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

CONTENTS

Annexes

NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

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

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

>>
Chilean Small Scale Renewable Energy Programme of Activities (PoA)
Version 1
Date: 30/03/2012

A.2. Description of the small-scale programme of activities (PoA):

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1. General Operating and Implementing Framework of PoA

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 Republic of Chile. The PoA is a voluntary action and the Coordinating/Managing Entity (CME) is Carbon Capital Inc. & Cia. Ltda. ("Less Carbon"). Less Carbon 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.

2. Policy/Measure or Stated Goal of the PoA

This SSC-PoA will incentivize the development of small scale renewable energy projects by helping to overcome local infrastructural and institutional barriers, reducing CDM transaction costs, introducing carbon finance to small scale renewable energy projects and increasing the Internal Rate of Return (IRR) of renewable energy projects thereby making them viable and more attractive to external financiers. At the same time, this SSC-PoA will support the Government of Chile's national energy and climate objectives by reducing the emissions intensity of the Chilean energy grid.

The Chilean electricity market consists of 4 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	Hydro	Wind	Total	Thermal	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	21,633.5 50.13%	21,198.8 49.12%	325.2 0.75%	43,156.7 100%	6,342.8 53.55%	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 4.0%	2.0 38.8%	49.0 100.0%
SEM	268.9 100%	-	-	268.9 100%	89.1 100%	-	-	89.1 100%
TOTAL (Chile)	36,955.9 63.0%	21,373.1 36.4%	332.1 0.6%	58,660.3 100%	10,019.9 64.40%	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)[1; 2; 3; 4] (December, 2010) (values are rounded)

As illustrated in the table above, thermal 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 a renewable energy source[5] under Chilean law. In relation to the SING system, most of the energy is produced by thermal power plants with small scale renewable energy sources forming a negligible part. Therefore, from the official data, it can be observed that there is little or no small scale renewable energy generation in Chile e.g. wind, solar, small hydro, and tidal/wave.

In general terms, the main problems associated with the lack of development of small scale renewable energy projects in Chile are high investment costs, leading to lower 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, 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 intends that by 2020, Chile's growth rate of greenhouse gas emissions will be reduced by 20% using 2007 as the base year[6]. In this way, local policy intends 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[7] of which the most significant are:

- Law N° 19.940[8] (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

[1] http://www.cne.cl/cnewww/export/sites/default/06_Estadisticas/Documentos/generacion_bruta_sic_sing.xls

[2] http://www.cne.cl/cnewww/export/sites/default/06_Estadisticas/Documentos/generacion_bruta_Magallanes.xls

[3] http://www.cne.cl/cnewww/export/sites/default/06_Estadisticas/Documentos/generacion_bruta_Aysxn.xls

[4] http://www.cne.cl/cnewww/export/sites/default/06_Estadisticas/Documentos/capacidad_instalada_de_generacion.xls

[5] http://www.leychile.cl/Navegar?idNorma=270212&buscar=energia+renovable#renovable0

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

[7] http://www.bcn.cl/leyes_temas/leyes_por_tema.2007-03-20.7683847886

[8] http://www.leychile.cl/Navegar?idNorma=222380

- Law N° 20.018[9] (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[10] (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 ERNC projects. This 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[11]/MWh (about 31.1USD/MWh[12]) which increases up to 0.6UTM/MWh (about 46.6USD/MWh) after the 3rd year of non-compliance.
  - The law will take effect 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 currently 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.

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

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

Each CPA will apply to one or more than one power plants with a combined installed capacity up to 15MW which are grid-connected projects within each relevant grid boundary.

This SSC-PoA will be applicable to the following project activities described in AMS-I.D. v.17[13] as follows:

(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 (greenfield plant)

(b) Involve a capacity addition.

[9] http://www.leychile.cl/Navegar?idNorma=238139

[10] http://www.leychile.cl/Navegar?idNorma=270212&idParte=&idVersion=2008-04-01

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

[12] Considering an exchange rate of 499.47 CLP/USD (08.11.2011) source: http://www.valorfuturoplus.com/contenidos_vf/indicadores.asp

[13] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

The geographical boundary of this PoA is the Republic of Chile. As described above the projects will be either restricted to the SING or the SIC electric systems (see Figures 1&2 below).

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

As a working procedure under this SSC-PoA, it is confirmed that this SSC-PoA is a voluntary action coordinated and managed by Carbon Capital Inc. y Cia. Ltda. ("Less Carbon"), 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.

In addition to writing the SSC-PoA-DD, Less Carbon as the CME will support renewable energy project developers by carrying out the following activities:

- Providing information to project developers about CDM markets and opportunities.
- Provide standardised and streamlined access to CDM services such as:
  - Documentation of the SSC-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 ERPAs and using them as collateral.

The Designated National Authority of the Republic 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. Renewable energy projects in Chile are subject to a legal framework and system for approval for environmental impacts. These national laws and regulations, together with supporting documentation, form the basis for approval of CDM projects or PoAs. Prior to the submission of the validation report to the Executive Board, the project participants of this PoA will obtain written approval of voluntary participation from the designated national authority of each relevant Party involved, including confirmation by the Chilean DNA that the project activity assists it in achieving sustainable development (3/CMP.1, Annex, paragraph 40(a)) by following the required procedure[14].

Less Carbon as CME of this PoA declares and confirms 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 Small Scale Renewable Energy Generation in Chile

[14] http://www.mma.gob.cl/1257/w3-article-44986.html

- 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 SSC-POA:

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The Coordinating or managing entity of the PoA which communicates with the Board will be Carbon Capital Inc. y Cia. Ltda. ("Less Carbon"):

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)	Carbon Capital Inc. y Cia. Ltda. ("Less Carbon")	No

Project participants above may or may not be involved in the CPAs related to this PoA.

A.4. Technical description of the small-scale programme of activities:

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A.4.1. Location of the programme of activities:

>>The Republic of Chile.

A.4.1.1. Host Party(ies):

>>The host party is the Republic of Chile.

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 small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented, covers the geographical boundary of Chile, specifically those CDM projects connected to the Interconnected Central System[15] (SIC) and the Grand North Interconnected System[16] (SING).

[15] https://www.cdec-sic.cl/contenido_es.php?categoria_id=4&contenido_id=000028

[16] http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_pag_web_pub.get_file?p_file=Unilineal.pdf&p_tipo=A

Figure 1: Grand North Interconnected System (SING)
Source: CDEC-SING[16]

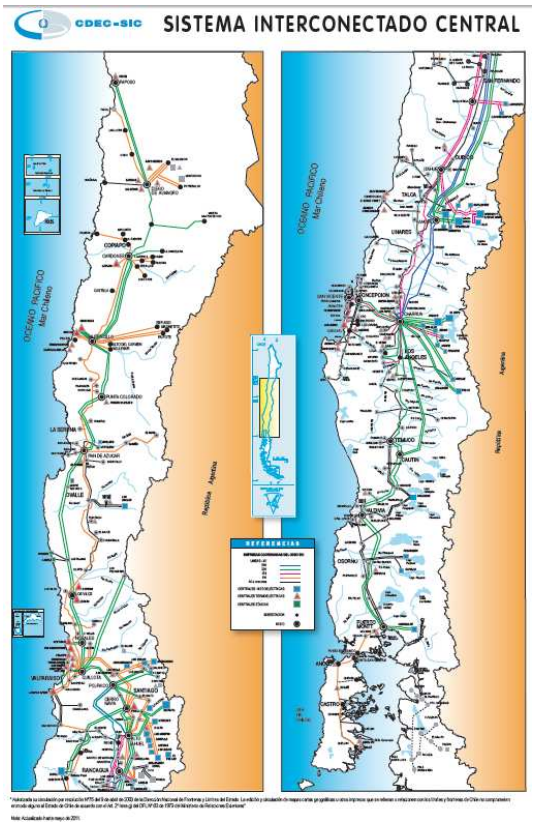

Figure 2: CDEC-SIC Central Interconnected System (SIC)
Source: CDEC-SIC[15]

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

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

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A typical CPA under this PoA will correspond to one or more greenfield renewable energy power plants with a maximum combined installed capacity of 15MW, or a capacity addition to an existing renewable energy project which in total does not exceed 15MW of installed capacity.

