the CDM-PoA) of the dispatch center's official publication.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whichever occurs later.

Data / Parameters applicable to the SING

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for grid connected power generation in year *y* for the SING
Source of data used:	Official records CDEC-SING webpage operational statistics and yearbooks.
Value applied:	0.7865 for wind and solar power generation project activities 0.8141for all other projects different to wind and solar power generation project activities.
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per procedures of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)
Any comment:	Fixed value during the 1st crediting period (ex-ante)

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit m in year y
Source of data used:	Yearbook for 2011, 2010 and 2009, available at CDEC-SING website and the operational statistics displayed also in the webpage (*http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*)

[67] Supporting evidence "SD78 Yearbook 2011 CDEC-SIC.pdf" is provided to the DOE

Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is derived from official data provided by the dispatch center from all plants connected to the SING grid
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	**$EG_{k,y}$**
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit k in year y
Source of data used:	Yearbook for 2011, 2010 and 2009, available at CDEC-SING website and the operational statistics displayed also in the webpage (*http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*))
Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is derived from official data provided by the dispatch center from all plants connected to the SING grid
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	T
Description:	Amount of fossil fuel type i consumed by power unit m in year y.
Source of data used:	Yearbook for 2011, 2010 and 2009, available at CDEC-SING website and the operational statistics displayed also in the webpage (*http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_inf_anuario_pub.sp_consu_central_buscar* and *http://www.cdec-sing.cl/html_docs/anuario2011/*)
Value applied:	Data used is presented in Annex 3 and in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The information used in is the most recent version available (at the time of submission of the CDM-PoA) of the dispatch center's official publication.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whichever occurs later.

Data / Parameters applicable to both the SIC and the SING

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ / t
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*.
Source of data used:	"Balance Nacional de Energía 2008", Comisión Nacional de Energía (National Energy Balance 2008, National Energy Commission), datasheet "CUADROA2"[68].
Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation * Fuel Oil = 41.74 Diesel = 43.33 Coal = 27.82 Petcoke = 27.82 Natural Gas = 35.17 LNG = 40.90 *Data provided by the National Energy Commission does not specify if these are net values and then it is assumed to be a gross value. Therefore, values have been amended as per 2006 IPCC Guidelines for National Greenhouse Inventories vol 2 p.1.16.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values from the fuel supplier of the power plants are not available for the project participant. "Balance Nacional de Energia 2008" is the most recent version available (at the time of submission of the CDM-PDD) of the national energy balance. Fuel Oil, Diesel, Coal, Petcoke and Natural Gas are sourced from the National Energy Balance 2008. These values are original expressed in kCal/Kg so they have been adjusted considering a conversion factor of 4.184 to convert kCal/Kg to KJ/Kg. (1 KCal = 4.184 KJ) For LNG default IPCC values were used, as there is no information in the National Energy Balance.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	***$EF_{CO2,i,y}$***
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*.
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied:	Fuel Oil = 0.0755 Diesel = 0.0726 Coal* = 0.0895 Petcoke = 0.0829 Natural Gas = 0.0543

[68] Supporting evidence "SD84 BNE 2008 CNE.xls" is provided to the DOE. The information is publicly available at: http://www.cne.cl/images/stories/estadisticas/raiz/BNE2008.xls

	LNG = 0.0583 * The type of coal according to table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is "other bituminous coal"
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values from the fuel supplier of the power plants (in invoices) are not available for the project participant. There are no regional or national average default values in the energy statistics/energy balance.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	$EF_{CO2,m,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*.
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied:	Fuel Oil = 0.0755 Diesel = 0.0726 Coal* = 0.0895 Petcoke = 0.0829 Natural Gas = 0.0543 LNG = 0.0583 * The type of coal according to table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is "other bituminous coal"
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values from the fuel supplier of the power plants (in invoices) are not available for the project participant. There are no regional or national average default values in the energy statistics/energy balance.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit m in year k.
Source of data used:	Default values provided in Annex 1 of "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).
Value applied:	Oil (Open cycle, new) 39.5% CFBS (old) 36.5% Natural Gas (Open Cycle, new) 39.5%
Justification of the choice of data or	The diesel power plants for which only data on electricity generation and fuel type is available started operation after 2000.

description of measurement methods and procedures actually applied :	The only plant with CFBS system for which only data on electricity generation and fuel type is available was constructed before 2000. The only natural gas fired power plant for which only data on electricity generation and fuel type is available was constructed after 2000.
Any comment:	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter:	$EG_{historical}$
Data unit:	MWh
Description:	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data used:	To be specified for each CPA
Value applied:	To be specified for each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be specified for each CPA
Any comment:	Only for CPAs that involve a capacity addition to an existing renewable energy plant/unit.

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh
Description:	Standard deviation of the annual average historical net electricity generation supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data used:	Calculation
Value applied:	To be specified for each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be specified for each CPA
Any comment:	Only for CPAs that involve capacity addition to an existing renewable energy plant/unit.

Data / Parameter:	$DATE_{BaselineCapacityAddition}$
Data unit:	Date
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity
Source of data used:	To be specified for each CPA
Value applied:	To be specified for each CPA

Justification of the choice of data or description of measurement methods and procedures actually applied :	To be specified for each CPA
Any comment:	Only for CPAs that involve capacity addition to an existing renewable energy plant/unit.

Data / Parameter:	GWP_{CH4}
Data unit:	tCO2e/tCH4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	For the first commitment period: 21 tCO2e/tCH4
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurements are required
Any comment:	Only applicable to geothermal CPAs.

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each CPA:

Based on ACM0002 (Version 12.3.0), the following data and parameters will be monitored during the CPA crediting period. Because different technologies are applicable under this PoA, not all the parameters are going to be monitored for each CPA.

Data / Parameter:	**$EG_{facility,y}$** (for capacity additions the parameter is called $EG_{PJ\ Add,y}$)
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*. In the case of capacity addition CPAs, it is the quantity of net electricity generation supplied to the grid in year *y* by the project plant/unit that has been added under the project activity
Source of data to be used:	Measured by electricity meter(s) at the electricity delivery point or other defined by the grid operator (e.g. project site)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each CDM-CPA-DD
Description of measurement methods and procedures to be applied:	To be measured continuously and electronically recorded and consolidated on a daily basis and aggregated/recorded monthly. Monitoring frequency and accuracy/precision provisions will be in compliance

	with the applicable regulation[69] and/or relevant industry standards. These will be specified at CPA level. As described in Section III. Monitoring methodology of the ACM0002 (Version 12.3.0) "*All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.*". In addition all data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the last verification date, whatever occurs later.
QA/QC procedures to be applied:	The measurements will be cross checked with records of the electricity sold Calibration and failure procedure provisions for metering equipment will be will be in compliance with the applicable regulation and/or relevant industry standards. These will be specified at CPA level.
Any comment:	$EG_{PJ\ Add,y}$ will be applicable to wind, solar, geothermal, wave or tidal power plant(s) or unit(s), provided that option 2 (capacity addition) in the baseline methodology is applied.

The following parameters only have to be monitored for CPAs considering geothermal power projects as described Based on ACM0002 (Version 12.3.0).

Data / Parameter:	$\mathbf{w_{steam,CO2,y}}$
Data unit:	tCO_2/t steam
Description:	Average mass fraction of carbon dioxide in the produced steam in year *y*
Source of data to be used:	Project activity site (To be specified in each CDM-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each CDM-CPA-DD
Description of measurement methods and procedures to be applied:	Non-condensable gases sampling should be carried out in production wells and at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO2 and CH4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. Hydrogen sulphide (H2S) and carbon dioxide (CO2) dissolve in the solvent while the residual compounds

[69] Supporting evidence "SD20 NTSyCS updated 2010.pdf" is provided to the DOE. Publicly available at: https://www.cdec-sic.cl/imagenes/contenidos/File/NTSyCS_actualizada_2010.zip

	remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH4. All alkanes concentrations are reported in terms of methane
QA/QC procedures to be applied:	-
Any comment:	Applicable to geothermal power projects

Data / Parameter:	$w_{steam,CH4,y}$
Data unit:	tCH_4/t steam
Description:	Average mass fraction of methane in the produced steam in year *y*
Source of data to be used:	Project activity site (To be specified in each CDM-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each CDM-CPA-DD
Description of measurement methods and procedures to be applied:	As per procedures outlined for $w_{steam,CH4,y}$
QA/QC procedures to be applied:	-
Any comment:	Applicable to geothermal power projects

Data / Parameter:	$M_{steam, y}$
Data unit:	t steam
Description:	Quantity of steam produced in year *y*
Source of data to be used:	Project activity site (To be specified in each CDM-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each CDM-CPA-DD
Description of measurement methods and procedures to be applied:	The steam quantity discharged from the geothermal wells should be measured with a venture flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the venture meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on international standards. The measurement results should be summarized transparently in regular production reports
QA/QC procedures to be applied:	-
Any comment:	Applicable to geothermal power projects

Based on ACM0002 (Version 12.3.0) and EB 41 Annex 11 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02), the following data and parameters will be monitored during the CPA crediting period. Please note that these parameters will be monitored solely for CPAs which have fossil fuel combustion as described in sections E.6.1 and E.6.2.

Data / Parameter:	$\mathbf{FC_{i,j,y}}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *j* during the year *y*
Source of data:	Onsite measurements
Measurements procedures (if any):	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

Data / Parameter:	$\mathbf{w_{C,i,y}}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply: Data Source: a) Values provided by the fuel supplier in invoices — Conditions for using the data source: This is preferred source Data Source: b) Measurements by the project participants. — Conditions for using the data source: If a) is not available

Measurements procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used

Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is preferred source
b) Measurements by the project participants.	If a) is not available
c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)

Measurements procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	
Any comment:	Applicable where Option A is used and where $FC_{i.j.y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m³, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

	<table><tr><td>Data Source</td><td>Conditions for using the data source</td></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is preferred source</td></tr><tr><td>b) Measurements by the project participants.</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</td><td>If a) is not available</td></tr></table>
Measurements procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option B is used

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply: <table><tr><td>Data Source</td><td>Conditions for using the data source</td></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is preferred source</td></tr><tr><td>b) Measurements by the project participants.</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default</td><td>If a) is not available</td></tr></table>

	values	These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances)
	d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	If a) is not available
Measurements procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards	
Monitoring frequency:	For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account	
Any comment:	Applicable where option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.	

E.7.2. Description of the monitoring plan for a CPA:

>>

The monitoring plan will be carried out according to the approved consolidated baseline and monitoring methodology ACM0002 (Version 12.3.0) . The monitoring plan will be implemented to ensure that real, measurable and long term GHG emissions reductions for each CPA are monitored and reported. 100% of the data will be monitored as applicable if not indicated otherwise in the tables in section E.7.1., as stated in ACM0002 (Version 12.3.0). Each CPA will be verified in a transparent system that ensures that no double counting occurs and that the status of verification can be determined anytime for each CPA.

The aim of the monitoring plan is to measure the net electricity delivered to the local electricity grid by each CDM-CPA. A detailed description of the monitoring plan will be presented at CPA level, the monitoring plan outlines the principles which shall be followed in the monitoring of the parameters listed in section E.7.1 in order to ensure real, measurable and long-term greenhouse gas (GHG) emission reductions for the proposed project activity are monitored and reported. The monitoring plan will be structured as follows:

1) Management structure and responsibilities:

For a typical CPA[70] the management structure and responsibilities are as follows:

CME: The CME in relation to the monitoring process will be responsible for monitoring data collection and storage, data security, backup and recovery from each CPA included under this CDM-PoA, as well as the preparation of PoA monitoring reports (in accordance with the collected data), data checking, review of monitoring and reporting procedures and processes, coordination with the CPA implementer, DOE and DNA[71]. Therefore, as shown in the "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*" there is a standardised and consistent approach for all CPAs under this PoA.

General Manager: will be responsible, at CPA level, for the supervision of the entire monitoring procedure and coordination of managers. The General Manager may also report to the CME.

CDM Project Manager: will be, at CPA level, responsible for the correct implementation of the procedures and processes, ensuring that all the personnel participating in the CDM tasks are properly trained and maintaining coordination with the CME. Before the commissioning, the CPA implementer will designate a CDM Project Manager, who will also be the responsible person to manage, analyse and report to the CME and to the General Manager the monitoring data on a monthly basis.

Operational and Monitoring Manager: will be responsible for on-site staff training, and on-site staff and control of monitoring procedures, collecting data, carrying out internal audit and ensuring the correct maintenance and operation of the measuring and monitoring equipment, including the existence of appropriate calibration certificates. It will report to the CDM Project Manager.

Financial Manager: will be responsible for collection of electricity sales receipts and any other receipt that may apply (e.g. fossil fuel purchase). It will report to the CDM Project Manager and General Manager.

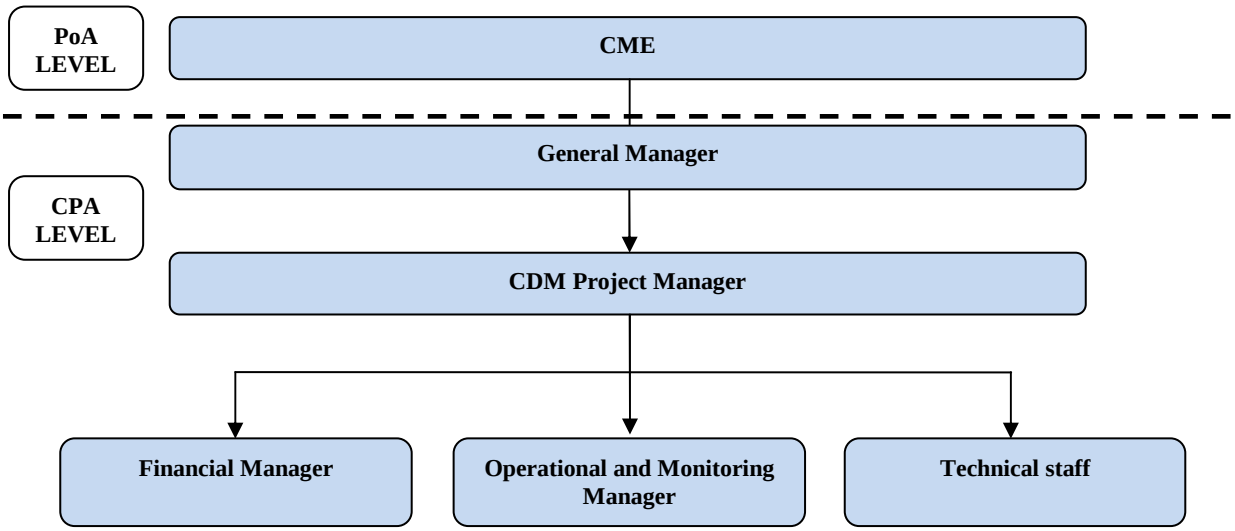
Technical Staff: will be responsible for day-to-day operation and maintenance of the facility, monitoring duties on-site, preparing operational reports, recording daily operation, etc. It will report to the Operational and Monitoring manager.

The following management structure and responsibilities are established:

[70] Some structure changes may exist based on CPA specific conditions impossible to identify beforehand. Positions defined are not exhaustive and job titles may change in a CPA to CPA basis.

[71] Operational Procedures of the "*Less Carbon Coordinating Managing Entity (CME) Procedures Manual*" and additional supporting evidence is provided to the DOE (the supporting evidence SD13; SD14; SD15; SD16; SD17; SD18; SD19 is provided to the DOE.

Figure 4: Management structure and responsibilities for the project activity.



At the beginning of the project implementation extensive initial training will be provided to the staff, either by technology provider or technical experts, especially in the matters referred in this section E.7.2. Similarly, new staff will also receive extensive initial training.