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

A.4.2.1. Technology or measures to be employed by the SSC-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 applicable to renewable energy technologies which use the potential energy from water, kinetic energy from wind and waves/tides, or solar radiation to produce electricity.

A typical CPA under this SSC-PoA will consist of small-scale renewable energy, projects up to 15MW delivering electricity to the relevant grid (as described above) as follows:

- *Wind generation*: The power plant will consist of 1 or more wind turbines (either on-shore and/or offshore) using the kinetic energy of wind to generate electricity
- *Wave/Tidal generation*: The power plant will consist of 1 or more underwater tidal turbines or wave generation devices using the kinetic energy of the ocean waves/tides to generate electricity
- *Hydro generation*: The power plant will consist of 1 or more hydro turbines using the potential energy of water to generate electricity. These power plants may or may not include a reservoir as per AMS – I.D. v.17 para.4.
- *Solar generation*: The power plants will consist of solar photovoltaic panels or concentrated solar power projects.

Individual CPA-DDs will contain detailed information about the technology to be implemented on a project-by-project basis.

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

>>

As per EB 65 Annex 3 para. 14, a CPA to be included in the PoA shall:

- Connect to, and supply, electricity to any of the interconnected systems in Chile as described in A.4.1.2. during all or part of the crediting period of the proposed PoA.
- Clearly identify the relevant grid to which the electricity will be delivered within the geographical boundary of Chile and which does not cause trans-boundary impacts[17]. The condition described in AMS-I.D. v.17 para. 1 clauses (a) and (b) and para. 4, also applies.
- In order to avoid double counting, confirm in writing that:

[17] 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). They will be identified in line with the guidance in the Convention.

- 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 nor a CPA under another PoA.
- The CPA implementer is aware and has agreed that the CPA will be part of the PoA. For more details refer to Section A.4.4.1.

- Be one of the following renewable energy power plant project categories:
  - a run of river hydro power plant as described by the WCD[18] in November 2000
  - a hydroelectric power plant with or without a reservoir (single or multiple) with a power density greater than 4 W/m^2.
  - a wind farm power plant, on-shore or off-shore
  - a solar farm power plant (solar photovoltaic (PV) or concentrated solar power (CSP))
  - a wave/tidal power plant
- Have a total installed capacity of up to 15 MW for small-scale and up to 5MW for micro-scale CPAs. This condition shall be maintained i.e. the thresholds cannot be surpassed during the CPA crediting period for both small-scale and micro-scale projects
- Have a project start date after the PoA validation start date. This shall be demonstrated by documentary evidence such as the earlier of equipment purchase order or financial closure
- As per methodology AMS-I.D. v.17 para. 3 be either:
  - *"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)"*; or
  - "*Involve a capacity addition*", which 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.*"
- The CPAs carried out under this PoA, involving capacity addition, as per methodology AMS-I.D. v.17 para. 7, must comply with the following: "*In case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units.*"
- Demonstrate that the CPA complies with the additionality test as described in Section E.5.
- Be 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 local stakeholder consultations and environmental impact analysis.
- Demonstrate in writing that no public funding from Annex I parties will be used in its development.
- Confirm that 100% of the CPA will be monitored according to the procedures in A.4.4.2.
- Sign a contract of services with the CME and comply with its requirements
- Be a voluntary activity
- Cede its rights over the CERs generated by the CPA to the CME (Less Carbon) under a contractual agreement

The eligibility criteria will be updated according to the procedures described in EB 65 Annex 3 para. 21 to para. 25.

[18] http://www.unep.org/dams/WCD/report/WCD_DAMS%20report.pdf

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-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[19; 20]
- The proposed PoA is a voluntary action coordinated and managed by the CME
- There are no mandatory laws or regulations that compel the CME or any other entity to carry out a PoA for Small Scale 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
- The voluntary coordinated action described above under this PoA is unlikely to be implemented in the absence of the proposed PoA
- As per paragraph 73 EB47, "*The Board, noting that in the context of programmes of activities that additionality is to be demonstrated either at the PoA level or at CPA level*"[21]. 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 may apply an investment analysis or barrier analysis, or both, to assess additionality, according to the methodological tool "Demonstration and assessment of additionality" v.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 small-scale renewable energy projects and the use of renewable sources in Chile [22]. 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 renewables PoAs in Chile[23], 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

[19] See IEA Chile Energy Sector Report available at http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2159

[20] http://www.sea.gob.cl/contenido/sistema-de-informacion-sobre-permisos-y-autorizaciones-de-contenido-ambiental

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

[22] http://www.cne.cl/cnewww/export/sites/default/05_Public_Estudios/emisiones_de_gases_2000_2025/Resumen_Ejecutivo_GEIS.pdf

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

time, CO2 emissions in the energy sector are forecast to double by 2025 (see footnote 22). As a result, fossil fuel generation is and will be the most likely scenario in Chile.

- Based on the information above, it can be concluded that:
  - 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 thermal generation) will remain.

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

A.4.4.1. Operational and management plan:

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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. The system will contain the following information:

(a) Serial Number ID (e.g. SSC-PoA001-S001-SSC-CPA (1st project of the POA, small scale, 1st Solar CPA); SSC-PoA002-W001 SSC-CPA (2nd project of the POA, small scale, 1st Wind CPA)). 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 power house GPS geo coordinates (UTM WGS 84) and geographic coordinates (for 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)
(k) Contact name
(l) Phone number
(m) Email
(n) Address
(o) Website
(p) Baseline data
(q) International status (CDM)
(r) Validation status
(s) Monitoring data
(t) Verification status (verification number and monitoring period)
(u) Issuance data

The record keeping system will be based on electronic excel spreadsheets 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.

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

- The database mentioned in (i) 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 (e.g. validation, requesting registration and registered) on the UNFCCC website[24].
- The developer will sign a contract containing an exclusivity clause with the CME which states that:
  - The CPA has not been and will not be registered as a single CDM project activity or as a CPA under another PoA.
  - The developer is aware that the CPA will be subscribed to the present PoA.
  - The developer 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 (as described in section A.4.2.2) that is aware, and has agreed that, the CPA will form part of the present PoA in addition to an agreement that it will not form part of any other CDM activity or PoA as set out above
- If any of the conditions above are not met, the CPA will not be included in the PoA.

In order to ensure that SSC-CPAs included in the proposed PoA are not a de-bundled component of another CPA or standalone CDM project activity, a de-bundling assessment will be carried out by the CME according to the "Guidelines on assessment of de-bundling for SSC project activities v.3" EB54 Annex 13 para. 8[25], Section II - Guidance for determine the occurrence of de-bundling under a Programme of Activities (PoA).

"*For the purposes of registration of a Programme of Activities (PoA)[26], a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below[27]:*

(a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;

(b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point."

De-bundling conditions will be assessed at CPA level in order to confirm that the SSC-CPA does not comply with both conditions (a) and (b) stated above and therefore is not a de-bundled component of another PoA or individual CDM project activity.

The CME will ensure that all the SSC-CPA boundaries under this proposed PoA will be separated by at least 1 km at their closest point. Exceptions may apply to a group of projects under the same SSC-CPA

[24] http://cdm.unfccc.int/Projects/projsearch.html

[25] https://cdm.unfccc.int/filestorage/B/2/G/B2G0MI867OH5JVD9FYN4CXQPKEATWZ.2/Annex%2013%20-%20Guidelines%20on%20assessment%20of%20debundling%20for%20SSC%20project%20activities%20%28version%2003%29.pdf?t=ekV8bHVybzY2fDCa-8ilkQf5T2YQjT8tEelG

[26] Only those PoAs need to be considered in determining de-bundling that are: (i) in the same geographical area; and (ii) use the same methodology; as the PoA to which proposed CPA is being added.

[27] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

with a total installed capacity up to 15MW. If applicable all the SSC-CPAs to be included under this PoA with an installed capacity up to 150 kW (up to 1% of the limit) will automatically satisfy de-bundling requirements.