In addition all the staff involved in CDM related tasks and specially in the monitoring process will be suitably qualified and trained annually in the operation and maintenance of the plant (relevant CPA). They will also receive a training session on the application of the monitoring plan including data management, data analysis, reporting the monitored data, data collection, internal audit, maintenance and operation of the measuring and monitoring equipment, calibration, sales receipts, day-to-day operation and maintenance of the facility, operational reports, and recording.
A written procedure must be set up at CPA level prior to its commissioning. The CME will ensure that all CPAs under the PoA have the same standardized monitoring report in order to make the process transparent and to facilitate the verification process. Written procedures to be implemented at CPA level are as follows:

i. CDM staff training procedure
ii. Data collection, recording & storage procedure
iii. Data QC&QA procedure
iv. Metering equipment failure procedure
v. Metering equipment calibration procedure
vi. Metering equipment maintenance procedure
vii. Verification procedure

The CPA implementer has overall responsibility for the monitoring and reporting to the CME of all parameters at the project site. The main parameter to be monitored is the net electricity generation

(MWh) supplied by the CPA to the grid, however other parameters may need monitoring as per the type of technology used, as described in section E.7.1. Those data/parameters will be defined at CPA level.

The monitoring procedures, data management, equipment calibration and maintenance schedules will be part of the operational procedures of each CPA, and will comply with the relevant national standards as described in section E.7.1.

2) Quality assurance and quality control (QA/QC):

The grid operator common regulation requires the CPA to comply with quality assurance procedures for energy measurement and meter calibration as described in E.7.1. Periodic checks can be made by the grid operator according to the relevant national standards and regulations. Data measured by the meter will transmitted in real time to the relevant grid operator (either the CDEC-SING or CDEC-SIC). Thus, the project implementer and grid operator have access simultaneously to the information which is used for invoicing and commercial purposes. Values will be cross checked against measurements results with records for electricity sales (invoices) or official information available from the CNE or the relevant grid operator monthly statistics (either the CDEC-SING or CDEC-SIC). The SING or SIC are not interconnected neither connected to other grids so there are neither exports nor imports to be considered.

At a CPA level, the number of meters will be at least 1. Electricity meter will have a precision ANSI Class 2 (2% error or less) in compliance with Chilean applicable regulation and the meter will be calibrated at appropriate intervals according to manufacturer specifications and/or Chilean regulations and/or grid operator regulations (relevant industry standards) as applicable. The standards applied by the relevant grid operator will prevail over any other standards. A dedicated electricity meter will be installed. The CDM Project Manager will provide the CME with the calibration certificates.

In case of the failure of metering equipment, procedures for equipment failure described in the national regulations (section 6-12 of NTSyCS) will apply.

3) Data collection, recording & storage procedure:

In order to secure accurate and timely collection of all the relevant data for a CPA under this PoA, the energy data used for billing purposes will be also used for CDM purposes. The electricity supplied by a CPA to the grid will be measured by a calibrated electricity meter. The parameters will be monitored at the electricity delivery point to the relevant grid (either SIC or SING) or other point defined by the grid operator. The data monitored of the net electricity generation (MWh) will be archived electronically and kept for at least 2 years after the end of the last crediting period, or the last verification date for the project, whatever occurs later. The CDM Project Manager will cross check the monitoring results with the invoices of the electricity sales. Data relating to the net electricity supplied by the project activity to the grid (MWh) will be monitored continuously, electronically recorded and consolidated on a daily basis and aggregated monthly. As a backup, soft and hard copies of the data will be also stored at the CPA's office in order to be available for the CME and DOE. In addition, the measures which are responsibility of the CME will also apply.

The day-to-day procedure for record handling will be implemented for each CPA. It will consist of automatic registration of the net electricity data supplied by the project activity to the grid (MWh) and automatically sent to an internal software system (e.g. SCADA). At the same time, the data measured by the meter will be transmitted in real time to the grid operator in accordance with national procedures and

standards "Norma Técnica de Seguridad y Calidad de Servicio" (NTSyCS), National Energy Comission (Comisión Nacional de Energía) [72] as described in Section E.7.1. If applicable, other data/parameters to be monitored will follow the procedures, frequency and QA/QC procedures described in EB41 Annex11.

4) Monitoring data

As defined in section E.7.1., monitoring data will be monitored on a CPA-by-CPA basis in which specific conditions may apply based on the renewable energy technology to be implemented.

The energy meter will be installed at the connection point to the relevant grid and/or at a point defined by local authorities and/or relevant standards in the industry.

The CPA Implementer will deliver electricity to the relevant grid on a continuous basis using an online remote system as requested by local regulations. Aggregated data of total energy delivered to the grid will be sent to the relevant load and dispatch centre (SIC or SING) for billing purposes which is also key for monitoring and verification purposes. At the same time the CPA Implementer will keep the monthly reports issued by the relevant load and dispatch centre for billing purposes as well as the relevant sale & purchase invoices.

For avoidance of any doubt for CDM purposes, the energy data used will be equal to the data informed for energy billing purposes based on the electricity delivered to the relevant system. The CME will verify the data to secure the accuracy, reliability and availability of the relevant information as described in the relevant Operational Procedures of the CME procedures manual described in point 1) of this section.

The meter (s) will be calibrated by manufacturers or authorised entities complying with the relevant standards in the industry. The monitoring generation data will be stored electronically in a monthly basis. Both digital and hard copy backup (paper folder) will be created. This documentation will be properly stored in a designated area along with the relevant monitoring plan.

The monitoring information data will be aggregated by the CME to facilitate the efficient verification of the PoA by the DOE.

5) Verification and monitoring results:

All measurements will be conducted by using calibrated measurement equipment according to relevant industry standards. Particular conditions may apply depending on the technology to be implemented at CPA level.

The CPA Implementer will be responsible for the implementation of the monitoring plan. The intention of the plan is to properly collect record and store the monitored information, which shall be complete, consistent, clear and accurate.

[72] Supporting evidence "SD20 NTSyCS updated 2010.pdf" is provided to the DOE. Publicly available at: https://www.cdec-sic.cl/imagenes/contenidos/File/NTSyCS_actualizada_2010.zip

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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Date of completion: [18/04/2012]

The baseline and monitoring sections have been prepared by Carbon Capital Inc. & Cia. Ltda. Carbon Capital Inc. & Cia. Ltda. is a project participant and the Coordinating Managing Entity (CME) responsible for developing and implementing this PoA

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Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

THIS PROGRAMME OF ACTIVITIES (CDM-POA) OR ANY CPAS INCLUDED OR TO BE INCLUDED UNDER THIS CDM-POA DOES NOT RECEIVE AND THERE ARE NO PLANS TO USE FUNDS DECLARED AS OFFICIAL DEVELOPMENT ASSISTANCE (ODA) FROM ANNEX I PARTIES FOR ITS IMPLEMENTATION

Annex 3

BASELINE INFORMATION

DETERMINATION OF GRID EMISSION FACTOR FOR THE SIC

- **Build Margin 2010**

The values used for the determination of the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh) are the following:

Generation of power units registered as CDM project activities

POWER PLANT		Generation 2010 (MWh)
FPC + FPC 2	CDM2264	90,548.0
Nueva Aldea 3	CDM0346	192,852.8
Valdivia	CDM1787	225,085.6
Chacabuquito	CDM1052	136,617.0
Quilleco	CDM1265	387,240.0
Hornitos	CDM1374	195,559.4
Puclaro	CDM1267	24,379.0
Ojos de Agua	CDM0937	49,804.6
Lircay	CDM2417	121,946.1
La Paloma	CDM3791	5,713.8
La Higuera	CDM0248	168,757.8
Canela	CDM1958	28,375.2
Lebu (Cristoro)	CDM3527	6,799.6
Totoral (eólica)	CDM3252	84,686.1
Nueva Aldea 1	CDM0258	93,908.8
Loma Los Colorados (KDM)	CDM0822	82,790.6
total		1,820,098.8

Total SIC generation = 43,232,776 MWh
CDM projects generation = 1,820,098.8 MWh
Then:

AEG_{total} = 41,412,677 MWh

The following table shows the generation of the power plants included in the BM.