In order to ensure that the CPA developer 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 developer will monitor all relevant parameters (as per project type) according to the established procedures.

One verification is expected per year for the PoA under normal circumstances. Then, each CPA developer will send the monitoring data to the CME monthly and an annual summary in a standardised form in order to comply with the verification procedure. The CME will control, organize and prepare the necessary documentation for verification by the DOE. All the data will be physically and electronically stored for at least 2 years after the last crediting period expires 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
- 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 primary data 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 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.
- The emissions reductions shall be correctly estimated and must be consistent with the SSC-PoA-DD and SSC-CPA-DDs.

A.4.5. Public funding of the programme of activities (PoA):

>>
No public funding will be used to develop this PoA.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

>> The date on which the SSC-CDM-POA is published on the website of the UNFCCC in accordance with the CDM modalities and procedures. 16/04/2012

B.2. Length of the programme of activities (PoA):

>> 28 years

SECTION C. Environmental Analysis

>>

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 SSC-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 up to 15MW.
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 Impact Assessment System (SEIA)[28]

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

>>The documentation required will be the nationally defined environmental impact assessment (DIA, EIA or Relevance Letter) if applicable (see C.3.) 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 Chile only, trans-boundary impacts are not expected to occur.

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 SSC CPA in the SSC PoA. The law applicable to a typical CPA under this PoA is as follows:

- Law 19.300[29] "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

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

[29] http://www.leychile.cl/Navegar?idNorma=30667

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 System of Environmental Impact Assessment. The owner of the CPA must submit either an Environmental Impact Statement or Environmental Impact Study. An Environmental Impact Statement (DIA) for a project is shorter than an Environmental Impact Study (EIA) as it is expected that the environmental impact is lower.

For example, a small scale hydro power project CPA under this PoA may include the construction of a reservoir and, in this case, an EIA will be required. On the contrary, a small run-of-river hydro project (without a dam) typically will require only a DIA.

Projects 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

>>

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 SSC-CPA level ✔ ☐

Invitation for consultation/comments from local stakeholders will be conducted at CPA level.

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

>>

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

D.3. Summary of the comments received:

>>

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

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

>>
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 SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

>>
Title of the approved SSC baseline and monitoring methodology:

AMS-I.D.: "Grid connected renewable electricity generation - Version 17.0".

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

AMS-I.D. is an approved SSC baseline and monitoring methodology with specific provisions for project activities under a PoA. It was approved by the Board for use in a PoA in EB 33, Annex 23[30].

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 CD 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.

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

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

The applicability criteria of AMS-I.D. v.17 are the following:	Methodology AMS-I.D. v.17 is applicable to an SSC.CPA under the proposed SSC-PoA because:
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: *(a) Supplying electricity to a national or a regional grid; or*	CPAs under this PoA will be renewable energy generation units, grid connected (SING or SIC) complying with either requirement (a) or (b).

[30] http://cdm.unfccc.int/EB/033/eb33_repan23.pdf

(b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	
2. This methodology is applicable to project activities that: *(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 (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 comprise of greenfield renewable energy power plants (as described in Section A.4.2.1.) or capacity additions to existing power plants/units only.
3. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;* • *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2;* • *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.*	CPAs under this proposed PoA may include hydro power plants with reservoirs which will be eligible if the hydro SSC-CPA has a power density greater than 4 W/m^2, as defined in the eligibility criteria and if at least one of the conditions is met.
4. If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not	SSC-CPAs under this PoA will have renewable energy generation components only.

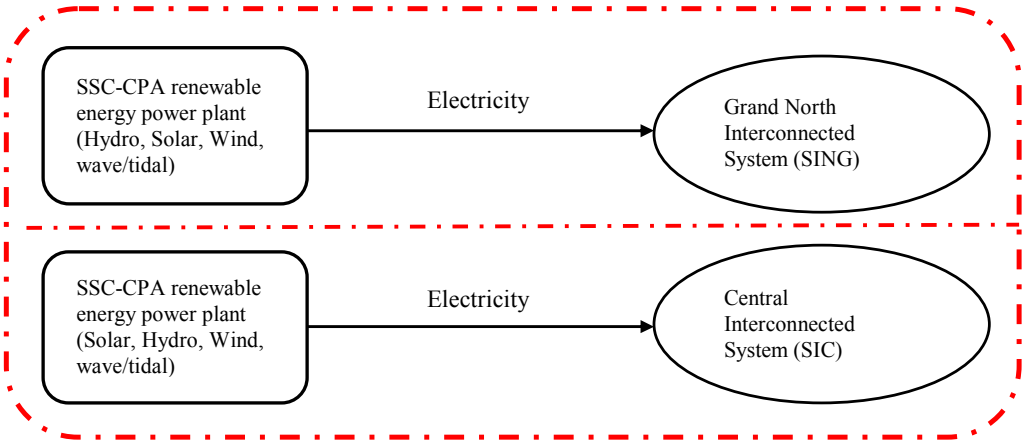
exceed the limit of 15 MW.	
5. Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable. Co-generation CPAs are not eligible to be part of this PoA.
6. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	CPAs under this PoA may include the addition of renewable energy generation units at an existing renewable power generation plant (see eligibility criteria). The capacity of the new units added will be lower than 15MW and will be physically distinct from the existing units.
7. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable. CPAs will apply to greenfield renewable power plants and capacity additions only (see eligibility criteria)

For CPAs to be included under this PoA which individually do not exceed 15MW, SSC methodologies will be used once the CME has checked to account for leakage in the context of a SSC-CPA.

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

>>

As established in AMS-I.D. v.17, for each individual SSC-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 SSC-CPA will deliver electricity (see Figure 3. below). The grids are unconnected.



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

Table 2: 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. N/A.
		CH_4	Yes	Main emission source. N/A.
		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. N/A.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source.

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 chosen methodology AMS-I.D. v.17 the following will apply for each grid:

"The baseline scenario is that the 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 into the grid."

The baseline emissions are the product of electrical energy baseline expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:
BE_y Baseline emissions in year *y* (tCO_2)
$EG_{BL,y}$ Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,grid,y}$ CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

Under this PoA the SSC-CPA 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.

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 SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

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

>>

Under this PoA additionality is demonstrated at CPA level. In order to assess the additionality for a SSC-CPA under this PoA one or more of the following documents will be considered:

1) EB 63 Annex 23 "Guidelines for demonstrating additionality of microscale project activities" v.3.
2) EB 35 Annex 34 "Non-binding best practice examples to demonstrate additionality for SSC project activities" v.01.0
3) EB 63 Annex 11 "Guidelines on additionality of first-of-its-kind project activities" v.1
4) EB 63 Annex 12 "Guidelines on common practice" v.1
5) EB 63 Annex 2 "Standard for demonstration of additionality of GHG emissions reductions achieved by a programme of activities" v.1
6) EB 63 Annex 24 "Attachment A of Appendix B" v.8
7) EB 65 Annex 21 methodological tool "Demonstration and assessment of additionality" v.06.0.0
8) EB 62 Annex 5 "Guidelines on the assessment of investment analysis" v.5
9) EB 50 Annex 13 "Guidelines for objective demonstration and assessment of barriers" v.1

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. As a result, different approaches to additionality will apply.

The CME may apply any of the additionality approaches below for a single CPA under this PoA. In order for a CPA to be part of this proposed PoA, the eligibility conditions 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 **any** of the additionality approaches as set out below at the time of its inclusion as a CPA.

A CPA proponent may choose a renewable or fixed crediting period. The crediting period will be chosen at CPA level. If a CPA proponent chooses a fixed crediting period and the conditions described in EB 63 Annex 11 para. 5a) and 5b) are met, then the proposed project activity is the First-of-its-kind in the applicable geographical area, and therefore can be considered as additional as per EB 63 Annex 11 para. 6.

Approach 1) Microscale projects (up to 5MW):

Under this PoA, and according to the "Guidelines for Demonstrating Additionality of Microscale Project Activities Version 3" EB 63 Annex 23 para. 2(d) (i) – (v), a CPA which complies with **any** of the project categories in EB63 is deemed to be additional.

CPAs to be included under this PoA only apply to the conditions established in para. (d) of EB63. In relation to these condition, the Chilean DNA submitted recommendation letter N° 110515 (11th, February 2011) for the board's approval. The Chilean DNA Ministry of the Environment "*recommends that any project activity up to 5MW which employ renewable energy as their primary technology such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass, that displace electricity from a distribution system that is or would have been supplied by at least one fossil fuel fired generating unit (technologies included in Type I Small Scale CDM methodologies for project activities less than 15MW, and specified in AMS.I.D Grid connected renewable electricity generation version 16.0) is additional in Chile*".

The board took note of the letter[31], however approval from the board is pending. Further modifications will be made based on the board's decision.

At the same time, the Chilean DNA recommendation letter above presents a table which shows the share of small scale (<15MW) renewable electricity generation in the country as follows: photovoltaic (0.00%), hydro (1.23%), tidal/wave (0.00%), wind (0.07%), geothermal (0.00%) and renewable biomass (0.64%). Therefore this demonstrates that, in Chile, there are no renewable energy technologies implemented in aggregate up to 15MW and which consist of more than 3% of installed capacity. Therefore, any CPA connected to any of the relevant grids with an installed capacity up to 5MW, is deemed to be additional without further assessment.

Approach 2) Small- scale projects (up to ≤15MW)

According to EB 63 Annex 24 v.8 para. 2 and CDM-EB-63 para. 102 in which the Board "*agreed to establish a positive list of renewable electricity generation technologies that are automatically defined as additional, without further documentation of barriers, in all non-Annex I countries, as included in the "Attachment A of the appendix B of the Simplified modalities and procedures for small-scale CDM projects activities" contained in annex 24. The list initially consists of the following technologies of installed capacity of 15 MW or less:*

(a) Grid-connected solar technologies (photovoltaic and solar thermal electricity generation);
(b) Grid-connected off-shore wind technologies;
(c) Grid-connected marine technologies (wave, tidal).

All the technologies above will be applicable to Approach 2 for the CPAs under this PoA, and these CPAs are deemed to be additional and will not require any further documentation of barriers.

Approach 3) Small- scale projects (>5MW to ≤15MW)

For all other CPAs not described above (i.e. hydro, solar CSP and wind on-shore) with an installed capacity between >5 and ≤15 MW, CPA proponents may chose to demonstrate additionality by conducting an investment analysis and/or a barrier analysis at a CPA level in accordance with the methodological tool "Demonstration and assessment of additionality" v.06.0.0.

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

[31] http://cdm.unfccc.int/Panels/ssc_wg/meetings/032/ssc_032_an07.pdf

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.*[32]".

The eligibility criteria states that greenfield renewable energy projects and capacity addition projects will be included in this SSC-PoA. For greenfield and capacity addition renewable energy projects, methodology AMS-I.D. v.17 para. 10 describes the baseline scenario as follows "*The baseline scenario is that the 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 into the grid.*" and therefore no further analysis is required.

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.)*"

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 latest available version of the "Guidelines on the assessment of investment analysis"[33] at the time of the CPA inclusion shall be taken into account when applying this step.

Sub-step 2a: Determine the appropriate analysis method

Because small-scale 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.

[32] http://cdm.unfccc.int/Reference/Standards/accr_man01.pdf

[33] 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 local sectoral benchmark rate (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 CPA investment decision.

Renewable energy projects under the scope of this PoA commonly require high investment expenditure during the construction phase but have relatively small 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 (preferred option) or a Project IRR as a comparison basis for benchmark analysis.

When Project IRR is used, local lending rates or weighted average costs of capital (WACC) will be appropriate benchmarks. Similarly, when Equity IRR is used the expected return on equity e.g. Capital Asset Pricing Model (CAPM) will be an appropriate benchmark. Other benchmarks may apply as per provisions in the "Guidelines on the assessment of investment analysis".

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)[34]:

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

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

[34] A.Damodaran, 2010. Equity Risk Premiums (ERP): Determinants, Estimations and Implications – The 2011 Edition. Stern School of Business. 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 cap companies and companies low price to book ratios, which may be the case for most of the renewable energy projects in Chile. ERNC projects in Chile are usually developed by a special purpose company (SPC) which does not own any other asset that those of the project. For these companies higher equity risk premiums will be obtained when investing in riskier emerging markets (as Chile) as its risk is not diversifiable.

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 the investor expect. Empirical evidence suggests that investments in small capitalization companies have earned greater historical rates of return than investments in large capitalization companies over the long-term. The size premium is estimated based on the information contained in the Grabowski, 2011[35], Duff & Phelps Risk Premium Report.

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

[35] 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[36]:

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

Where:

K_d = Cost of debt before taxes

[36] http://papers.ssrn.com/sol3/papers.cfm?abstract_id=254587

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 the Approach 1. In all cases the EB 62 Annex 5 or its updated version 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. The alternative approaches shall be comprehensively explained and documented at a CPA level, which can be conducted by independent financial consultant companies hired to assess the benchmark.

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

As Option III (benchmark analysis) is used, the SSC-CPA-DD shall demonstrate that the CPA has a less favourable indicator (e.g. lower IRR) than the benchmark and thus the CPA cannot be considered as financially attractive without revenues from carbon credits.

Calculation of the relevant IRR excel calculation spreadsheet will be prepared for each CPA. This will be submitted along with the SSC-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 3: Key parameters applied in the calculation of the CPA Equity IRR

Parameter	Unit	Source
Total investment	MUSD	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks; quotations for major equipment; purchase orders
Equity	MUSD	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks
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
Yearly electricity generation	kWh/year	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as

		presented to banks
Plant load factor	%	As per EB 48 Annex 11 v.1 para. 3 or its latest update (Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks
Yearly O&M costs	MUSD/year	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks
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	MUSD/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
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
Electricity feed in tariff (including subsidies and inflation rate adjustments)	MUSD/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
Project lifetime (investment term)	years	(Pre-) Feasibility Study revised and certified by an independent expert; (Pre-) Feasibility Study as presented to banks

Table 4: 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 v.1 or its latest update.
Investment decision date	DD/MM/YY	
Construction start date	Year	
Date project starts operating	Year	
Annual electricity generation	MWh/year	As per calculations using a plant load factor based on EB 48 Annex 11 v.1 or its latest update. Value is given according to Sections E.6 and E.7.
FINANCIAL PARAMETERS		
	Unit	**Comment**
Electricity tariff	CLP/kWh	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
Increase in electricity tariff	% per year	

		indexed to inflation only if specified in the PPA (or equivalent document) or relevant policy.
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	Foreign currency/CLP	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 CLP
COSTS AND EQUIPMENT		
	Unit	**Comment**
Total investments	Relevant currency[37]	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	Only if applicable
Operation & Maintenance cost	Relevant currency/year	The O&M costs might include cost components such as (but not limited to): 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). Can be sourced from e.g. 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 or its latest update will be considered. Nevertheless, if more recent and reliable data is available from quotations, purchase orders, financing agreements or PPA 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 USD or EUROS (to be chosen at CPA level) using the average exchange rate during the twelve months preceding the date of the investment decision.

[37] e.g. USD; EURO; CLP

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 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 4 shall be obtained from documents the CPA developer provides to financiers or government agencies. Dates at which these documents were compiled will also be reported in the SSC-CPA-DD. 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)[38].

The results of the relevant IRR (equity or project) compared to the relevant benchmark and CPA implemented with CER revenues will be presented as:

IRR (equity or project) of CPA	
IRR (equity or project) of CPA with CER revenues	
Benchmark	

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

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

When assessing the sensitivity analysis, EB62 Annex 5 para. 20 and 21 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. Therefore, a sensitivity analysis is conducted on total investment and electricity price. The assessed variation is +/- 10%.

Table 5: Sensitivity of total investment and electricity price.

IRR (equity or project)					
Sensitivity on kWh price	-10%	-5%	0%	5%	10%
without CERs					
with CERs					
Sensitivity on Investment	-10%	-5%	0%	5%	10%
without CERs					
with CERs					

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. Then it can be demonstrated that the CPA is not financially attractive without access to CER revenues.