Build Margin Power Units. Accumulated Generation (MWh)

	Name	Start operation	$EG_{m,y}$ (MWh)	%	% accumulated	$EF_{ELm,y}$ (tCO_2/MWh)	EG x $EF_{EL\ m,y}$	
SET $_{5\text{-units}}$	CBB-Centro	2010	4,190.3	0.010%	0.01%	0.6617	2,773	
	Punta Colorada	2010	7,882.5	0.019%	0.03%	0.6617	5,216	
	San Clemente	2010	7,349.1	0.018%	0.05%	0.0000	0	
	Juncalito	2010	1,263.3	0.003%	0.05%	0.0000	0	
	El Salvador	2010	297.0	0.001%	0.05%	1.0071	299	
SET $_{\geq 20\%}$	Campanario 4	2010	2,283.5	0.006%	0.06%	0.7819	1,785	
	Colihues	2010	22,127.4	0.053%	0.11%	0.6617	14,641	
	Emelda	2010	1,186.4	0.003%	0.11%	0.6617	785	
	La Paloma	2010						CDM3791
	Loma Los Colorados (KDM)	2010						CDM0822
	Guacolda 4	2010	1,036,581.4	2.503%	2.50%	0.7838	812,477	
	Nueva Ventanas	2010	1,998,142.0	4.825%	7.33%	0.9289	1,856,080	
	Orafti	2009		0.000%	7.33%		0	
	Trueno	2010	19,914.9	0.048%	7.38%	0.0000	0	
	Los Corrales	2010	171.4	0.000%	7.38%	0.0000	0	
	Doña Hilda	2010		0.000%	7.38%		0	
	Dongo	2010		0.000%	7.38%		0	
	Monte Redondo	2010	82,790.6	0.200%	7.58%	0.0000	0	
	Totoral	2010	84,686.1	0.204%	7.78%	0.0000	0	
	PMGD Planta Curicó	2009	498.6	0.001%	7.78%	0.8262	412	
	Canela 2	2009	122,611.3	0.296%	8.08%		0	
	Termopacífico	2009	19,786.4	0.048%	8.13%	0.6617	13,092	
	San Lorenzo de D. De Almagro	2009	309.2	0.001%	8.13%	1.7904	554	
	Truful Truful	2009	892.8	0.002%	8.13%	0.0000	0	
	Tapihue	2009	1,049.8	0.003%	8.13%	0.4949	520	
	Guacolda 3	2009	1,199,068.0	2.895%	11.03%	0.9092	1,090,210	
	El Peñón	2009	57,733.7	0.139%	11.17%	0.6674	38,531	
	Quintero	2009	262,713.0	0.634%	11.80%	0.3256	85,532	
	Tierra Amarilla	2009	2,180.7	0.005%	11.81%	1.0696	2,332	
	Louisiana Pacific	2009	0.4	0.000%	11.81%	0.6617	0	
	Multiexport I	2009	0.0	0.000%	11.81%	0.6617	0	
	Multiexport II	2009	0.0	0.000%	11.81%	0.6617	0	
	Watts	2009	0.0	0.000%	11.81%	0.6617	0	
	Pehui	2009	7,115.0	0.017%	11.82%	0.0000	0	
	Newen	2009	38,789.9	0.094%	11.92%	0.1191	4,620	
	Teno	2009	58,042.1	0.140%	12.06%	0.6736	39,098	
	Chuyaca	2009	5,464.6	0.013%	12.07%	0.7987	4,365	
	Santa Lidia	2009	49,516.3	0.120%	12.19%	0.8166	40,434	
	Los Pinos	2009	174,311.0	0.421%	12.61%	0.6637	115,688	
	Cenizas	2009	26,865.8	0.065%	12.68%	0.1152	3,096	
	Biomar	2009	1.8	0.000%	12.68%	0.6617	1	
	Salmofood I	2009	0.0	0.000%	12.68%	0.6617	0	
	Salmofood II	2009	75.5	0.000%	12.68%	0.6617	50	
	Eagon	2009	14.5	0.000%	12.68%	0.6617	10	
	Los Espinos	2009	14,201.4	0.034%	12.71%	0.6719	9,542	
	Lircay	2009					0	CDM2417
	San Gregorio	2009	264.6	0.001%	12.71%	0.7073	187	
	Linares Norte	2009	142.3	0.000%	12.71%	0.7579	108	
	Trapén	2009	42,689.8	0.103%	12.81%	0.6572	28,057	
	Lebu (Cristoro)	2009					0	CDM3527
	Chiloé	2008	1.1	0.000%	12.81%	0.8653	1	
	Olivos	2008	4,019.0	0.010%	12.82%	0.7125	2,863	
	Quellon II	2008	14,396.3	0.035%	12.86%	0.7056	10,157	
	Colmito	2008	1,108.1	0.003%	12.86%	0.6617	733	
	Placilla	2008	1,120.7	0.003%	12.86%	0.6369	714	
	Quintay	2008	935.2	0.002%	12.87%	0.6958	651	
	Skretting	2008	59.4	0.000%	12.87%	0.6617	39	
	Totoral	2008	429.0	0.001%	12.87%	0.6458	277	
	FPC + FPC 2	2007-2009					0	CDM2264
	Nueva Aldea 3	2008					0	CDM0346
	Coya	2008	83,303.9	0.201%	13.07%	0.0000	0	
	El Manzano	2008	27,498.1	0.066%	13.13%	0.0000	0	
	Hornitos	2008					0	CDM1374
	Ojos de Agua	2008					0	CDM0937

	Puclaro	2008					0	CDM1267
	San Isidro II	2007-2008	2,950,490.0	7.125%	20.26%	0.2073	611,552	
		Total	8,436,565		20.26%		4,797,481	

Sources: (1) Source: SD78 Yearbook 2011 CDEC-SIC.pdf ("Estadísticas de Operación 2001-2010" CDEC-SIC), page 68-71

(2) Source: Files Real Annual Operation ("Operación Real Anual"), CDEC-SIC. Supporting documents SD79 Op real year 2006.xls; SD80 Op real year 2007.xls; SD81 Op real year 2008.xls; SD82 Op real year 2009.xls; SD83 OP real year 2010.xls are provided to the DOE

(3) Calculations are presented on the Operation Margin calculations (2010). Supporting evidence "EF-SIC calculation 2010 20 12 2012.v.1.2.xlsx" is provided to the DOE.

$$\sum_m EG_{m,y} \times EF_{EL,m,y} = \mathbf{4,797,481\ tCO_2}$$

$$\sum_m EG_{m,y} = \mathbf{8,436,565\ MWh}$$

- **Operating Margin**

To display how the operating margin is calculated, the Simple Adjusted Method calculations for year 2010 are described:

Power plants with option A1:

Name	$EG_{m,y}$ (MWh)	NG (mm m^3)	Diesel (m ton)	Coal (m ton)	Fuel Oil	Petcoke (m ton)	GNL (mm m^3)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Antilhue_TG	71742		18.5					0.8124	58,285
Bocamina	215770		0.0	82				0.9463	204,179
Campanario	25,963	0	6.5					0.7819	20,301
Candelaria	184,596	29	26.8					0.6789	125,313
Cañete	730.3		0.2					0.8183	598
Casablanca	221.42		0.2					2.5611	567
Cenizas	26865.8		1.0					0.1152	3,096
Chiloé	1.1		0.0					0.8653	1
Chuyaca	5464.6		1.4					0.7987	4,365
Collipulli	642.8		0.1					0.6922	445
Concon	406.44		0.2					1.3952	567
Constitución 1	1887		0.4					0.7177	1,354
Curacautin	1545.1		0.4					0.7367	1,138
Curanilahue	51.8		0.0					0.0000	0
Curauma	480.03		0.2					1.0513	505
D. Almagro	442		0.2					1.3521	598
Degan	41051.16		8.7					0.6697	27,491
El Peñón	57733.7		12.3					0.6674	38,531
El Salvador	297		0.1					1.0071	299
Esperanza	1,838		0.4					0.7294	1,341
Guacolda 1	1138228			439				0.9602	1,092,979
Guacolda 2	1109142			423				0.9503	1,054,057
Guacolda 3	1199068			438				0.9092	1,090,210
Guacolda 4	1036581.4			326				0.7838	812,477
Horcones	6572.9	0	3.3					1.5907	10,456
Huasco TG	1,069		1					1.8313	1,958
Huasco TV	0			0					0
L.Verde TG	4211		1.03					0.7723	3,252
Las Vegas	673.31		0.1					0.6398	431
Lebu	55.9		0.0					0.5627	31
Linares Norte	142.29		0.0					0.7579	108
Los Espinos	14201.4		3.0					0.6719	9,542
Los Pinos	174311		36.8					0.6637	115,688
Los Sauces	1106.7		0.2					0.6821	755
Los Vientos TG	49179.66		14.0					0.8960	44,064
Maule	646.7		0.1					0.6070	393
Monte Patria	172.4		0.0					0.6589	114
Nehuenco	873228	40	111.2					0.4648	405,858
Nehuenco II	2526732	140	252.9					0.3931	993,148