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

Step 3: Barrier analysis

This approach helps to determine whether the proposed project activity faces barriers that:

- *"Prevent the implementation of this type of proposed project activity; and*
- *Do not prevent the implementation of at least one of the alternatives, if the project is not "first of its kind"*

"For barriers other that barriers due to project being "first of its kind", the identified barriers are only sufficient grounds for demonstration of additionality if they would prevent potential project proponents from carrying out the proposed project activity undertaken without being registered as a CDM project activity.

For barriers other than barriers due to project being "first of its kind", if the CDM does not alleviate the identified barriers that prevent the proposed project activity from occurring, then the project activity is not additional."

To prove and demonstrate that some of the following barrier will prevent the implementation of a typical CPA (as described above) a barrier analysis must be carried out according to the methodological tool "Demonstration and assessment of additionality" v.06.0.0. Different barriers could apply for different kinds of technologies.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

At CPA level it must be establish that: *there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a CDM activity. Such realistic and credible barriers may include, among others:*

a) *"Investment barriers, other than the economic/financial barriers in Step 2 above, inter alia:*
   - *For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant country/region;*
   - *No private capital is available from domestic or international capital markets due to real or perceived risks associated with investment in the country where the proposed CDM project activity is to be implemented, as demonstrated by the credit rating of the country or other country investments reports of reputed origin.*

b) *Technological barriers, inter alia:*
   - *Skilled and/or properly trained labour to operate and maintain the technology is not available in the relevant country/region, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance;*
   - *Lack of infrastructure for implementation and logistics for maintenance of the technology*

(e.g. natural gas cannot be used because of the lack of a gas transmission and distribution network);

- *Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information;*
- *The particular technology used in the proposed project activity is not available in the relevant region.*

c) *Barriers due to prevailing practice, inter alia: The project activity is the .first of its kind.*

d) *Other barriers, preferably specified in the underlying methodology as examples."*

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

"*If the identified barriers also affect other alternatives, explain how they are affected less strongly than they affect the proposed CDM project activity. In other words, demonstrate that the identified barriers do not prevent the implementation of at least one of the alternatives. Any alternative that would be prevented by the barriers identified in Sub-step 3a is not a viable alternative, and shall be eliminated from consideration".*

If both Sub-steps 3a, 3b are satisfied, proceed to Step 4 (Common practice analysis).
If one of the Sub-steps 3a, 3b is not satisfied, the project activity is not additional.

Step 4: Common practice analysis

Common practice analysis will be carried out according to the methodological tool "Demonstration and assessment of additionality" v.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:

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 SSC-CPA:

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The key criteria for assessing the additionality of a CPA to be included under this PoA are described below using 3 different approaches:

Approach 1) Microscale projects (up to 5MW)
As described in section E.5.1, all CPAs with an installed capacity up to 5MW are additional.

Approach 2) Small- scale projects (up to ≤15MW)
As described in section E.5.1, solar PV, offshore wind and wave/tidal CPAs with an installed capacity up to 15MW are additional.

Approach 3) Small- scale projects (>5MW to ≤15MW)
As described in section E.5.1, all CPAs not included in approaches 1) and 2) (i.e. hydro, onshore wind, and CSP) may follow the methodological tool "Demonstration and assessment of additionality" v.06.0.0" in order to assess additionality.

Due to the wide 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 are Investment Analysis and/or Barrier Analysis

Investment Analysis

According to section E.5.1 Approach 3), *Step 2: Investment Analysis*, to prove that a CPA is not financially attractive, the following information and criteria has to be provided and assessed:

1. The applicable benchmark (expected return on equity or project) is calculated based on approach 3 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 based on the approach 3 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 equity IRR (including all realistic scenarios of the sensitivity analysis) is below the benchmark without considering CDM incomes.

Barrier Analysis

According to section E.5.1 Approach 3), *Step 3: Barrier Analysis,* to prove that a CPA faces realistic and credible barriers that prevent its implementation from being carried out, a barrier analysis will be conducted according to the rules established in the methodological tool ”Demonstration and assessment of additionality” v.06.0.0.

Common Practice

According to section E.5.1 Approach 3), *Step 4: Common Practice,* to prove that a CPA is not common practice and that institutional barriers are present, the methodological tool ”Demonstration and assessment of additionality” v.06.0.0 and EB 63 Annex 12 “Guidelines on common practice” v.1 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 SSC-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 based on the small scale baseline and monitoring methodology AMS-I.D. v.17[39].

[39] http://cdm.unfccc.int/filestorage/V/9/L/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ/EB61_repan17_Revision_AMS-I.D_ver17.pdf?t=bE18bHVjanNzfDBebhiAbE3f-ItHQmN-YZVg

Baseline emissions:

The baseline emissions for **greenfield generation** units CPAs, as described in AMS-I.D. v.17 para. 11, 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 AMS-I.D. v.17 para. 15 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 AMS-I.D. v.17 para. 15 are considered under this PoA. As a result, AMS-I.D. v.17 para. 18 is not applicable to the CPAs under this PoA.

Grid emissions factor:

The grid emission factor calculations will be carried out in a transparent and conservative manner according to the methodology which states that "*The emission factor can be calculated in a transparent and conservative manner as follows:*

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system";

OR

(b) The weighted average emissions (in t CO2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations shall be based on data from an official source (where available) and made publicly available."

Option (a) above has been chosen in order to assess the emission factor of each relevant grid. The grid emission factor will be calculated at CPA 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" v.02.2.1[40], 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."

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

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 will use ***ex ante*** values for the estimations of the OM, provided that the calculations will be made at CPA 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.

The OM method to be used will be defined at CPA level at the date of the relevant CPA inclusion, considering the relevant energy data at that time.

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

Central Interconnected System (SIC): Simple Adjusted OM (Option B) is currently applicable because low-cost/must-run resources[41] constitute more than 50% of total SIC grid generation according to table 6 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 6: 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

[41] 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

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).[42]

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 7 based on the as the average of the five most recent years.

Table 7: Total grid electricity generation in the SING 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 SING (MWh)	69.737	68.167	67.836	61.863	56.868	
Other (MWh)	13.166.277	13.877.613	14.434.509	14.844.587	15.043.147	
Total	**13.236.014**	**13.945.780**	**14.502.345**	**14.906.450**	**15.100.015**	
Total Grid Generation (%)	**2006**	**2007**	**2008**	**2009**	**2010**	**Average (%)**
Low-cost/must run SING (%)	0,5	0,5	0,5	0,4	0,4	0,5
Other (%)	99,5	99,5	99,5	99,6	99,6	99,5
Total (%)	100	100	100	100	100	100

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

The emission factor will be 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 inclusion of a CPA under this PoA. The emission factor will be calculated once at the validation stage and then no monitoring or recalculation of the emissions factor will be conducted during the crediting period.

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

The operating margin emission factor will be calculated at a CPA level according to the relevant grid as follows:

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

The simple OM for the SING will be 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.

[42] http://www.cne.cl/cnewww/opencms/06_Estadisticas/energia/Electricidad.html

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" v.02.2.1 must be fulfilled.

The emission factor of each power unit CPA under this PoA will be determined by choosing Option A1, A2 or A3, on a CPA-by-CPA basis in that specific order of preference and data availability.

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

For each CPA under this PoA, the simple OM for the SIC will be calculated according to the procedure established in the "Tool to calculate the emission factor for an electricity system" v.02.2.1.

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

The build margin emission factor will be calculated at a CPA level according to its relevant Grid and based on the data available at the time of its inclusion under this proposed PoA.

The build margin will be calculated according to vintage data **Option 1** of the EF tool 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 will be calculated ***ex ante***, based on the most recent information available on units already built for sample group *m* at the time of the SSC-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 should be determined as per the procedure established in "Tool to calculate the emission factor for an electricity system" v.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, wave/tidal and hydro without reservoir/dam renewable energy projects.

However hydro power plants with reservoirs, may have project emissions different to zero and then, according to AMS-I.D. v.17 para. 20 it will be assessed according to the procedures described in the most recent version of the ACM0002 baseline and monitoring methodology at the time of the CPA inclusion under this PoA.

According to AMS-I.D. v.17 para. 21, CO_2 emissions from on site consumption of fossil fuels due to the project activity ($PE_{FC,j,y}$ tCO_2/yr) (e.g. combustion in process *j*, when a diesel generator is used as a back-up) will be calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels as per the procedures described in EB 41 Annex 11 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" v.02 or its latest update at the time of the CPA inclusion under this PoA.

Based on the data available, Option A or Option B 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

As per AMS-I.D. v.17 para. 22, leakage will be considered for the CPAs under this PoA only if energy generating equipment is transferred from another activity.

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

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I. Emission Reductions (ER_y) calculation:

Based on the small scale methodology AMS-I.D. v.17.0 para. 23 equation 10, 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.

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year *y* (t CO_2/y)
BE_y = Baseline Emissions in year *y* (t CO_2/y)
PE_y = Project emissions in year *y* (t CO_2/y)
LE_y = Leakage emissions in year *y* (t CO_2/y)

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 small scale methodology AMS-I.D. v.17 as follows:

Greenfield generation projects: the equation (1) of AMS-I.D. v.17 baseline and monitoring methodology is used for estimation of baseline emissions for greenfield generation CPAs under this PoA:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:

BEy	Baseline emissions in year y (tCO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,grid,y}$	CO2 emission factor of the grid in year y (tCO_2/MWh)

The relevant parameter(s) will be monitored as described in the monitoring section E.7.1.

Capacity addition projects: as per equations (2) to (4) of AMS-I.D. v.17, the calculation procedure described below shall be used for estimation of baseline emissions for hydro power plant CPAs under this PoA which involve capacity additions. This ensures that the baseline electricity generation is conservative and that the calculated emissions reductions are attributable to the project activity. This will address the associated uncertainty taking into account historical generation data of the existing plant/units.

However, for CPAs involving wind, solar or wave/tidal renewable generation technologies, it is assumed that capacity additions to existing plant/units does not affect the electricity generated by existing plants/units. Therefore the electricity generated by the new added power plants could be directly metered and used to determine $EG_{BL,y}$ provided that the electricity generated by the added power plant/units is metered separately.

$$BE_{capacity\ addition,CO2,y} = [EG_{BL,capacity\ addition,y}] * EF_{CO2}$$

Where:

$EG_{BL,capacity\ addition,y}$ = $EG_{PJ,favility,y} - (EG_{historical} + \sigma_{historical})$

$EG_{BL,capacity\ addition,y}$ = 0 on/after $DATE_{BaselineCpacityAddition}$)

Where:

$EG_{BL,capacity\ addition,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EG_{PJ,capacity\ addition,y}$	Quantity of net electricity supplied to the grid by the project plant/unit in year y (MWh)
$EG_{historical}$	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 (MWh)

	Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e. by 5% or more), shall be used. To determine $EG_{historical}$, CPA proponent may choose between the following two historical periods. (a) The three last calendar years (five calendar years for hydro project) prior to the implementation of the CPA; 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 three calendar years (five calendar years for hydro project), were $DATE_{hist}$ 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
$\sigma_{historical}$	Standard deviation of the annual average historical net electricity 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 (MWh)
$DATE_{BaselineCapacityAddition}$	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

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

According to Section E.6.1, the grid emissions factor will be calculated based on the "Tool to calculate the emission factor for an electricity system" v.02.2.1 at CPA 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;

To be determined at CPA level

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);

To be determined ex ante at CPA level, according to the relevant grid.

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

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

For CPAs delivering electricity to the Grand North Interconnected System (SING), the Simple Operating Margin (OM) will be calculated ***ex ante*** using the equations (1) to (6) (when applicable) of the "Tool to calculate the emission factor for an electricity system" v.02.2.1 as follows:

The Simple OM will be calculated Option A (preferred) or Option B procedures as follows:

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

$$EF_{OMsimple,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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:

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

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:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} * 3,6}{\eta_{m,y}}$$

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.

Determination of $EG_{m,y}$

For grid power plants, $EG_{m,y}$ should be determined at CPA level as per the provisions in the monitoring tables.

Option B – Calculation based on total fuel consumption and electricity generation of the system

If not possible to use Option A the calculation will be based on Option B EF Tool v.02.2.1 as follows:

$$ER_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} * NCV_{i,y} * EF_{CO2,i,y})}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
FCi,y = Amount of fossil fuel type *i* consumed in the project electricity system system 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)

$EF_{CO2,I,y}$ = CO2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
i = All fossil fuel types combusted in power sources in the project electricity system in year *y*
y = The relevant year as per data vintage chosen in Step 3

For this approach (simple OM), to calculate the operating margin, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant *m*. As a result, if the SING changes, then electricity from interconnected grids must be considered as an electricity import and accounted for as a low-cost, must-run unit.

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

For CPAs delivering electricity to the Central Interconnected System (SIC), the Simple Adjusted Operating Margin (OM) will be calculated *ex ante* using the equation (7) of the "Tool to calculate the emission factor for an electricity system" v.02.2.1 as follows:

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

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 $EG_{k,y}$ should be 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 EF Tool v.02.2.1. net electricity imports must be considered low-cost/must-run units *k*. Therefore if the SIC changes, new grid connections could be considered as electricity imports and must be considered as low-cost must-run units.

The parameter λ_y is defined as follows:

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

Lambda (λy) should be 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

Step 5. Calculate the build margin (BM) emission factor;

For the CPAs under this PoA (applicable to both the SIC and SING systems) the build margin emission factor will be calculated ex ante using Option 1 at a CPA level.

This option (Option 1) does not require monitoring the emission factor during the crediting period.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

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);

b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in 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} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in 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});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid.
If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Otherwise:

d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build 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 = Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which electricity generation data is available, and using for *m* the power units included in the build margin.

If the power units included in the build margin *m* correspond to the sample group $SET_{sample\text{-}CDM\text{->}10yrs}$, then, as a conservative approach, only option A2 from guidance in Step 4 (a) can be used and the default values provided in Annex 1 shall be used to determine the parameter $\eta_{m,y}$.

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

The calculation of the Combined Margin (CM) emission factor ($EF_{grid,CM,y}$) for CPAs under this PoA will be conducted at CPA level based on the following method:

(a) Weighted average CM

The combined margin emissions factor calculation method is applicable to both the SING and SIC systems. It is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{om} + EF_{grid,BM,y} * W_{BM}$$

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;

- 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.

Alternative weights can be proposed, as long as $w_{OM} + w_{BM} = 1$, for consideration by the Executive Board, taking into account the guidance as described below. The values for $w_{OM} + w_{BM}$ applied by project participants should be fixed for a crediting period and may be revised at the renewal of the crediting period.

IV. Project emissions calculations *(PE_y)*

According to AMS-I.D. v.17 para. 20, most renewable power generation CPAs will have zero project emissions, $PE_y = 0$. However, some project activities may involve project emissions which may be significant. As defined in the methodology, project emissions are calculated according to the most recent version of ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources v. 12.3.0"[43]. These emissions shall be accounted for as project emissions by using the following equation:

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

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 water reservoirs of hydro power plants and fossil fuel consumption. The following equation will be used to determine project emissions:

$$PE_y = PE_{FF,y} + PE_{HP,y}$$

Where:

43 http://cdm.unfccc.int/filestorage/4/W/1/4W1SCKX3EMPO6AYGRJUTD7BQ8IVN0H/Consolidated%20baseline%20methodology%20for%20gridconnected%20electricity%20generation%20from%20renewable%20sources.pdf?t=dmt8bTFuaGlufDDMgOYF1bdD4QL_gg6Gzr6m

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

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

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

The procedure to calculate the project emissions from the sources presented below, as required by AMS-I.D. v.17 para. 21 it is based on the latest version of EB 41 Annex 11.