Nehuenco TG 9B	7,208	2	0.2					0.3884	2,799
Newen	38,790		1.5					0.1191	4,620
Nueva Renca	1913014.92	0	227.2				116	0.4387	839,304
Nueva Ventanas	1,998,142.00			745				0.9289	1,856,080
Olivos	4019		0.9					0.7125	2,863
Petropower	65518			27				1.0142	66,449
Placilla	1120.68		0.2					0.6369	714
Punitaqui	308.8		0.1					0.8791	271
Quellon	757.6		0.0007					0.0029	2
Quellon II	14396.3		3.2					0.7056	10,157
Quintay	935.18		0.2					0.6958	651
Quintero	262,713		4.1				68	0.3256	85,532
Renca	2653		0.8					0.9414	2,497
San Fco. de Mostazal	619.8		0.3					1.4260	884
San Gregorio	264.64		0.1					0.7073	187
San Isidro	2,236,183	6.3533	7.9				437.27	0.2249	502,911
San Isidro II	2,950,490	3.1083	14.8				522.33	0.2073	611,552
San Lorenzo de D. de Almagro U1	309.2		0.2					1.7904	554
Santa Lidia	49516.25		12.9					0.8166	40,434
Taltal 1	55,841	5.8418	23.0				0.50	1.4536	81,173
Taltal 2	92254	11.0619					0.01	0.1696	15,647
Teno	58042.1		12.4					0.6736	39,098
TG_Coronel	92277.5	3.2096	16.6					0.6150	56,750
Tierra Amarilla	2180.66		0.7					1.0696	2,332
Totoral	428.98		0.1					0.6458	277
Traigen	1105.3		0.2					0.6572	726
Trapén	42689.8		8.9					0.6572	28,057
Ventanas 1	914308			346.79				0.9445	863,568
Ventanas 2	1157271			450.45				0.9693	1,121,709
Total	**20,736,409**								**12,362,293**

Sources: (1) Files Real Annual Operation ("Operación Real Anual"), CDEC-SIC. Supporting documents SD79 Op real year 2006.xls; SD80 Op real year 2007.xls; SD81 Op real year 2008.xls; SD82 Op real year 2009.xls; SD83 OP real year 2010.xls are provided to the DOE

(2) Source: SD78 Yearbook 2011 CDEC-SIC.pdf ("Estadísticas de Operación 2001-2010" CDEC-SIC), page 68-71

Power plants with option A2:

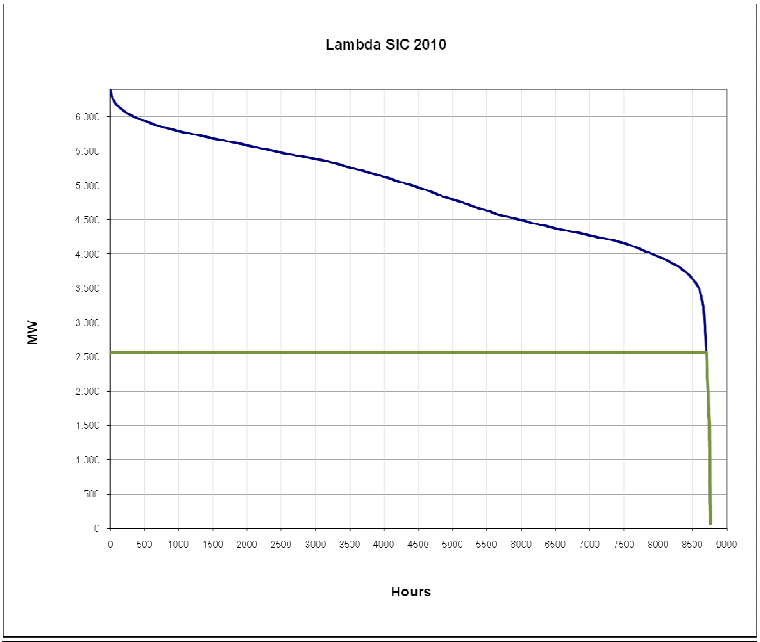
Name	Start operation	Type	Fuel	Gen (MWh)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Biomar	2009	Open cycle, new	Petróleo Diesel	1.8	0.6617	1
Cem Bio Bio DIESEL	2010	Open cycle, new	Petróleo Diesel [Petró	0	0.6617	0
Cem Bio Bio IFO	2010	Open cycle, new	Petróleo Diesel [Petró	4190.3	0.6617	2,773
Colihues	2010	Open cycle, new	Petróleo Diesel [Petró	22,127	0.6617	14,641
Colmito	2008	Open cycle, new	Petróleo Diesel	1108.07	0.6617	733
Curicó	2009	new	Carbón	498.6	0.8262	412
Eagon	2009	Open cycle, new	Petróleo Diesel	14.5	0.6617	10
Emelda	2010	Open cycle, new	Petróleo Diesel	1,186	0.6617	785
Louisiana Pacific	2009	Open cycle, new	Petróleo Diesel	0.4	0.6617	0
Multiexport I	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Multiexport II	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Nueva Aldea 2	2006	Open cycle, new	Petróleo Diesel	0	0.6617	0
Punta Colorada	2010	Open cycle, new	Petróleo Diesel	7882.5	0.6617	5,216
Salmofood I	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Salmofood II	2009	Open cycle, new	Petróleo Diesel	75.5	0.6617	50
Skretting	2008	Open cycle, new	Petróleo Diesel	59.4	0.6617	39
Tapihue	2009	Open cycle, new	Gas Natural	1049.82	0.4949	520
Termopacífico	2009	Open cycle, new	Petróleo Diesel	19786.44	0.6617	13,092
Watts	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Ancud	2006		Petróleo Diesel	834.3	0.6617	552
L.Verde	1939-U1; 1949-U	Old	Carbón	284	0.8708	247
			Total	**59,099**		**39,071**

Sources: (1) SD78 Yearbook 2011 CDEC-SIC.pdf ("Estadísticas de Operación 2001-2010" CDEC-SIC), pages 30-32
(2) Files Real Annual Operation ("Operación Real Anual"), CDEC-SIC. Supporting documents SD79 Op real year 2006.xls; SD80 Op real year 2007.xls; SD81 Op real year 2008.xls; SD82 Op real year 2009.xls; SD83 OP real year 2010.xls are provided to the DOE
(3) Default efficiency factors, Annex I, Tool to calculate the emission factor for an electricity system Version 02.2.1.