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

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

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} * COEF_{i,y}$$

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: $COEF_{i,y} = w_{C,i,y} \times 44/12$

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

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:

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

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 from water reservoirs of hydro power plants ($PE_{HP,y}$)

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

(a) If the power density of the single or multiple reservoirs (*PD*) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:

$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year *y* (tCO_2e)
EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants ($kgCO_2e$/MWh)
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2:

$$PE_{HP,y} = 0$$

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

PD = Power density of the project activity (W/m^2)

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

A_{PJ} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

A_{BL} = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

V. Leakage calculations *(LE_y)*

As defined in Section E.6.1 as per AMS-I.D. v.17 para. 22, leakage will be considered if energy generation equipment is transferred from another activity only. Relevant parameters will be monitored accordingly.

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

Based on AMS-I.D. v.17, 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 / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for grid connected power generation in year *y*
Source of data used:	Official records, operational statistics and yearbooks
Value applied:	To be determined
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per procedures of the latest version of the "Tool to calculate the emission factor for an electricity system"
Any comment:	Fixed value during the 1st crediting period

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:	$\mathbf{EF_{Res}}$

Data unit:	kgCO2e/MWh
Description:	Default emission factor for emissions from reservoirs
Source of data used:	Decision by EB23
Value applied:	90 kgCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required; data is obtained from Decision by EB23
Any comment:	Only for CPAs that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs.

Data / Parameter:	$\mathbf{Cap_{BL}}$
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data used:	To be specified for each CPA
Value applied:	To be specified for each CPA; For new hydro power plants, this value is zero
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 result in new reservoirs and CPAs that result in the increase of existing reservoirs

Data / Parameter:	$\mathbf{A_{BL}}$
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2).
Source of data used:	To be specified for each CPA
Value applied:	To be specified for each CPA; For new reservoirs, this value is zero
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 result in new reservoirs and CPAs that result in the increase of existing reservoirs

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

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

Based on AMS-I.D. v.17, 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 $EG_{add,y}$)
Data unit:	MWh/y
Description:	Quantity of net electricity supplied to the grid in year *y*
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 SSC-CPA-DD
Description of measurement methods and procedures to be applied:	As described in the paragraph 24, table 1 of the methodology AMS-I.D. v.17 "*Measurements are undertaken using energy meters. Calibration should be undertaken as prescribed in the relevant paragraph of "General Guidelines to SSC CDM Methodologies".* *If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts).* *The net electricity export/supplied to a grid is the difference between the measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes*" Continuous monitoring apply i.e. hourly measurement and at least monthly recording. According to the paragraph 17 of the "General Guidelines to SSC CDM Methodologies" v.17[44] Monitoring: while monitoring the emission reductions from the small-scale project activity, project participants shall: (a) Electronically archive all data collected as part of monitoring for a period of two years from the end of the crediting period; (b) Data variables that are most directly related to the emission reductions (e.g. quantity of the fuel inputs, the amount of heat or electricity produced, gas

[44] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

	captured) should be measured continuously. Data elements that are generally constant and indirectly related to the emission reductions (e.g. emission factors, calorific value, system efficiencies) should be measured or calculated at least once a year, unless detailed specifications are provided as part of the indicated methodology; (c) Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years; (d) The measured data with high levels of uncertainty or without adequate calibration should be compared with location/national data and commercial data to ensure consistency; (e) Wherever a statistical sample is proposed for monitoring, the "General guidelines for sampling and surveys for small-scale CDM project activities <http://cdm.unfccc.int/Reference/Guidclarif/ssc/index_guid.html> shall be referred. In this section the project participants shall provide description of equipment used for measurement, if applicable, and its accuracy class.
QA/QC procedures to be applied:	According to the paragraph 17(c) of the "General Guidelines to SSC CDM Methodologies" v.17: "*Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years;*"
Any comment:	-

According to the "Tool to calculate the emission factor for an electricity system" v.02.2.1 section III "Monitoring methodology", the following parameters are going to be monitored for each relevant grid at CPA level and re-calculated at the beginning of each CPA crediting period renewal.

Data / Parameter:	**$EG_{m,y}$, EG_y, $EG_{k,y}$ and $EG_{n,h}$**
Data unit:	MWh
Description:	Net electricity generated by power plant/unit *m*, *k* or *n* (or in the project electricity system in case of EG_y) in year *y* or hour *h*
Source of data to be used:	Utility or government records or official publications i.e. CDEC/SIC[45] CDEC/SING[46] and/or the National Energy Commission (CNE)[47]
Measurements procedures (if any):	Data will be obtained from official sources
Monitoring frequency:	Simple OM (SING) and simple adjusted OM (SINC),: once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex ante*

[45] https://www.cdec-sic.cl/index_en.php

[46] http://cdec2.cdec-sing.cl/portal/page?_pageid=33,4121&_dad=portal&_schema=PORTAL

[47] http://www.cne.cl/cnewww/opencms/

	option). BM: For the first crediting period, once *ex ante* following the guidance included in Step 5 of the EF tool. For the second and third crediting period, only once *ex ante* at the start of the second crediting period.
QA/QC procedures:	Information will be collected from official sources and therefore no QA/QC procedures will be applied
Any comment:	-

Data / Parameter:	**$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ and $FC_{i,n,h}$**
Data unit:	Mass or volume unit (Diesel, Coal and Petcoke: kg/year; Natural Gas: m^3/year)
Description:	Amount of fossil fuel type *i* consumed by power plant/unit *m*, *k* or *n* (or in the project electricity system in case of $FC_{i,y}$) in year *y* or hour *h*
Source of data to be used:	CDEC/SIC CDEC/SING and/or the National Energy Commission (CNE)
Measurements procedures (if any):	Data will be obtained from official sources
Monitoring frequency:	Simple OM (SING) and simple adjusted OM (SINC): once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD (SSC-CPA-DD) to the DOE for validation (*ex ante* option). BM: For the first crediting period, once *ex ante* following the guidance included in Step 5 of the EF tool. For the second and third crediting period, only once *ex ante* at the start of the second crediting period
QA/QC procedures:	Information will be collected from official sources and therefore no QA/QC procedures will be applied
Any comment:	-

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/ per mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g. utilities)
Regional or national default values	If values are reliable and documented in regional or national energy statistics/energy balances
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	
Measurements procedures (if any):	Data will be obtained from official sources	
Monitoring frequency:	Simple OM (SING) and simple adjusted OM (SINC): once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD (SSC-CPA-DD) to the DOE for validation (*ex ante* option). BM: For the first crediting period, once *ex ante* following the guidance included in Step 5 of the EF tool. For the second and third crediting period, only once *ex ante* at the start of the second crediting period.	
QA/QC procedures:	Information will be collected from official sources and therefore no QA/QC procedures will be applied	
Any comment:	The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. Make sure that in such cases also a gross calorific value basis is used for CO_2 emission factor	

Data / Parameter:	**$EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$**	
Data unit:	tCO_2/GJ	
Description:	CO_2 emission factor of fossil fuel type *i* used in power unit *m* 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** Values provided by the fuel supplier of the power plants in invoices / If data is collected from power plant operators (e.g. utilities) Regional or national average default values / If values are reliable and documented in regional or national energy statistics/energy balances 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	
Measurements procedures (if any):	Data will be obtained from official sources	
Monitoring frequency:	Simple OM (SING) and simple adjusted OM (SINC): once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex ante* option). BM: For the first crediting period, once *ex ante* following the guidance included	

	in Step 5 of the EF tool. For the second and third crediting period, only once *ex ante* at the start of the second crediting period.
QA/QC procedures:	Information will be collected from official sources and therefore no QA/QC procedures will be applied
Any comment:	-

Data / Parameter:	**$\eta_{m,y}$ and $\eta_{k,y}$**
Data unit:	-
Description:	Average net energy conversion efficiency of power unit *m* or *k* in year *y*
Source of data to be used:	Use either: • Documented manufacturer's specifications (if the efficiency of the plant is not significantly increased through retrofits or rehabilitations); or • For grid power plants: data from the utility, the dispatch center or official records if it can be deemed reliable; or • The default values provided in the table below in Annex 1 (if available for the type of power plant)
Measurements procedures (if any):	Data will be obtained from official sources
Monitoring frequency:	Once for the crediting period
QA/QC procedures:	If the data obtained from the manufacturer, the utility, the dispatch center of official records is significantly lower than the default value provided in Annex 1 for the applicable technology, project proponents should assess the reliability of the values, and provide appropriate justification if deemed reliable. Otherwise, the default values provided in Annex 1 shall be used
Any comment:	-

The following parameters only have to be monitored for CPAs for hydro power projects with a reservoir (new or existing, single or multiple, or reservoir size increase) as defined by AMS-I.D. v.17. The relevant parameters are based on ACM0002 v.12.3.0.