Power plants with option A3:

Name				Gen (MWh)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Quidico				43.1	0	0
Cabrero				1455.5	0	0
			Total	**1,499**		**0**

Lambda:



Intersection (MW)	2,567.00
Area under the curve	22,435,768.8
Low Cost Generation	22,435,768.8
No Low Cost Generation	20,783,901
Number of hours	57
λ =	0.0065
1-λ =	0.9935

- **2009**

To display how the operating margin is calculated, the Simple Adjusted Method calculations for year 2009 are described:

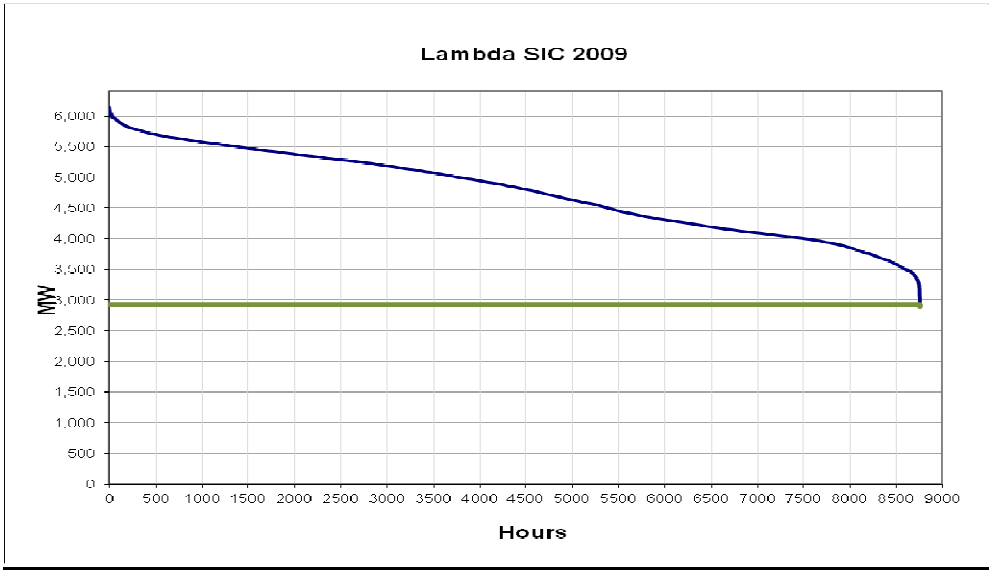
Power plants with option A1:

Name	$EG_{m,y}$ (MWh)	NG (mm m^3)	Diesel (m ton)	Coal (m ton)	Fuel Oil	Petcoke (m ton)	GNL (mm m3)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Antilhue_TG	112,723		29					0.8031	90,525
Bocamina	919,093		2	370				1.0081	926,557
Campanario	104,955	0	31					0.9154	96,080
Candelaria	128,222	9	28					0.7835	100,460
Cañete	2,859		1					0.7152	2,045
Cenizas	46,871		2					0.1152	5,401
Chiloé	763		0					0.8653	661
Chuyaca	2,476		1					0.7496	1,856
Collipulli	2,227		0					0.6922	1,541
Constitución 1	768		0					0.9009	692
Curacautin	2,818		1					0.7367	2,076
D. Almagro	24,735		10					1.3263	32,807
Degan	42,074		9					0.6701	28,192
Esperanza 1	2,363		1					0.7294	1,724
Guacolda 1	1,266,852			627				1.2315	1,560,168
Guacolda 2	1,217,009			595				1.2179	1,482,174
Guacolda 3	723,012			308				1.0600	766,388
Horcones	1,566	0	1					1.5517	2,429
Huasco TG	24,127		10	0				1.3255	31,979
Huasco TV	0								0
L.Verde	20,180			14				1.7794	35,909
L.Verde TG (ex Indio TG)	19,161		5					0.8157	15,630
Lebu	1,777		0					0.6904	1,227
Los Pinos	108,097		23					0.6567	70,992
Los Sauces	4,094		1					0.6685	2,737
Los Vientos TG	155,101		42					0.8416	130,538
Maule	318		0					0.8905	283
Monte Patria	6,588		2					0.8785	5,788
Nehuenco	1,048,926	23	153					0.4890	512,877
Nehuenco II	1,538,681	2	246					0.5059	778,401
Nehuenco TG 9B	42,240	8	5					0.6748	28,504
Newen	4,403		0.02					0.0175	77
Nueva Renca	1,276,404	0	212					0.5223	666,634
Nueva Ventanas	117,212			41				0.8662	101,526
Olivos	52,873		12					0.7035	37,198
Petropower	482,252			210				1.0820	521,774
Placilla	2,954			1				0.5557	1,642
Punitaqui	7,979		2					0.8791	7,014
Quellon	1,463		0.31					0.6664	975
Quellon II	15,336		3					0.7056	10,820
Quintero	22,286		0.8				4.9	0.3476	7,747
Renca	338		0.0000					0.0000	0
San Fco. de Mostazal	2,172		1					1.0674	2,318
San Isidro	1,679,533	83	102				137	0.3488	585,841
San Isidro II	1,799,921		245				82	0.4762	857,137
Santa Lidia	10,455		3					0.8586	8,977
Taltal 1	235,378	38	56					0.9705	228,440
Taltal 2	207,090	40						0.2733	56,592
TG_Coronel	26,492	0	6					0.7459	19,762
Tierra Amarilla	23,655		8					1.0162	24,037
Traigen	4,023		1					0.6568	2,642
Ventanas 1	883,371		331					1.1791	1,041,574
Ventanas 2	1,667,410		636					1.1993	1,999,668
Casablanca	1,075		0.32					0.9461	1,017
Concon	1,926		0.46					0.7469	1,439
Curauma	1,703		0.47					0.8736	1,488
Las Vegas	1,462		0.37					0.7891	1,154
Quintay	3,039		0.66					0.6845	2,080
San Gregorio	113		0.02					0.6740	76
Totoral	2,418		0.53					0.6848	1,656
Linares Norte	118		0.03					0.8979	106
El Peñón	11,433		2.28					0.6273	7,172
Teno	2,076		0.50					0.7576	1,573
Trapén	47,835		10.28					0.6760	32,335
San Lorenzo de D. De Almagro	635		0.36					1.7835	1,132
Los Espinos	27,238		5.81					0.6710	18,278
Total	**16,194,747**								**12,968,539**

Power plants with option A2:

Name	Start operation	Type	Fuel	Gen (MWh)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Biomar	2009		Petróleo Diesel	0	0.6617	
Colmito	2008	Open cycle, new	Petróleo Diesel	5,203	0.6617	3,443
Skretting	2008	Open cycle, new	Petróleo Diesel	4	0.6617	3
Termopacífico	2009	Open cycle, new	Petróleo Diesel	4,899	0.6617	3,241
Eagon	2009	Open cycle, new	Petróleo Diesel	4	0.6617	3
Louisiana Pacific	2009	Open cycle, new	Petróleo Diesel	4	0.6617	2
Multiexport I	2009	Open cycle, new	Petróleo Diesel			
Multiexport II	2009	Open cycle, new	Petróleo Diesel	3	0.6617	2
Tapihue	2009	Open cycle, new	Gas Natural	1,187	0.4949	588
Watts	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Salmofood I	2009	Open cycle, new	Petróleo Diesel	0	0.6617	0
Salmofood II	2009	Open cycle, new	Petróleo Diesel	22	0.6617	15
Nueva Aldea 2	2,006	Open cycle, new	Petróleo Diesel	0	0.6617	
Ancud	2,006	Open cycle, new	Petróleo Diesel	650.5	0.6617	430
			Total	**11,977**		**7,727**

Lambda:



Intersection (MW)	2,920.45
Area under the curve	25,583,096.4
Low Cost Generation	25,583,096.4
Number of hours	1
λ =	0.0001
1-λ =	0.9999

- **2008**

To display how the operating margin is calculated, the Simple Adjusted Method calculations for year 2008 are described:

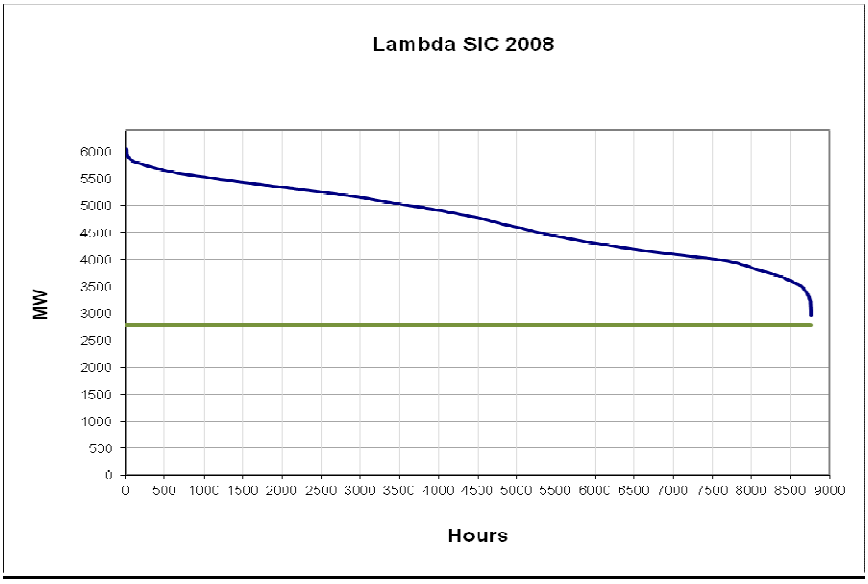
Power plants with option A1:

Name	$EG_{m,y}$ (MWh)	NG ($mm m^3$)	Diesel (m ton)	Coal (m ton)	Fuel Oil	Petcoke (m ton)	$EF_{EL,m,y}$ (tCO_2/MWh)	EG x EF_{EL}
Ancud	6,041		1				0.7052	4,260
Antilhue_TG	241,149		55				0.7173	172,977
Bocamina	958,128		1	399			1.0422	998,526
Campanario	240,211	5	55				0.7455	179,076
Candelaria 1	576,633	12	147				0.8315	479,459
Cañete	4,636		1				0.8083	3,748
Collipulli	7,654		2				0.6994	5,353
Constitución 1	10,755		2				0.6209	6,678
Curacautin	6,281		1				0.7250	4,554
D. Almagro	58,083		21				1.1378	66,088
Degan	68,292		14				0.6632	45,294
Guacolda 1	1,244,834			580			1.1601	1,444,124
Guacolda 2	1,285,397			607			1.1762	1,511,833
Horcones Diesel	6,806	0	2				1.0968	7,464
Huasco TG	160,787		60	0			1.1648	187,278
Huasco TV	0							0
L.Verde	247,403			171			1.7252	426,822
L.Verde TG (ex Indio TG)	38,912		10				0.7921	30,822
Lebu	4,470		1				0.6980	3,120
Los Sauces	4,720			1			0.5417	2,557
Los Vientos TG	380,794		102				0.8427	320,902
Maule	5,197		1				0.6210	3,227
Monte Patria	17,085		4				0.7014	11,984
Nehuenco	312,172	0	51				0.5118	159,772
Nehuenco II	2,392,508	36	365				0.5014	1,199,688
Nehuenco TG 9B	235,153	33	40				0.7264	170,813
Nueva Renca	1,502,737	0	259				0.5411	813,196
Olivos	28,296		6				0.7155	20,247
Punitaqui	18,090		4				0.6764	12,236
Quellon	10,477		2				0.6831	7,157
Quellon II	3,551		1				0.6511	2,312
Renca	12,399		5				1.2132	15,042
San Fco. de Mostazal	32,569		11				1.0524	34,276
San Isidro	1,385,688	166	103				0.4018	556,713
San Isidro II	1,647,925		289				0.5508	907,673
Taltal 1	350,112	6	258				2.3389	818,863
Taltal 2	689,674	28					0.0580	39,999
TG_Coronel	74,588	0	17				0.7123	53,126
Traigen	2,592		1				0.7054	1,828
Ventanas 1	941,608			351			0.9275	873,367
Ventanas 2	1,633,583			607			0.9255	1,511,907
Victoria	0		0				0.0000	0
Chiloé	111		0				0.6362	71
Total	16,848,101							13,114,431

Power plants with option A2:

Name	Start operation	Type	Fuel		$EG_{m,y}$ (MWh)	$EF_{EL,m,y}$ (tCO_2/MWh)	$EG \times EF_{EL}$
Casablanca	2007	Open cycle, new	Petróleo Diesel		4,130	0.6617	2,733
Cenizas	2009	Open cycle, new	Petróleo Diesel		865	0.6617	573
Colmito	2008	Open cycle, new	Petróleo Diesel		4,422	0.6617	2,926
Concon	2007	Open cycle, new	Petróleo Diesel		7,211	0.6617	4,771
Curauma	2007	Open cycle, new	Petróleo Diesel		5,903	0.6617	3,906
Esperanza 1	2007	Open cycle, new	Petróleo Diesel		12,579	0.6617	8,323
Las Vegas	2007	Open cycle, new	Petróleo Diesel		6,074	0.6617	4,019
Los Pinos	2009	Open cycle, new	Petróleo Diesel		7,118	0.6617	4,710
Nueva Aldea 2	2006	Open cycle, new	Petróleo Diesel		37	0.6617	24
Petropower	1998	Open cycle, old	Petcoke		493,911	0.7161	353,667
Placilla	2008	Open cycle, new	Petróleo Diesel		3,020	0.6617	1,999
Quintay	2008	Open cycle, new	Petróleo Diesel		3,237	0.6617	2,142
Santa Lidia	2009	Open cycle, new	Petróleo Diesel		525	0.6617	348
Totoral	2008	Open cycle, new	Petróleo Diesel		3,431	0.6617	2,270
Skretting	2008	Open cycle, new	Petróleo Diesel		0	0.6617	0
Chuyaca	2008-2009-20	Open cycle, new	Petróleo Diesel		83	0.6617	55
			Total		**552,547**		**392,465**

Lambda:



Intersection (MW)	2,793.76
Area under the curve	24,473,303.9
Low Cost Generation	24,473,303.9
Number of hours	0
λ =	0.0000
$1-\lambda$ =	1.0000

Then:

	2008	2009	2010
EF_{OM} (t CO_2/MWh)	0.7762	0.8006	0.5924

	2008	2009	2010	**Total**
Annual Generation OM (MWh)	41,873,952	41,789,714	43,232,776	**126,896,442**
Weight	33.00%	32.93%	34.07%	

EF_{OM}	= 0.7216	Ton CO_2/MWh

Finally, the grid emission factor for solar and wind projects is:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad \textbf{(14)}$$

W_{OM}	0.75
W_{BM}	0.25

$EF_{grid,CM,y}$	**= 0.6834**	**ton CO_2/MWh**

and the grid emission factor for all other projects is:

W_{OM}	0.5
W_{BM}	0.5

$EF_{grid,CM,y}$	**= 0.6451**	**ton CO_2/MWh**

DETERMINATION OF GRID EMISSION FACTOR FOR THE SING

- **Build Margin 2011**

Total SING generation = AEG_{total} = 15,889,183 MWh

The following table shows the generation of the power plants included in the BM.

Build Margin Power Units. Accumulated Generation (MWh)

		Plant Name	Start operation	$EG_{m,y}$ (MWh)	% accumulated	$EF_{EL.m.v}$ (tCO_2/MWh)	EG x EF_{EL}
SET 5-units	SET ≥20% in the total universe of the SING	CTH	05/08/2011	668,955	4.2%	0.730	488,619.5
		CTA	15/07/2011	755,526.8	9.0%	0.833	629,067.0
		ANG1- 2	11/04/2011	1,988,025.7	21.5%	0.937	1,863,421.5
		MHAH	2010	8,272.1	21.5%	0.000	0.0
		MHT2	2010	8,291.9	21.6%	0.000	0.0

Source: CDEC-SING webpage operational statistics and yearbooks: *http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*

$$\sum_m EG_{m,y} \times EF_{EL,m,y} = 2{,}981{,}108 \quad tCO_2$$

$$\sum_m EG_{m,y} = 3{,}429{,}072 \quad MWh$$

- **Operating Margin**

- **2011**

To display how the operating margin is calculated, the Simple Method calculations for year 2011 are described:

Power plants with option A1:

Power plant Name	$EG_{m.v}$ (MWh)	NG ($mm\ m^3$)	Diesel (ton)	Coal (m ton)	Fuel Oil (t)	$EF_{EL.m.v}$ (tCO_2/MWh)	EG x EF_{EL}
SALTA	734,473		144,086			0.6171	453,211
TERMOELÉCTRICA ANDINA	755,527		1,398	251		0.833	629,067
TERMOELÉCTRICA ANGAMOS	707,534		4,901	741	694	0.937	1,863,421
	1,280,491						
DIESEL MANTOS BLANCOS	49,017		1,801		9,465	0.724	35,489
DIESEL TAMAYA	160,046		6,675		21,806	0.561	89,707
DIESEL INACAL	24,225		657		4,700	0.697	16,877
TERMOELÉCTRICA TARAPACÁ	972,727			376		0.963	936,295
	8,076		3,983			1.551	12,528
DIESEL ENAEX	138		82			0.781	259
	194						
DIESEL ANTOFAGASTA	-					-	-
	-					-	-
ESTANDARTES	5,888		1,255			0.670	3,947
DIESEL ZOFRI	730		981			0.652	3,085
	4,000						
ATACAMA	1,229,972	391	47,645			0.330	702,113
	896,602						
TERMOELÉCTRICA NORGENER	1,104,271		183	854	64	0.957	2,127,817
	1,120,314						
TERMOELÉCTRICA MEJILLONES	1,118,312	64	1,490	907		0.910	2,355,221
	1,158,990						
	310,253						
DIESEL IQUIQUE	5,822		5,624		3,967	0.884	30,190
	1,421						
	14,227						
	2,472						
	10,204						
TERMOELÉCTRICA TOCOPILLA	3,388	233	11,219	941	9,433	0.792	2,737,601
	3,154						
	16,737						

	14,045						
	18,179						
	280,878						
	350,003						
	819,191						
	754,875						
	1,196,985						
DIESEL ARICA	10,381		3,879			0.783	12,201
	2,724						
	2,479						
TERMOELÉCTRICA HORNITOS	668,955		4,747	190		0.730	488,619
	15,817,902						**12,497,649**

Source: CDEC-SING webpage operational statistics and yearbooks: *http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*

Power plants with option A2:
Not applicable for 2011.

Total:

	Option A1	Option A2	**Total**
$\sum_m EG_{m,y} \times EF_{EL,m,y}$ (tCO_2)	12,497,649	0	12,497,649
$\sum_m EG_{m,y}$ (MWh)	15,817,902	0	15,817,902

To display how the operating margin is calculated, the Simple Method calculations for year 2010 are described:

Power plants with option A1:

Power plant Name	$EG_{m.v}$ (MWh)	NG (mm m^3)	Diesel (ton)	Coal (m ton)	Fuel Oil (t)	$EF_{EL.m.v}$ (tCO_2/MWh)	EG x EF_{EL}
SALTA	958,079		608			0.0020	1,911
TERMOELÉCTRICA ANDINA	641.2		3,871			18.989	12,176
TERMOELÉCTRICA ANGAMOS	249.95		65			0.813	203
DIESEL MANTOS BLANCOS	88,207		2,450		18,983	0.765	67,522
DIESEL TAMAYA	187,143		1,299		38,493	0.670	125,378
DIESEL INACAL	44,123		350		9,357	0.693	30,583
TERMOELÉCTRICA TARAPACÁ	1,076,282			414		0.958	1,030,724
	9,588		4,368		0	1.433	13,739
DIESEL ENAEX	244		130			0.765	408
	289						
DIESEL ANTOFAGASTA	-		0			-	-
	-					-	-
ESTANDARTES	10,620		2,362			0.700	7,429
DIESEL ZOFRI	1,141		1,353			0.622	4,255
	5,703						
ATACAMA	1,243,813	302	275,939		0	0.436	1,295,023
	1,728,917						
TERMOELÉCTRICA NORGENER	1,098,868		300	877	235	0.963	2,186,396
	1,170,469						

TERMOELÉCTRICA MEJILLONES	1,114,450	28	50,744	900	0	0.904	2,441,042
	1,219,790						
	366,734						
DIESEL IQUIQUE	8,584		7,094		5,362	0.924	39,209
	2,565						
	17,617						
	3,498						
	10,189						
TERMOELÉCTRICA TOCOPILLA	2,828	296	9,906	1,347	14,942	0.828	3,849,482
	1,144						
	19,605						
	8,854						
	35,711						
	611,563						
	555,928						
	896,374						
	992,016						
	1,526,835						
DIESEL ARICA	16,733		7,130			0.909	22,427
	4,296						

	3,639						
	15,043,328						**11,127,907**

Source: CDEC-SING webpage operational statistics and yearbooks: *http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*

Power plants with option A2:
Not applicable for 2010.

Total:

	Option A1	Option A2	**Total**
$\sum_m EG_{m,y} \times EF_{EL,m,y}$ **(** tCO_2)	11,127,907	0	11,127,907
$\sum_m EG_{m,y}$ **(**MWh)	15,043,328	0	15,043,328

- **2009**

To display how the operating margin is calculated, the Simple Method calculations for year 2009 are described:

Power plants with option A1:

Power plant Name	**$EG_{m,v}$ (MWh)**	**NG (mm m^3)**	**Diesel (ton)**	**Coal (m ton)**	**Fuel Oil (t)**	**$EF_{EL.m,v}$ (tCO_2/MWh)**	**EG x EF_{EL}**
SALTA	1,348,181	14	**0**			0.0149	20,084
DIESEL MANTOS BLANCOS	68,923		3,886		12,116	0.7312	50,398
DIESEL TAMAYA	183,530		769		32,246	0.5668	104,027
DIESEL INACAL	12,696		297		2,577	0.7133	9,056
TERMOELÉCTRICA TARAPACÁ	1,065,241 10,521		4,085	409	3,817	0.9692	1,042,602
DIESEL ENAEX	261		129			0.6377	404

	373						
DIESEL ANTOFAGASTA	73		13		5	0.7674	56
ESTANDARTES	32						
DIESEL ZOFRI	883 5,229		1,387			0.7137	4,385
ATACAMA	1,404,610 1,800,865	117	482,363		0	0.5250	1,683,010
TERMOELÉCTRICA NORGENER	1,049,219 911,103		685	750	366	0.9549	1,871,963
TERMOELÉCTRICA MEJILLONES	1,190,756 1,282,197 632,175	79	47,452	992	0	0.8792	2,729,970
DIESEL IQUIQUE	14,222 1,458 10,307 2,758 2,529		2,488		5,469	0.8013	25,060
TERMOELÉCTRICA TOCOPILLA	6,068 5,704	142	17,949	1,256	37,227	1.0690	3,502,802

	33,042 57,370 54,992 553,295 568,040 969,181 850,819 731,510						
DIESEL ARICA	10,458 3,862 2,421		4,150			0.7797	13,053
	14,844,903						**11,056,869**

Source: CDEC-SING webpage operational statistics and yearbooks: *http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_oper_real_pub.rpt_gen_centrales_sing_x_annos* and *http://www.cdec-sing.cl/html_docs/anuario2011/*

Power plants with option A2:
Not applicable for 2009.

Total:

	Option A1	Option A2	**Total**
$\sum_m EG_{m,y} \times EF_{EL,m,y}$ **(** tCO_2)	**11,056,869**	0	**11,056,869**
$\sum_m EG_{m,y}$ **(**MWh)	14,844,903	0	14,844,903

Then:

	2009	2010	2011
EF_{OM} (t CO_2/MWh)	0.7448	0.7397	0.7901

	2009	2010	2011	Total
Annual Generation OM (MWh)	14,844,903	15,043,328	15,817,902	**45,706,133**
Weight	32.5%	32.9%	34.6%	

EF_{OM} =	0.7588	Ton CO_2/MWh

Finally, the grid emission factor for solar and wind projects is:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad \textbf{(14)}$$

W_{OM}	0.75
W_{BM}	0.25

$EF_{grid,CM,y}$ =	**0.7865**	**ton CO_2/MWh**

and the grid emission factor for all other projects is:

W_{OM}	0.5
W_{BM}	0.5

$EF_{grid,CM,y}$ =	**0.8141**	**ton CO_2/MWh**

Annex 4

MONITORING INFORMATION

To be provided at CPA level as described in section E.7

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