Data / Parameter:	**TEG_y**
Data unit:	MWh/yr
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*
Source of data to be used:	Project activity site (To be specified in each SSC-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA-DD
Description of measurement methods and procedures to be applied:	Electricity meters
QA/QC procedures to be applied:	-

Any comment:	Applicable to hydro power project activities with a power density of the project activity (PD) greater than 4 W/m^2 and less than or equal to 10 W/m^2

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Project site (To be specified in each SSC-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA-DD
Description of measurement methods and procedures to be applied:	Determine the installed capacity based on recognized standards
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Project site (To be specified in each SSC-CPA-DD)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA-DD
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc
QA/QC procedures to be applied:	-
Any comment:	-

Based on AMS-I.D. v.17 and EB 41 Annex 11 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" v.02 or its latest version, 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:	**$FC_{i,j,y}$**

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:	$w_{C,i,y}$
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: 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 Data Source: c) Regional or national default values — Conditions for using the data source: 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: 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 Data Source: c) Regional or national default — Conditions for using the data source: If a) is not available

	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 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:	
	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)
	d) IPCC default values at the	If a) is not available

	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.	
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 SSC-CPA:

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The monitoring plan will be carried out according to AMS-I.D. v.17 and the "General Guidelines to SSC CDM Methodologies" v.17 para. 17 as follows:

"*Monitoring: while monitoring the emission reductions from the small-scale project activity, project participants shall:*

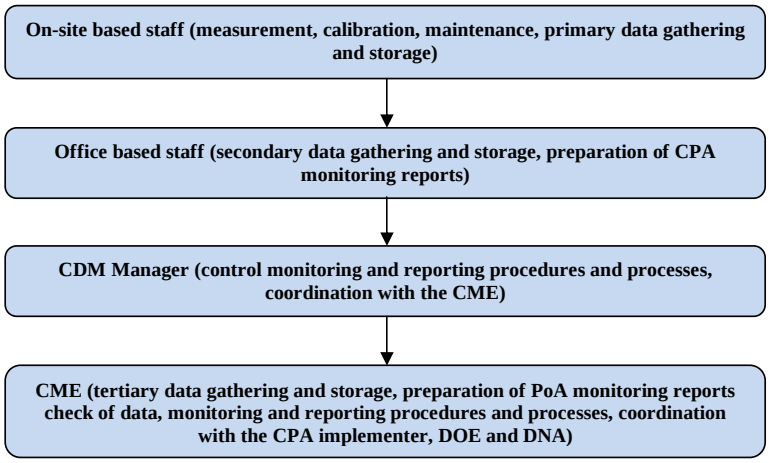
(a) Electronically archive all data collected as part of monitoring for a period of two years from the end of the crediting period;
(b) Data variables that are most directly related to the emission reductions (e.g. quantity of the fuel inputs, the amount of heat or electricity produced, gas captured) should be measured continuously. Data elements that are generally constant and indirectly related to the emission reductions (e.g. emission factors, calorific value, system efficiencies) should be measured or calculated at least once a year, unless detailed specifications are provided as part of the indicated methodology;
(c) Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years;
(d) The measured data with high levels of uncertainty or without adequate calibration should be compared with location/national data and commercial data to ensure consistency;"

The monitoring plan will be implemented to ensure that real, measurable and long term GHG emissions reductions per 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.. 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 SSC-CPA. A detailed description of the monitoring plan will be presented at CPA level and will be structured as follows:

1) Management structure and responsibilities:

a. Staff will be selected (either within the CPA or hired specifically for this purpose) to conduct the monitoring CDM process at CPA level.
b. Responsibilities and roles will be assigned to the selected staff in order to properly coordinate the CDM procedures and gather the relevant data (e.g. meter reading; equipment calibration, equipment maintenance, data storage and coordination with the CME).
c. The following structure is expected:



d. Office based staff will be responsible for on-site staff training, monitoring duties on-site, coordination of managers and on-site staff and control of monitoring procedures
e. A written procedure must be set up at CPA level. 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

f. The CDM Manager will be, at CPA level, responsible for the correct implementation of the procedures and processes as well as maintaining a close relationship with the CME.
g. The CME in relation to the monitoring process will be responsible for tertiary data gathering and storage, preparation of PoA monitoring reports, data checking, review of monitoring and reporting procedures and processes, coordination with the CPA implementer, DOE and DNA.

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. Periodic checks can be made by the grid operator according to the relevant national standards and regulations.

At a CPA level, the number of meters will be at least 1, one from the CPA proponent and another from the relevant transmission company. All the metering instruments will be calibrated according to manufacturer specifications and/or national and/or grid operator regulations. The standards applied by the relevant grid operator will prevail over any other standards. The accepted error level in the accuracy of metering instruments shall not be greater or less than the limit as specified by the manufacturers and/or the grid operator requirements.

In case of failure of metering equipment, it will be repaired or replaced by an accredited equipment testing organization following the standards and requirements of the relevant grid operator.

The electricity invoice provided by the grid operator to the CPA proponent will be used by the CME to double check the data of energy delivered to the grid.

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 readings of the energy meter (or meters as applicable) will be uploaded on a continuous and online basis and will be sent remotely to the grid operator. The standards and requirements of the relevant grid operator will be fulfilled.

In case of problems with the main meter, measurement data from the relevant transmission company located at the same connection point could be used by the relevant grid administrator for energy billing purposes. The meters will have to be registered at the relevant grid operator registries. Periodic readings of the generation in accordance with the frequency of the methodology will be done from the relevant meter, in consideration of instrument errors and transmission losses.

In case the relevant grid operator does not receive the generation information from the meter (s), the CPA generation will be calculated by the system operator from third party data.

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 relevant standards in the industry.

The CPA proponent will deliver electricity to the relevant grid on a continuous basis using an on-site and/or an online remote system if available. 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 proponent 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.

The meters 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 will be aggregated by the CME to facilitate the efficient verification of the PoA.

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 proponent 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.

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: 30/03/2012

The baseline and monitoring sections have been prepared by Carbon Capital inc. y Cia. Limitada ("Less Carbon"). Less Carbon is the Coordinating Managing Entity (CME) responsible for developing and implementing this PoA

Company name: Carbon Capital Inc. y Cia. Limitada
Address: Cirujano Guzman 179, Providencia, Santiago, Chile.

Contact person1: Mr. Marcos Miranda
Telephone number: +56 (2) 981 96 75 / +56 (2) 897 48 29
E-mail: marcos@lesscarbon.com

Contact person2: Mr. Hector Belmar
Telephone number: +56 (2) 981 96 75 / +56 (2) 897 47 22
E-mail: hector@lesscarbon.com

Annex 1

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

Organization:	Carbon Capital Inc y Cia. Limitada (Less Carbon)
Street/P.O.Box:	Cirujano Guzman 179, Providencia
Building:	
City:	Santiago
State/Region:	Metropolitana
Postfix/ZIP:	7500513
Country:	Chile
Telephone:	+56 (2) 981 96 75
FAX:	
E-Mail:	marcos@lesscarbon.com
URL:	http://www.lesscarbon.com/
Represented by:	Gregory Dunne
Title:	CEO
Salutation:	Mr.
Last Name:	Dunne
Middle Name:	
First Name:	Gregory
Department:	
Mobile:	+56 9 9453 0740
Direct FAX:	
Direct tel:	+56 (2) 981 96 75 / +56 (2) 897 78 46
Personal E-Mail:	greg@lesscarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This PoA does not receive any public funding

Annex 3

BASELINE INFORMATION

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

Annex 4

MONITORING INFORMATION

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

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